



Book of Abstracts

GLOBAL CONFERENCE ON WOMEN IN AGRI-FOOD SYSTEMS (GCWAS-2026)

DRIVING PROGRESS,
ATTAINING NEW HEIGHTS



📅 **March 12-14, 2026**

📍 **Bharat Ratna C. Subramaniam Hall, ICAR Convention Centre,
National Agricultural Science Complex (NASC),
Pusa Campus, New Delhi-110012, India**

www.gcwas.taas.in

BOOK OF ABSTRACTS

GLOBAL CONFERENCE ON WOMEN IN AGRI-FOOD SYSTEMS (GCWAS-2026)

DRIVING PROGRESS, ATTAINING NEW HEIGHTS

📅 **March 12-14, 2026**

📍 Bharat Ratna C. Subramaniam Hall, ICAR Convention Centre,
National Agricultural Science Complex (NASC),
Pusa Campus, New Delhi-110012, India

Organizers

Indian Council of Agricultural Research (ICAR)
Trust for Advancement of Agricultural Sciences (TAAS)
Consultative Group of International Agricultural Research (CGIAR)
Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA)

Co-Organized by

International Maize and Wheat Improvement Center (CIMMYT)
Borlaug Institute of South Asia (BISA)
International Center for Agricultural Research in the Dry Areas (ICARDA)
Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT)
Tata Cornell Institute (TCI)
Australian Centre for International Agricultural Research (ACIAR)
Center for International Forestry Research and World Agroforestry (CIFOR-ICRAF)
CGIAR Gender Equality and Inclusion (CGIAR GENDER)
SM Sehgal Foundation (SMSF)
Bhartiya Krishak Samaj (BKS)
Indian Society of Plant Genetic Resources (ISPGR)

www.gcwas.taas.in

© March 2026,
Indian Council of Agricultural Research (ICAR) and
Trust for Advancement of Agricultural Sciences (TAAS), New Delhi

Guidance

Dr R.S. Paroda, Chairman,
Trust for Advancement of Agricultural Sciences (TAAS), New Delhi, India

Dr M.L. Jat, Secretary,
Department of Agriculture and Education (DARE) and Director General, Indian Council of Agricultural
Research (ICAR) Krishi Bhavan, New Delhi, India

Dr Renu Swarup, Former Secretary,
Department of Biotechnology (DBT), Ministry of Science and Technology, Government of India

Dr Rajbir Singh, DDG (Agricultural Extension),
ICAR, Pusa Campus, New Delhi, India

Collation and Technical Editing

Dr Malavika Dadlani, Former Joint Director (Research),
ICAR-Indian Agricultural Research Institute, New Delhi, India

Dr R.K. Tyagi, Senior Consultant,
TAAS, New Delhi, India

Dr Bhag Mal, Executive Secretary,
TAAS, New Delhi, India

Dr K.K. Vinod, Associate Dean,
ICAR-IARI, New Delhi, India

Dr Amalendu Ghosh, Senior Scientist,
ICAR-IARI, New Delhi, India

Editing

Dr Anuradha Agrawal, Project Director,
ICAR-Directorate of Knowledge Management in Agriculture (DKMA), New Delhi

Ms Shareya and Mr Anup Pratap Singh, Young Professional-II,
ICAR-DKMA, New Delhi

Design and Production

Mr Punit Bhasin, Incharge, Production Unit,
ICAR-DKMA, New Delhi, India

Citation

GCWAS (2026). *Book of Abstracts, Global Conference on Women in Agri-Food Systems*, 12–14 March, 2026.
Indian Council of Agricultural Research (ICAR) and Trust for Advancement of Agricultural Sciences (TAAS),
New Delhi, p282.

Published by Dr Anuradha Agrawal, Project Director, Directorate of Knowledge Management in Agriculture, Indian
Council of Agricultural Research, Pusa Campus, New Delhi 110 012; Lasertypeset and printed at M/s Royal Offset
Printers, A-89/1, Naraina Industrial Area, Phase-I, New Delhi 110028.

PREFACE

WE are pleased to present the *Book of Abstracts* from the **Global Conference on Women in Agri-Food Systems (GCWAS 2026)**, held from 12–14 March 2026 under the theme “*Driving Progress, Attaining New Heights.*” The conference brought together researchers, policymakers, practitioners, industry leaders, and grassroots innovators from around the world to examine and strengthen the role of women in building resilient, sustainable, and inclusive agri-food systems.

The conference focused on four key objectives: assessing women’s participation and leadership in agri-food systems; identifying scientific, economic, institutional, and policy barriers limiting their access to resources, technology, markets, and decision-making; highlighting innovative and gender-responsive approaches that empower women entrepreneurs and leaders; and developing actionable recommendations to advance gender equality across the sector.

Through keynote lectures, technical sessions, panel discussions, and oral and poster presentations, participants engaged in meaningful dialogue on topics such as women’s leadership, climate-resilient agriculture, inclusive value chains, nutrition-sensitive farming, and emerging technologies for women’s empowerment. These discussions reflected diverse perspectives and experiences from across the globe.

This *Book of Abstracts* compiles the research and insights shared during the conference, showcasing efforts by scholars and practitioners to strengthen women’s agency and promote inclusive agricultural development. We hope this collection serves as a valuable resource for researchers, educators, policymakers, development professionals, and students committed to advancing equitable and sustainable agri-food systems.

The successful organization of GCWAS 2026 was made possible through the collective support of many institutions and individuals dedicated to gender-inclusive agricultural development. We extend our sincere gratitude to Dr R.S. Paroda, Chairman, Trust for Advancement of Agricultural Sciences (TAAS), and Chief Patron of the conference, for his visionary leadership.

We also acknowledge the guidance of the Conference Patrons—Dr. M.L. Jat (DARE–ICAR), Dr. Ismahane Elouafi (CGIAR), and Dr. Trilochan Mohapatra (PPV&FRA), whose leadership strengthened the vision and outreach of the conference. Our appreciation also goes to the International Advisory Committee, comprising distinguished global leaders in agricultural research and development, for their valuable insights in shaping the scientific framework of the event.

Our sincere appreciation is extended to the organizing institutions - **ICAR, TAAS, CGIAR, and PPV&FRA**, as well as to co-organizing and partner institutions, sponsors, and knowledge partners whose financial and technical support enabled the successful conduct of this conference.

We thank the Steering Committee, chaired by Dr Renu Swarup, with Dr. Rajbir Singh (ICAR) as Co-Chairperson, along with members from leading international organizations and academic institutions, for guiding the conference programme. They were ably supported by Dr. Rishi K. Tyagi and Dr Rajarshri Roy Burman; and the Co-Convenors, Dr. Anuradha Agrawal, Dr. Mridula Devi, and Dr. Anupama Singh, along with organizing committee members and volunteers whose dedication ensured the smooth conduct of the conference and preparation of this publication. Special thanks to Dr Malavika Dadlani, Dr Bhag Mal, Dr J.L. Karihaloo and entire staff of TAAS (especially Ms Simmi Dogra) for all their help in various ways. All personnel from ICAR Extension Division and DKMA (especially Mr Punit Bhasin) deserve deep appreciation for their hard work and support.

Finally, we extend our heartfelt appreciation to all plenary and keynote speakers, panellists, session chairs, authors, reviewers, exhibitors, and participants from India and around the world. Their contributions and engagement enriched the conference and advanced the global dialogue on women's empowerment in agri-food systems.

Organizing Committee

GCWAS 2026

CONTENTS

Abstracts of Oral Presentations

TECHNICAL SESSION-2: Driving Progress, Attaining New Heights	3
--	---

TECHNICAL SESSION-3: Mainstreaming Gender Equality and Social Inclusion	6
---	---

TECHNICAL SESSION-4: Emerging and Disruptive Technologies for Gender-Transformative Change	13
---	----

TECHNICAL SESSION-5: Building Future Leadership in the Agri-Food Sector	22
---	----

TECHNICAL SESSION-6: Empowering Women through Economic Inclusion	28
--	----

TECHNICAL SESSION-7: Gender Dynamics in Policy and Market Access	37
--	----

Abstracts of Poster Presentations

TECHNICAL SESSION-1: Interface with Global Women Trailblazers	41
---	----

TECHNICAL SESSION-2: Driving Progress, Attaining New Heights	43
--	----

TECHNICAL SESSION-3: Mainstreaming Gender Equality and Social Inclusion	59
TECHNICAL SESSION-4: Emerging and Disruptive Technologies for Gender-Transformative Change	98
TECHNICAL SESSION-5: Building Future Leadership in the Agri-Food Sector	131
TECHNICAL SESSION-6: Empowering Women through Economic Inclusion	161
TECHNICAL SESSION 7: Gender Dynamics in Policy and Market Access	258
Abstracts of Youth Forum	266





**ORAL
PRESENTATIONS**



Empowerment of Rural Women as Agri-Entrepreneurs through Seed Production Intervention in West Bengal

Sudeshna Panja¹, Swagat Ghosh¹, Kalyan Sundar Das², Pradip Dey²

¹Sasya Shyamala Krishi Vigyan Kendra, Ramakrishna Mission Vivekananda Educational and Research Institute (RKMVERI), Arapanch, Sonarpur, Kolkata 700150, West Bengal, India; ²ICAR-Agricultural Technology Application Research Institute (ATARI), Kolkata, West Bengal, India

Indian rural agricultural scenario has commonly witnessed the indirect participation of women members of farming family through either helping the male members in agriculture or physical work related to farm management activities; but insignificant engagement in decisive steps of agricultural practices or direct economic earnings through agricultural entrepreneurship. However, with the expansion of knowledge-based extension and technical support from Krishi Vigyan Kendras (KVKs), rural women are increasingly emerging as producers, entrepreneurs, leaders, and key decision-makers in agricultural production and marketing systems. Empowerment through skill- and knowledge-oriented interventions has thus become a critical pathway for strengthening rural livelihoods, leadership, and household economic security, reflecting a shift towards gender equity and shared authority in Indian agriculture. Recognizing this latent leadership potential, Sasya Shyamala Krishi Vigyan Kendra (SSKVK) initiated structured capacity-building programmes and demonstrations on scientific seed production of pulses, particularly green gram, across the blocks of South 24 Parganas district. The success stories of Mrs. Sabita Middy and Mrs. Rupa Roy of Mathurapur-II block vividly illustrate this process of empowerment and transformation. Initially engaged primarily in household responsibilities, they ventured into scientific green gram seed production by utilizing fallow land after receiving systematic training, continuous technical guidance and seeds from SSKVK. Through the adoption of improved varieties, recommended agronomic practices, quality seed and seed production techniques, they were able to achieve higher productivity and seed quality, resulting in an income generation of about ₹ 20,000-30,000. Their achievement became a driving force, motivating nearly 40 other farm women in the block to adopt green gram seed production. Of these successful rural women, 20 are directly involved with SSKVK for green gram seed production under Pulses Seed Hub Project. This ripple effect highlights how targeted capacity-building and institutional support can transform rural women from passive contributors to active entrepreneurs and leaders, strengthening both household livelihoods and community-level agricultural development.

Keywords: Agri-entrepreneurship, Green gram, Krishi vigyan kendra, Leadership development, Seed production, Women empowerment

For correspondence: Sudeshna Panja <sudeshnapanja.panja@gmail.com>

Training for Skill Development of Farm Women and their Children

Vaishnavi Bhardwaj¹, Sada Nand Rai¹, Suvidha²

¹Krishi Vigyan Kendra, Kaimur, Adhaura, Bhabua 821102, Bihar, India; ²Banasthali Vidyapith, P.O. Banasthali Vidyapith 304022, Rajasthan, India

Women's participation in agri-food systems is significantly constrained by unpaid care responsibilities, time poverty, and limited opportunities for health and skill development. This study examines the effect of a Play Way Psychosocial Intervention on children's developmental outcomes and its subsequent influence on the psychological, physical, and economic status of farm women. The study was conducted in Kaimur district, Bihar, among 70 children from farming households enrolled at Artmen School, selected using a purposive sampling technique. A structured and expert-validated Play Way Psychosocial Intervention Programme was implemented over a period of 12 weeks. Teachers received standardized training to ensure uniform delivery of modules emphasizing emotional regulation, social competence, communication skills, cooperative behavior, and adaptive functioning.

Baseline findings revealed that 78.6% of farm women were unable to participate in income-generating activities due to childcare and household responsibilities, while 71.4% reported inadequate investment in personal health because of financial constraints and time limitations. Post-intervention results demonstrated a statistically significant improvement ($p < 0.05$) in children's psychosocial induction scores, with mean composite scores increasing from 42.3 ± 6.8 to 61.7 ± 7.4 . Improvements were observed in emotional stability, peer interaction, attention span, and adaptive behavior.

Following the intervention, women's participation in income-generating activities increased from 34.2% to 67.1%. Average weekly income rose from ₹710±185 to ₹1,020±210, and available time for self-care and livelihood activities increased by 41.6%. Significant gains were also recorded in psychological well-being, health awareness, nutritional practices, and decision-making confidence ($p < 0.05$).

The findings establish that strengthening children's psychosocial functioning through play-based interventions significantly reduces maternal caregiving burden, enabling greater economic participation and well-being among farm women. The study highlights child-centered psychosocial intervention as a scalable strategy for promoting resilient, inclusive, and gender-responsive agri-food systems.

Keywords: Agri-food systems, Child development, Economic inclusion, Farm women empowerment, Play way intervention, Psychosocial induction

For correspondence: Vaishnavi Bhardwaj <vaishnavibhardwaj16@gmail.com>

In Agri-Food Systems: Insights from Value Addition Enterprises in Thrissur, Kerala

K.P. Smitha¹, F. Mary Regina¹, U. Krishnaja², G.J. Shimi², C. Anju², Ambili John², G.S. Aparna²

¹Krishi Vigyan Kendra, Vellanikkara, Thrissur 680656, Kerala, India; ²Kerala Agricultural University, Vellanikkara, Thrissur 680656, Kerala, India

Women are vital to agri-food systems, but structural barriers still limit their access to skills, infrastructure, finance, and markets. This paper shares insights from five women-led agri-food enterprises supported by Krishi Vigyan Kendra (KVK), Thrissur, Kerala, India, and explores how integrated institutional support can promote gender equality, nutrition, and resilience in agri-food systems. Through multiple case studies involving value-added foods, nutraceuticals, traditional grains, fruits, vegetables, and herbal wellness products, the paper connected empirical evidence with key Sustainable Development Goals (SDGs). The cases show strong alignment with SDG 5 (Gender Equality) by increasing women's leadership, decision-making power, and entrepreneurial roles; SDG 8 (Decent Work and Economic Growth) through enterprise creation, income, and local jobs; SDG 2 (Zero Hunger) by promoting nutrition-sensitive products like millets, moringa, jackfruit, and traditional rice; and SDG 12 (Responsible Consumption and Production) by reducing post-harvest losses and supporting local value chains. Contributions to SDG 1 (No Poverty) and SDG 10 (Reduced Inequalities) are also clear through livelihood diversification and including women from marginalized and conservative communities. KVK Thrissur has successfully nurtured five women-led enterprises that demonstrate the power of value addition in rural entrepreneurship. Jaitri Foods showcases a cooperative model that transformed farm women into large-scale processors of fruits and vegetables. Kariat Dry Foods pioneered nutraceutical products from moringa and millets, linking health and markets. Nutri Lifa Foods reflects resilience, where a failed venture was revived through moringa and jackfruit products. Vincy's Foods highlights diversification into fruit processing and herbal wellness products. Jyothy Prakash's Natural Agri Products revives traditional rice and nutrition-sensitive foods, blending heritage with income generation. The findings show that training alone is not enough to sustain women-led businesses. A complete ecosystem including capacity building, incubation, certification, branding, financial connections, and market access is necessary. Diversifying into different food and wellness products proved to be a key strategy for resilience, and branding and market positioning played a crucial role in the success of these enterprises. Notably, women entrepreneurs became technology multipliers, spreading knowledge, skills, and confidence to broader farmer networks and strengthening local agri-food systems. The paper concludes that women-centered value addition models, built into responsive extension and innovation systems, provide scalable pathways to achieve gender equality, nutrition security, and sustainable transformations in agri-food systems in the Global South.

Keywords: Gender equality, Institutional support, Nutrition security, Value addition, Women-led enterprises

For correspondence: K.P. Smitha and F. Mary Regina <smitha.kp@kau.in>

Women-Led Mission Navshakti - Hub and Spoke Cluster for Ornamental Fisheries (MN-HSCOF): A Globally Recognized Technical Model for Transformative, Sustainable and Innovative Livelihood Opportunities

Poonam Jayant Singh¹, Ravi Kumar¹, Arpita Batta¹, Suresh Chandra², Ajey K. Pathak¹, Lalit Kumar Tyagi¹, Indramani Raja³, Archana Singh⁴, Dayashankar Srivastava⁵, Nimisha Awasthi⁶, A. K. Singh⁶, Vikas Kumar¹, Sanjay Singh¹, Amit Kumar Bisht¹, Santosh Kumar¹

¹ICAR-National Bureau of Fish Genetic Resources, Lucknow 226002, Uttar Pradesh, India; ²Aquaworld Hitech Fisheries, Barabanki, Uttar Pradesh, India; ³Krishi Vigyan Kendras, ⁴Unnao, ⁵Sitapur, ⁶Kanpur Dehat, Uttar Pradesh, India

Mission Navshakti, launched under the SCSP component of ICAR-NBFGR, has emerged as a transformative model that has empowered over 425 Scheduled Caste rural women through skill development in ornamental fish rearing and aquarium fabrication and has potential to scale up. Spread across four districts in Uttar Pradesh, Barabanki, Unnao, Sitapur, and Kanpur Dehat, the initiative has successfully introduced micro-entrepreneurship to women with minimal or no previous economic engagement. Through a hub-and-spoke model, in association with KVK Sitapur, KVK Unnao, and KVK Kanpur Dehat, Hitech Fisheries and Aquaworld women were trained, provided with exposure visits, and equipped with start-up kits including aquaria and inputs like fish feed and accessories. Women turned backyards into functional cemented ponds, unlocking new sources of livelihood while remaining embedded in their communities. Digital handholding via WhatsApp ensured continuity in learning and collective motivation. To strengthen market linkages, Navshakti: Aquagri Business Incubation Centre (NABiC) has been established as a centralized platform for selling ornamental fish, aquaria, and locally crafted decorative items. What began in Dhankutti village with 50 women has now become a livelihood movement, expanding to Rajasthan and urban clusters of Lucknow. The impact is multidimensional economic, social, and psychological as women shift from subsistence farming to confident entrepreneurship, inspiring others in their communities. Mission Navshakti showcases how integrating traditional knowledge with modern techniques can reshape gender roles, foster resilience, and catalyse sustainable rural development through inclusive aquatic micro-enterprise. Mission Navshakti also empowers cobblers through basic startup kit, farmers with iceboxes and includes creativity and design thinking in school kids through aquarium fabrication and cognitive learning devices. Mission Navshakti and its incubation center NABiC and shops named Navshakti ki udaan were recognized by UN-FAO, during FAO's 80th anniversary for first ever Global Technical Recognition in Sustainable Aquatic Food Systems for technical leadership, collaboration, innovation and best practices in transformation, showcasing exemplary contribution, highlighting the initiative's role in uplifting Schedule Caste communities through women-led entrepreneurship and resilient fish farming practices. The collaboration among stakeholders has created a new model of rural-urban market linkage that has potential to transform and empower lives through micro-entrepreneurship.

Keywords: Modern techniques, Micro-entrepreneurship, Resilient fish farming, Rural-urban market linkage

For correspondence: Poonam Jayant Singh <poonamjayant@gmail.com>

Gender based Barriers in Access to Crop Seed Certification System: Implications for Resilient Seed Systems in the Haor Ecosystem of Bangladesh

Rehana Noor, Muhammad Ashraf Habib, Swati Nayak, Humnath Bhandari

International Rice Research Institute (IRRI), House 07, Road 56, Gulshan02, Dhaka1217, Dhaka, Bangladesh

Strong and resilient crop seed systems play a vital role in gender equality and women empowerment. Seed certification, an important part of the seed system, ensures access to high-quality, climate-resilient seeds, but faces systemic, socio-ecological, and gender barriers in Bangladesh's Haor region. This study reviewed literature and identified key barriers to a gender-inclusive, resilient crop seed system. Typical farmers and community produced rice seeds fail to meet certification standards due to inadequate post-harvest drying infrastructure, limited access to quality testing facilities, and limited awareness of seed quality parameters. This constrained the availability of quality seeds and adoption of improved rice varieties. For example, although climate-resilient rice varieties (CRRVs) are available, their adoption remains moderate (35-40%); 15-30% of adopters report yielded instability under extreme or atypical hydrological conditions, indicating gaps in agro-ecological targeting and advisory support. Furthermore, delays in seed distribution, poor demand forecasting, and weak horizontal coordination among research, extension, and certification agencies reduced timely access to certified seeds during the short Haor planting windows. Gender disparities in training, technical skills, and participation in seed systems further limit women's roles in seed production and certification. Addressing these barriers requires leveraging local innovations. For example, Community Seed Banks (CSBs) are considered grassroots institutions that supply seeds locally, conserve agrobiodiversity, safeguard seed sovereignty, empower women and other farmers, and strengthen resilience to climate change. With the potential to bolster the informal rice seed sector, CSBs can improve resilience and enable higher replanting success after post-flash floods. However, their limited formal integration curtails business development, scaling and recognition. These findings call for an inclusive seed certification framework that addresses Haor climatic volatility, strengthens institutional coordination, mainstreams gender-responsive capacity, and leverages community-based seed infrastructure. Implementing such reforms is crucial for ensuring equitable access to certified, climate-adapted seeds and for strengthening the long-term resilience of both women and men farmers in Bangladesh's flood-prone Haor regions.

Keywords: Community seed banks, Gender, Haor ecosystem, Seed certification

For correspondence: Rehana Noor <r.noor@cgiar.org>

Leading Change from Within: Strengthening Women's Agency and Institutional Power in Agri-Food Systems

Kavitha Kasala¹, Almamy Sylla², Padmaja Ravula¹, Victor Afari-Sefa³

¹International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, Hyderabad 502324, Telangana, India; ²ICARISAT, Mali; ³ICARISAT, Nigeria

Strengthening women's leadership and agency within agri-food systems is essential for achieving inclusive, equitable, and climate-resilient development. While Gender Equality and Social Inclusion (GESI) has gained visibility in development policies and programs, women remain underrepresented in decision-making, while institutional capacities to address structural gender inequalities remain limited. Advancing women's leadership therefore requires Gender-Transformative Approaches (GTAs) that challenge power relations, reshape organizational norms, and embed accountability for gender equality within institutions.

This paper presents evidence from a structured gender-transformative capacity-building initiative implemented in India by ICRISAT under the Indian Technical and Economic Cooperation (ITEC) training programme, as part of a South-South agri-cooperation effort. The initiative targeted mid-career professionals from the global south, including government agencies, academic institutions, and development organizations working across agri-food systems, with a deliberate focus on strengthening women's leadership, agency, and institutional influence. The training emphasized critical reflection on gender norms and power, intersectionality, inclusive research and program design, and strategies for institutional mainstreaming of GESI. The programme engaged 35 professionals from 26 countries, 74% of whom were women. Across twelve GESI competency domains, participants reported mean self-assessed gains of 32-61%, with the largest improvements in understanding power and social norms, institutional GESI mainstreaming, and gender-responsive research design. These gains were reflected in participant perspectives, with an African participant noting that ungendered development endangers development, and an Asian participant emphasising that GESI can be realised through cumulative individual and societal actions. Post-training, 83% of participants predominantly women reported increased confidence to influence organisational decision-making, while 76% indicated readiness to advocate for policy and procedural change.

Qualitative reflections connote early GESI leadership and practice-level outcomes. Survey responses collected before the start of the training captured participants' reflections on women's leadership and gender equality within their respective national contexts, strengthening critical awareness of structural barriers and opportunities for change. The programme's beyond-course applicability approach catalysed strategic mindset shifts, with women initiating revisions to research proposal guidelines, establishing internal GESI working groups, and mentoring junior women colleagues, while male participants reported increased engagement in supporting women's leadership and embedding GESI principles within extension and policy processes.

The findings demonstrate that South-South, leadership-oriented GTA training can serve as a catalyst for strengthening women's agency and institutional transformation. Investing in such approaches is critical for embedding gender equality within agri-food systems at scale.

Keywords: Gender-transformative approaches, GESI mainstreaming, Institutional transformation, South-South cooperation, Women's leadership

For correspondence: Kavitha Kasala <kavitha.kasala@icrisat.org>

Participation and Time Contribution of Women in Agriculture Who are not Counted as Worker

Anil Kumar¹, Ananta Sarkar², G. Uma³

¹ICAR-National Institute of Agricultural Economics and Policy Research, New Delhi 110012, Delhi, India; ²ICAR-Central Institute for Women in Agriculture, Bhubaneswar, Odisha, India; ³School of Gender and Development Studies, Indira Gandhi National Open University, New Delhi, India

Outside the realm of formal workforce, a large segment of women continues to participate in agriculture providing critical labour in various activities. The invisibility of such women deprives them of the recognition and appreciation of the work they do, besides a lack of policy support for them. Using unit level data of the Time Use Study 2024, we analyzed the total work-time of rural women and men in 50,763 farming households and compared with 32,093 non-farming households, covering a total of 241,050 individuals. Their participation and time contribution in unpaid domestic work, farming activities further disaggregated into crop and livestock activities were also analyzed besides working on the above indicators by classifying them into worker and non-worker, gender and age categories. We reported that 60% households were engaged in farming activities. Specific to women, 46.8% of adult females participated in farming; 25.9% in crop production and 26.1% in livestock rearing activities compared to males being 65.3, 53.8 and 26.3%, respectively. In rural areas, there were 31.47% female identified as workers of which 25.64% participate as worker in agriculture, as against their participation in agriculture being 46.8% irrespective of the categorization as worker. The daily work-time of women in agriculture covering paid and unpaid work are 572.4 minutes while that of men it is 468.0 min. These women devoted 299 min each day in unpaid domestic, care and volunteer (UDCV) work (vs. 45.7 min for men). Thus, they get only 273 min (vs. 422 min for men) to engage in gainful employment impacting their livelihood opportunities besides facing time poverty in skill development or socialization. In farming activities, women devoted 226.7 min per day per participant (vs. 321.5 minutes for men). In the status as worker, women spend 295 min per day in farming activities whereas, those not identified as 'worker' devote 144 min per day. Hence, over two hours of work each day, 21.2% of women in farming households gets invisibilized, marginalizing them as an active participant in agricultural development. The women farmers in the age group 25 to 44 year work for over 10 hours each day to keep the farm and home up and running which needs recognition, appreciation and enabling environment to reduce their work burden to live a fulfilling life.

Keywords: Agricultural participation, Time use analysis, Rural women farmers, Women's unpaid labour, Work-time disparity

For correspondence: Anil Kumar<anil.niap@gmail.com>

State-Led Natural Farming and Women's Reproductive Labour: Exploratory Insights from Andhra Pradesh, India

Sandhya Kumari V.

Indian Institute of Management, Vastrapur, Ahmedabad 380015, Gujarat, India

Rural women play a central role in Indian agriculture and allied activities, contributing extensively to farm operations as well as to unpaid reproductive labour. Despite their significant participation, women's reproductive work remains largely invisible in economic accounting and policy dialogue. In rural India, reproductive labour is socially assigned to women and often taken for granted, limiting their time, mobility, and participation in income-generating and decision-making activities outside the household. Over the years, the Government of India has introduced various welfare schemes aimed at reducing women's reproductive labour burden, including the PMUY, JJM, ICDS, and NRLM. While these interventions have eased certain aspects of unpaid work, they have not addressed the unequal gender norms. In contrast, the state-led natural farming initiative implemented through Rythu Sadhikara Samstha (RySS) under the Andhra Pradesh Community Managed Natural Farming (APCNF) program has influenced household-level gender relations.

Although gender sensitization was not an explicit objective of APCNF, the program placed women at the center of knowledge dissemination, community mobilization, and collective action through WSHGs. Natural farming is framed within these communities as a form of family-based farming, wherein both men and women share responsibility for farm management and household well-being. The discussion draws on insights from a focused group discussion with women farmers associated with the RySS program. Women reported spending 10-14 hours daily managing household chores, farm work, and WSHG responsibilities. While participants continued to view reproductive labour as primarily women's responsibility, they observed gradual shifts in household support. Increased engagement in training program, collective meetings, and farm related responsibilities led male family members, children, and in-laws to assist with domestic tasks, which was an uncommon practice before their involvement in APCNF. Participants also highlighted improved confidence, enhanced decision-making power, financial stability through reduced cultivation costs, value addition, and easier access to low-interest loans via WSHGs.

Based on these exploratory insights, it suggests that state-led natural farming program may open new spaces for renegotiating gender roles and the inclusion of women in economic activities. The discussion provides a foundation for future research and underscores the importance of incorporating gender dynamics and unpaid care indicators into agricultural policy and program design.

Keywords: Community institutions, Gender norms, Natural farming, Reproductive labour, Women's agency

For correspondence: Sandhya Kumari V. <pbd25sandhyav@iima.ac.in>

Women in India's Agri-Food Systems: Thematic Trends and Research Directions

Jaya Jumrani, Samridhi

ICAR-National Institute of Agricultural Economics and Policy Research, D.P.S. Marg, Pusa, New Delhi 110012, India

Women are central to agricultural production, food and nutritional security, and livelihood systems in developing countries, yet their roles are unevenly reflected in the knowledge base that informs agricultural research and policy. This study undertook a scoping review under the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) framework to identify dominant research areas and assess how gender-related research themes have evolved over space and time within India's agricultural sector.

Between 2000 and 2025, 778 records were identified from two key electronic search databases for peer-reviewed literature *i.e.*, Web of Science and Scopus. After removing duplicate records, 610 unique records were screened for title and abstract, yielding 339 studies that met the final adopted inclusion criteria. All publications considered in this review were written in English and explicitly examined women's roles or contributions to agriculture and allied activities. Each study had a clear gendered orientation across domains like production, nutrition, livestock, extension, climate adaptation etc. within the agri-food systems in India, and was categorised under six broad research themes.

The largest thematic cluster was Climate Change, Sustainability and Resilience (20.9%, n=71), which grew by 346% between 2016 and 2025, with key publication outlets including journals such as Climatic Change, Land Use Policy and Global Environmental Change. This was followed by Livestock and Allied Activities (19.7%; n = 67) and Nutrition, Diet and Health (18.8%; n = 64) published in journals such as Indian Journal of Animal Sciences, Food Policy, and BMC Public Health. Next were Extension, Technology and Capacity Building (17.6%; n = 60) and Women's Work, Roles and Time Use (17.4%; n = 59) themes. In contrast, the Institutions, Policy and Research Systems theme remained least represented (5.3%; n = 18), underscoring a significant research gap. Over 70% studies had at least one female co-author, concentrated in livestock and nutrition themes, while 26% studies involved foreign collaborators, more prevalent in nutrition- and climate-focused studies.

To the best of our knowledge, this is the first scoping review examining the thematic trends in research on women's involvement in Indian agriculture. Findings revealed there is limited scholarship addressing how institutional frameworks, policy mechanisms, and research systems shape or constrain women's participation. This underrepresentation highlights the need for more research on structural and policy dimensions to better integrate gender perspectives into agricultural governance, research prioritisation and developmental planning.

Keywords: Agricultural research, Gender, India, Women

For correspondence: Jaya Jumrani<jaya.jumrani@icar.org.in>

Gendered Decision-Making and Household Dietary Quality in South Asia: Evidence from Eastern Gangetic Plains

Bhuvana Narayana Rao¹, Ravi Nandi², Arifa Jannat³, Anamika Kandel⁴, Kalyan Kanti Das⁵, Tamara Jackson⁶

¹International Maize and Wheat Improvement Center (CIMMYT), New Delhi 110012, India; ²CIMMYT, Dhaka, Bangladesh; ³Bangladesh Agricultural University, Mymensingh, Bangladesh; ⁴Agriculture and Forestry University, Rampur, Chitwan, Nepal; ⁵Uttar Banga Krishi Viswavidyalaya, Cooch Behar, West Bengal, India; ⁶The University of Adelaide-South Australia, Adelaide, Australia

Across South Asia, policy has long treated women's empowerment as an instrument for improving diets, yet adult dietary quality remains uneven, and the burden of non-communicable diseases is rising. However, evidence on whether women's involvement in specific agricultural production and income-use decisions translates into better adult dietary outcomes is mixed and context-dependent. Moreover, harmonised multi-country evidence using robust causal methods remains scarce in the Eastern Gangetic Plains. This study assessed associations between women's involvement in household decision-making and adult dietary quality and non-communicable disease risk across three countries in the Eastern Gangetic Plains. Using baseline data from 1,394 households in India, Nepal, and Bangladesh, the analysis examined whether women's participation in agricultural production decisions and in decisions over the use of agricultural income is linked with three diet outcomes: Minimum Dietary Diversity for Women, NCD-protective food scores, and NCD-risk food scores. To address model dependence and selection bias in observational settings, the study combined elastic net-based logit regressions for regularised variable selection with machine-learning-based causal estimators, including cross-fit partial Lasso and entropy balancing for covariate reweighting.

Results revealed limited average effects of women's decision involvement across all dietary outcomes once socioeconomic and aspirational factors are controlled for, and causal estimates remain close to zero and statistically insignificant across specifications. Instead, education, landholding, salaried income, group memberships, and aspirations to diversify into non-farm activities exhibited stronger and more consistent associations with dietary adequacy and protective food consumption. Findings also documented a double-burden pattern in which factors that increase protective food intake simultaneously increase exposure to NCD-risk foods, indicating that market access and income growth can expand opportunities for both healthy and unhealthy consumption.

The results suggested that strengthening women's agency within narrow decision-making domains, by itself, may yield only modest gains in adult diet quality in patriarchal agrarian contexts, unless paired with complementary investments that relax binding constraints on capabilities and food environments. Policy implications for gender-responsive agri-food systems emphasised integrated interventions that combine empowerment with education, income stability, social protection, and improvements in the availability and affordability of protective foods, alongside measures that limit exposure to risk-promoting products.

Keywords: Causal inference, Dietary quality, Eastern Gangetic Plains, Non-communicable diseases, Women's decision-making

For correspondence: Bhuvana Narayana Rao <bbhuvanaditya7@gmail.com>

Reconfiguring Drudgery: Gender, Technology, and Lived Labour Burdens in the Eastern Gangetic Plains

Gunjan Rana¹, Ravi Nandi², Tamara Jackson³

¹International Maize and Wheat Improvement Center (CIMMYT), Bamanpara, Cooch Behar 736101, West Bengal, India; ²CIMMYT, Dhaka, Bangladesh; ³The University of Adelaide, Adelaide, South Australia, 5005 Australia

Women's agricultural work in South Asia is commonly framed through the notion of a triple burden spanning productive, reproductive, and social roles. While analytically useful, this framing obscures how labour burdens are actively negotiated and evaluated in everyday life. In the Eastern Gangetic Plains (EGP), where women contribute more than half of agricultural labour yet retain limited land rights and decision-making authority, technological interventions promoted as labour-saving have produced uneven outcomes. Their impacts are typically assessed through technocratic efficiency metrics that inadequately capture women's lived experiences.

Drawing on comparative focus group discussions with women and men farmers in northern Bangladesh, eastern Terai Nepal, and eastern India, this study conceptualized drudgery as a lived, cumulative, and socially embedded experience encompassing physical effort, time pressure, coordination demands, and responsibility. Women consistently articulate drudgery through interconnected evaluative criteria, while men's narratives emphasize aggregate outcomes, thereby obscuring differentiated gendered labour costs. The analysis showed that agricultural technologies including mechanized harvesting and tillage, custom hiring services, and information- and service-based innovations often reconfigure rather than reduce drudgery, introducing new dependencies, learning burdens, and coordination responsibilities for women, even when specific physical tasks are reduced. Limited access to technical know-how, repair services, and reliable service networks further constrains women's ability to sustain technology use, rendering labour-saving gains fragile and uneven over time.

Importantly, the forms and meanings of drudgery vary across contexts: in India, drudgery is closely linked to time pressure and task coordination; in Bangladesh, to cumulative physical strain; and in Nepal, to information access and learning demands. These differences underscore the limitations of universalized empowerment metrics that prioritize asset ownership or individual decision-making while rendering the labour costs of empowerment invisible. By treating drudgery as a critical yet under-theorized cost of empowerment, this work advances a gender-transformative perspective on agricultural technology. It argues that truly transformative and disruptive innovations must be grounded in women's lived evaluations of work, autonomy, and responsibility, rather than in narrow assumptions of labour efficiency alone. Based on these findings, gender-transformative technology development must move beyond labour-saving claims to explicitly address scale appropriateness, service and repair infrastructures, knowledge access, and the redistribution of coordination and care responsibilities borne by women. Incorporating emic perspectives into technology design and deployment is therefore essential to ensure that emerging agri-food technologies redistribute, rather than reproduce, gendered labour burdens.

Keywords: Agricultural technology, Eastern Gangetic Plains, Gendered drudgery, Gender-transformative innovation, Triple burden

For correspondence: Gunjan Rana<g.rana@cgiar.org>

Gender-Friendly Technologies for Drudgery Reduction in Banana and Cassava Farming

G. Chithra

ICAR-Krishi Vigyan Kendra, Mitraniketan PO, Vellanad, Thiruvananthapuram 695543, Kerala, India

Farm women constitute a substantial proportion of the agricultural workforce in India and are predominantly engaged in drudgery-prone operations such as transplanting, weeding, harvesting, threshing and post-harvest handling. Most farm tools and equipment have traditionally been designed for male workers, resulting in reduced work efficiency and increased occupational health risks when used by women. Since the ergonomic and anthropometric characteristics of farm women differ significantly from men, there is a strong need to develop and promote gender-friendly technologies for them. In this context, the present work highlights drudgery-reducing improved technologies promoted through field interventions conducted by ICAR-Krishi Vigyan Kendra (KVK), Thiruvananthapuram over the past five years.

Two women-friendly technologies were evaluated and popularized: a farmer-friendly banana bunch covering device and a semi-manual cassava harvester. Banana bunch covering is an important practice to protect fruits from bird and animal damage, skin injuries and irregular ripening. The improved device eliminated the need for climbing using ladders, reduced physical strain and enhanced safety. Performance evaluation showed higher bunch weight (11.5 kg), yield (287.5 q/ha) and improved fruit quality (TSS 28.2 °Brix), along with 66.72%-time savings and reduced labour requirement compared to the manual method.

Similarly, cassava harvesting, which is traditionally labour-intensive and physically demanding for women, was made easier through the introduction of a semi-manual harvester based on the lever principle. The implement significantly increased field capacity (50-60 plants/hour), reduced labour requirement from 205 to 46 man-hours per hectare, and minimized tuber breakage from 41.7% to 12.5%, resulting in 77.56% labour savings.

Both technologies were found to be lightweight, easy to operate, affordable and highly acceptable among farm women. The study demonstrates that gender-sensitive mechanization through KVK-led interventions can effectively reduce drudgery, improve productivity and enhance the livelihoods of small and marginal farm women.

Keywords: Banana bunch covering device, Cassava harvester, Drudgery reduction, Field capacity, Gender-friendly technology

For correspondence: G. Chithra <gchithramitra@gmail.com>

Leveraging Gender Responsive Technologies for Women Empowerment and Climate Resilience in Rice-based Cropping Systems

Sukanta Kumar Sarangi

ICAR-Central Institute for Women in Agriculture, Bhubaneswar 751003, Odisha, India

Rice-based cropping systems support the livelihoods of millions of smallholder farm families in South and Southeast Asia, where women constitute 40-60% of the agricultural workforce. However, climate change-induced stresses such as erratic rainfall, salinity intrusion, water scarcity, and rising labour costs disproportionately affect women farmers due to their limited access to technologies. Gender-responsive technologies offer a pathway to enhance women's empowerment, labour efficiency, farm income, and climate resilience.

Evidence from Direct Seeded Rice (DSR) demonstrated significant gender and climate benefits. Studies reported a 20-30% reduction in labour demand, 15-25% water savings, and 10-15% lower cost of cultivation compared to conventional puddled transplanted rice, while maintaining comparable yields. DSR lowers women's drudgery and exposure to prolonged standing in water. Drum-seeded rice using salt-tolerant varieties integrated with Azolla enhanced grain yield by 12-18%, improved nitrogen use efficiency, and reduced chemical fertilizer requirements by 20-25%, making it particularly suitable for women-managed coastal saline ecologies. Adoption of drudgery-reducing tools (cono weeders, manually operated seeders, improved sickles, pedal threshers, and mini harvesters) reduce women's physical strain by 30-50%, save 25-40% time, save ₹ 22,500 per hectare per crop season and improve operational efficiency, thereby enabling women to participate in higher-value farm and off-farm activities.

Diversification and system intensification further strengthen climate resilience. Intercropping of climbing vegetables in waterlogged paddy fields using soil- and manure-filled bags increased land productivity by 1.5-2.0 times and generated 30-60% additional income, with women playing a central role in crop management and marketing. Zero-tillage potato cultivation after rice with paddy straw mulching reduced the cost of cultivation by 27%, labour requirement by 50% and irrigation water requirement by 40%. It improved water productivity (146.5%), tuber yield (38.5%), soil moisture (8.0%) and reduced soil salinity (40%). Sequential cultivation of green gram after zero-tillage potato enhanced system productivity, added 20-25 kg N/ha and improved household nutrition and women's control over pulse crops.

Climate-smart diversification options such as maize cultivation on raised beds after rice and rapeseed-mustard under zero tillage improved cropping intensity, stabilized yields under residual soil moisture and salinity stress, and increased net returns by 25-40%. Zero tillage and paddy straw mulching in rice-based systems significantly reduced GHG emissions by 20-35% while improving soil organic carbon. Overall, the integration of gender-responsive, climate-smart technologies in rice-based cropping systems enhances labour efficiency, income diversification, and adaptive capacity. Scaling these technologies can substantially contribute to women's empowerment and resilient agri-food systems.

Keywords: Climate-smart agriculture, Direct seeded rice, Gender-responsive technologies, Rice-based systems, Women's empowerment

For correspondence: Sukanta Kumar Sarangi <sksarangicanning@gmail.com>

Development of Ergonomic Protective Garments and Devices for Pesticide Applicators and Device to Reduce Work Pressure among Farm Women in Chilli De-stalking

R. Prabhavathi, M. Ravi Kishore

Dr. K. L. Rao Krishi Vigyan Kendra, Acharya N. G. Ranga Agricultural University (ANGRAU), Garikapadu, Jaggayyapeta 521175, Andhra Pradesh, India

Improving and maintaining human health is essential for sustaining energy efficiency and productivity within the Indian food chain. Increasing population pressure has led to intensive cultivation of commercial crops under high-input management systems. Chilli (*Capsicum annuum* L.), one of the most important commercial spice crops of India, is extensively cultivated using improved varieties along with repeated applications of fertilizers, pesticides, and fungicides. India is one of the largest producers, consumers, and exporters of chilli, with a production area of 6.81 lakh hectares and an output of 10.09 lakh tonnes. Andhra Pradesh ranks first in chilli export, cultivating the crop on approximately 1.3 lakh hectares.

The intensive use of plant protection chemicals throughout the crop period exposes farmers and workers to serious occupational health hazards. In addition, farm women engaged in post-harvest chilli processing, particularly de-stalking of dried chillies, experience considerable work pressure and drudgery. Women spend 6-7 hours daily on de-stalking activities, leading to finger injuries, pain, itching, cuts, and burning sensations caused by the prickly stalks and chilli pungency. These conditions adversely affect their ability to perform daily household activities and reduce work efficiency.

The present study aimed to design and develop ergonomic and comfortable protective garments and devices to reduce work pressure and occupational health risks among chilli workers, with special emphasis on farm women de-stalkers. A survey was conducted among 120 pesticide applicators and 50 women chilli de-stalkers in and around Guntur district to assess pesticide usage practices, existing protective measures, health problems, and specific needs. Based on the findings, water-repellent protective garments with hood, water-repellent footwear, nose masks, goggles, and knitted gloves were developed to enhance protection and comfort. The developed protective devices were found to be suitable for minimizing injuries, discomfort, pungency-related irritation, and overall work pressure, thereby contributing to improved occupational safety and drudgery reduction among farm women.

Keywords: Chilli de-stalkers, Drudgery reduction, Ergonomic protective clothing, Farm women, Water-repellent garment

For correspondence: R. Prabhavathi <rachuri78@gmail.com>

Empowering Women through Plant-Based Milk Analogue Production Technologies

Khwairakpam Bembem, Sujata Sethy

ICAR-Central Institute of Post-Harvest Engineering and Technology, Hambran Road, P.O.-Punjab Agricultural University, Ludhiana 141004, Punjab, India

Global shifts towards sustainable and nutrition sensitive food systems have increased interest among consumers in plant-based milk analogues derived from different food crops such as soy, peanuts, almonds, coconuts, etc. Plant-based milk analogue production technologies present a substantial opportunity for empowering women through gender transformative change within agri-food systems. These technologies can address gender inequalities, as they do not demand high physical strength for their operation, enhancing women's participation economically and strengthening their decision-making and leadership across value chains. Plant-based milk analogue production involves several processing steps, including cleaning, soaking, grinding, extraction, filtration, homogenization, pasteurization or ultra-high temperature (UHT) treatment, fortification, and packaging. Recent technological advancements have developed small- to medium-scale, modular, and semi-automated processing units that are affordable, energy-efficient, and easy to operate. These technologies are particularly appropriate for women-led self-help groups, cooperatives, and micro-enterprises, as they enable women to transition from primary production activities to value-added processing and entrepreneurial roles. Plant-based milk analogue technologies also support nutrition and environmental sustainability. Fortification techniques allow enhancement with calcium, vitamins, and minerals, addressing micronutrient deficiencies prevalent among women and children. The use of locally grown, climate-resilient crops such as millets, pulses, and nuts reduces water use, greenhouse gas emissions, and dependence on animal-based dairy systems, while creating resilient local supply chains. For these technologies to achieve genuine gender-transformative impact, inclusive design and targeted capacity-building are critical. Developing ergonomically sound equipment considering women users, providing skill development and training in local languages, and establishing supportive policy and regulatory frameworks can promote equitable access and sustained adoption. When integrated into enabling ecosystems that offer access to finance, markets, and institutional support, plant-based milk analogue production technologies can become powerful drivers of women's empowerment-advancing sustainable livelihoods, enhancing nutrition outcomes, and fostering more inclusive and resilient agri-food systems.

Keywords: Gender-transformative change, Nutrition-sensitive processing, Plant-based milk analogues, Sustainable agri-food systems, Women-led enterprises

For correspondence: Khwairakpam Bembem <bembemkhwai@gmail.com>

Women-Led Climate-Smart Agriculture for Sustainable Livelihoods In Plateau Region of Odisha

Praveen Jakhar, Sachidananda Swain, Neetish Kumar

ICAR-Central Institute for Women in Agriculture, Plot No. 50-51, Mouza-Jokalandi, Khurda, Bhubaneswar 751003, Odisha, India

The present study was carried out in Keonjhar district of Odisha, located in the north-central and eastern plateau region, characterized by a predominantly rainfed agro-ecosystem and high vulnerability to climatic variability *viz.* cyclones, intermittent droughts, and declining soil health. The study covered 200 farm women from 20 villages across seven Minor Irrigation Projects (MIPs) in three blocks of the district with a set of women-centric climate-smart agriculture (CSA) in different modules were designed and implemented, integrating emerging technologies for women farmers. The modules encompassed 1) Intensification through resilient stress-tolerant crop varieties 2) crop diversification 3) soil health and water conservation practices 4) climate literacy 5) mechanization and value-addition enterprises. Emphasis was placed on farm women-led demonstrations, area-based adoption, and institutional mechanisms to enhance access, decision-making, and leadership.

Under intensification module through the introduction of climate-resilient varieties such as Swarna Sub-1, MTU 1010, MTU 7029, and Sahabhagi were demonstrated over an area of 301 acres resulting in an average yield enhancement of 18.5%, indicating the effectiveness of varietal substitution and improved crop management in mitigating climate-induced production risks. Crop diversification during *kharif* focused on shifting from paddy to non-paddy crops to reduce water stress and enhance system resilience. Millets (MR-6), sesame, and groundnut interventions resulted in significant productivity gains, with 21.5% yield enhancement in millets and 20.4% in groundnut, underscoring the potential of diversification and climate adaptability. Third module highlights soil health management and carbon sequestration-oriented best management practices. Interventions such as direct seeded rice (DSR) over 25 acres, drum seeding, crop residue management, were promoted.

Livelihood enhancement was addressed through processing and value addition, wherein 18 women-led Custom Hiring Centres (CHCs) were established, involving 210 farm families. These CHCs generated a monthly average income of ₹ 12,000-15,000%, contributing significantly to women's economic empowerment. The climate literacy module strengthened institutional and knowledge capacities through the formation of 20 Village Climate Resilient Management Committees, engaging more than 200 farm women. Overall, the social impact analysis revealed high adoption of adapted varieties (86.7%), direct seeded rice (76.2%), and composting practices (68%), alongside improved leadership and decision-making among farm women. The results indicate that adoption of gender-responsive CSA technologies led to improved productivity, resource-use efficiency, and livelihood security, while simultaneously reducing drudgery and strengthening women's participation. The study demonstrated that gender-transformative deployment of climate-smart and disruptive technologies can play a critical role in building resilient agri-food systems and empowering women farmers.

Keywords: Climate-smart agriculture, Crop diversification, Custom hiring centres, Gender-responsive technologies, Women farmers

For correspondence: Praveen Jakhar <icarpraveen@gmail.com>

Green Matriarchs: Women Farmers of Northeast India Pioneering Climate-Smart Agriculture through Perennial Carbon Farming

Divya Parisa¹, Ramesh Thangavel², T. Amrutha¹, A.K. Singha¹, Mainak Ghosh¹, P.K. Pathak¹, A.K. Mohanty¹

¹ICAR-Agricultural Technology Application Research Institute (ATARI) Zone VII, Barapani Umiam, Shillong 793103, Meghalaya, India; ²ICAR Research Complex for NEH Region, Umiam 793 103, Meghalaya, India

In the ecologically fragile and climate-vulnerable landscapes of Northeast India, women farmers are emerging as pivotal agents of change in soil carbon dynamics and climate adaptation. Confronting severe environmental challenges including accelerated soil erosion on steep slopes (15-35% gradient), deforestation from shifting cultivation (*Jhum*), and declining soil organic carbon (SOC) these women are fundamentally transforming agricultural practices by shifting from annual, soil-exhausting crops to diversified perennial horticultural systems. This strategic transition represents a profound socio-ecological innovation with direct benefits for planetary health. Scientific evidence underscores the efficacy of this shift. Research on SOC stabilization mechanisms revealed that perennial fruit tree systems significantly enhance carbon sequestration compared to barren or annual-cropped lands. For instance, guava (*Psidium guajava*) and peach (*Prunus persica*) orchards demonstrated superior SOC retention, with guava macroaggregates containing up to 23.33 g SOC/kg substantially higher than control soils. These systems also exhibited greater aggregate stability, higher levels of stabilizing biochemicals (e.g., glomalin-related soil proteins), and reduced temperature sensitivity of carbon mineralization, making them more resilient to warming.

By championing these systems, women farmers are creating continuous soil cover, reducing tillage-induced carbon loss, and building belowground carbon stocks. This shift from carbon-emitting practices to carbon-capturing horticulture directly mitigates agriculture's climate footprint. Each hectare converted to a diverse perennial system can sequester 0.5-3 tons of CO₂ equivalent annually, while also enhancing water infiltration, biodiversity, and soil fertility. Ultimately, the leadership of women farmers in adopting perennial horticulture is more than a livelihood strategy. It is a critical, grassroots-led climate solution. Their pioneering work demonstrates that aligning agricultural production with ecological regeneration can buffer vulnerable communities against climate shocks, restore degraded landscapes, and contribute meaningfully to global carbon drawdown efforts, positioning them as indispensable stewards in the journey toward a stable planet.

Keywords: Climate adaptation, Northeast India, Perennial horticulture, Soil carbon sequestration, Women farmers

For correspondence: Divya Parisa<divya3233@gmail.com>

Designing Women Friendly Shrimp Peeling Solution through Participatory Approach

Pradip Tulshiram Lanjile, Shivaji Argade

ICAR -Central Institute of Fisheries Education, Andheri West, Mumbai 400061, Maharashtra, India

Shrimp peeling is a labour-intensive, repetitive task vital to India's post-harvest fisheries sector, primarily performed by women from low-income backgrounds. Manual methods expose workers to poor posture, repetitive motions, and unhygienic conditions, leading to musculoskeletal disorders and physical strain. This study assessed ergonomic and occupational challenges faced by women shrimp peelers and introduced a women-centric solution through a participatory approach. Eighty women shrimp peelers from Sassoon Dock and New Ferry Wharf in Mumbai were selected for the study. A large proportion of 82.50% women took up peeling due to financial pressure. Only 32.50% women used any tool while 67.50% used to do shrimp peeling by bare hands. Health hazards assessment showed 100% reported injuries like skin issues (63.75%), infections (75%) and respiratory discomfort (77.50%). RULA score (7) placed 82.50% women in the very high ergonomic risk. The Nordic Musculoskeletal Questionnaire showed severe discomfort in the lower back (92.50%), neck (90%), knees (97.50%) and feet (92.50%). The drudgery index was found high (0.62), with deveining and waste disposal were most strenuous. The shrimp peeling needle platform was designed through participatory approach by involving women shrimp peelers. It was tested, modified and validated with the help of hands on practice by women shrimp peelers. Post intervention, RULA score reduced to 4 scale and drudgery index was reduced to 0.33. Discomfort in key body areas decreased. Though peeling time per kg rose from 11.27 to 16.17 min but women workers reported lower fatigue and better posture comfort. The participatory approach ensured relevance, usability, and ownership offering a scalable ergonomic solution to enhance comfort, safety and efficiency of women in shrimp peeling.

Keywords: Ergonomic strain, Drudgery, Participatory approach, RULA, Shrimp peeling, Women

For correspondence: Pradip Tulshiram Lanjile <pradip.fexpb503@cife.edu.in>

Decentralised Renewable Energy Technologies and Gendered Livelihood Pathways in Agriculture

Arundhita Bhanjdeo

WRI India, LGF AADI 2, Balbir Saxena Marg, Hauz Khas, New Delhi 110016, India

In rural India, women play a central role in agriculture and household energy and food systems, yet their access to clean and modern energy technologies remains constrained by structural, economic, and institutional factors. Climate variability further interacts with these constraints, affecting the availability and stability of natural resources and agricultural livelihoods. Despite comprising nearly 50% of the agricultural workforce, they continue to face unequal access to land, finance, training, technology, and decision-making spaces, which limits their ability to benefit from energy and agricultural innovations.

This research argues for moving beyond the mechanisation of drudgery towards energy and agricultural technology pathways that enhance women's agency and livelihood opportunities. It examines how decentralised renewable energy (DRE) interventions can strengthen local agrifood systems and support more equitable clean energy transitions by recognising women beyond their role as end-users of technologies, and by positioning them as economic actors whose participation, knowledge, and decision-making shape agrifood system outcomes. Drawing on empirical research across 21 DRE interventions in nine Indian states, the study analysed irrigation, cold storage, and agro-processing applications implemented through diverse institutional and financing models, many of which are anchored in women-led self-help groups and farmer-producer collectives.

Using a reformulated Sustainable Livelihoods Framework, the paper examined gendered access to assets, power relations, and institutional arrangements shaping these interventions. The findings highlight significant heterogeneity in outcomes, shaped by land ownership, scale of operations, credit access, and local socio-cultural contexts. While government subsidies and policy incentives have largely benefited resource-rich farmers, women and smallholder farmers with limited landholdings often remain excluded. However, interventions that adopt bottom-up, community-based approaches demonstrate stronger equity outcomes.

Across irrigation, cold storage, and agro-processing technology applications, women's involvement in operating, managing, and governing DRE systems has challenged local gender norms and enabled new forms of participation in agricultural value chains, including water provision, post-harvest processing, and collective enterprise management. These arrangements contribute to income diversification, local value addition, and enhanced resilience, without assuming uniform outcomes or transformative impacts. The research finds that DRE interventions integrated with extension services, capacity building, inclusive financing alternatives, and market linkages are more likely to be sustained over time. Conversely, dependence on external actors and the absence of clear institutional exit strategies constrain long-term autonomy and scalability. The research concluded that advancing equity in technological innovations in agrifood systems requires attention to institutional design, resource access, and governance processes, rather than relying on technological change alone.

Keywords: Agrifood systems, Decentralised renewable energy, Gender equity, Sustainable livelihoods, Women's agency

For correspondence: Arundhita Bhanjdeo <Arundhita.Bhanjdeo@wri.org>

Guardians of Agrobiodiversity: Decoding the Role of Women in Farmer-Led Conservation of Landraces in Odisha and Uttarakhand

Preeti Yadav, Raghwendra Singh, Ajay Kumar Singh, Seema Yadav

ICAR-Agricultural Technology Application Research Institute, Zone III, GT Road, Rawatpur, Kanpur 208002, Uttar Pradesh, India

In the era of the Green Revolution, the widespread adoption of High-Yielding Varieties (HYVs) has resulted in considerable on-farm loss of traditional crop varieties. While modern agricultural systems prioritize productivity and uniformity, custodian farmers continue to conserve indigenous landraces that possess distinct nutritional, medicinal, and climate-resilient attributes. This research examined indigenous conservation practices and the socio-economic significance of farmer-led agro-biodiversity conservation in selected agro-biodiversity hotspots of Odisha and Uttarakhand. Although the study was not designed as a gender-focused analysis, the findings highlight the crucial functional role played by women in landrace conservation. Despite often not being the legal holders of land, women were actively involved in decision-making in selecting and sustaining landraces underscores the importance of recognizing women's contributions as key custodians of agro-biodiversity, even within male-headed landholding systems. The study utilized a multi-regional approach, involving focus group discussions with custodian farmers across 10 villages in Odisha; 5 villages from West part of Odisha and 5 villages from Koraput district of Odisha, and 6 villages in Uttarakhand. A mix of statistical tools, including Matrix Ranking, Four-Square Analysis, and Principal Component Analysis (PCA), was employed to identify selection criteria and landrace-specific practices. A critical finding of the research identifies women as the primary decision-makers in seed selection. Within "Diversity Blocks," women utilized their deep-rooted traditional knowledge to select the mother panicle for conservation, ensuring the continuation of desired traits across generations. Women's prioritization of landraces is often driven by food and culinary preferences. In Bageshwar, Uttarakhand, wheat landraces like Jhusia are conserved primarily for their specific culinary properties, a domain traditionally managed by women. Women play a pivotal role in informal seed exchange networks and seed banks, which are essential for maintaining genetic diversity. In Odisha, these networks facilitate a barter system that ensures local seed security. The study found that landrace cultivation provides substantial economic value. Women contribute significantly to the processing and marketing of value-added products, with 100% of custodian farmers in Bageshwar engaged in selling value-added landrace products. The findings underscore that women are not merely labourers in the agri-food system but are the custodians of crop genetic resources. Their role in selecting mother panicles and managing value-added products is central to the resilience of traditional farming systems. To ensure global food security, it is imperative to formalize the recognition of women's traditional knowledge and bridge the gap in their awareness regarding Farmers' Rights under the PPV&FR Act.

Keywords: Agro-biodiversity conservation, Farmer-led conservation, Indigenous landraces, Seed selection, Women custodians

For correspondence: Preeti Yadav <yadavpreeti1704@gmail.com>

Leadership Development through Community Based Food Processing Venture

Y. Prabhavati Devi¹, Y. Jamuna Devi², Arati Ningombam³

¹KVK, Imphal East, Central Agricultural University, Imphal 795149, Manipur, India; ² Standard College, Imphal, Manipur, India; ³ICAR, Manipur Centre, Imphal, Manipur, India

The Manipur Hill region is a rich reservoir of many underutilised indigenous fruits and vegetables with unique taste, vibrant colour and attractive flavour which significantly contribute to local organic zero toxic food basket and are believed to be rich in bioactive properties. Processing of agri-horticultural crops is the sunrise sector for North Eastern Hill Region. This sector has the potentiality to be the largest growth sector in this region in terms of production, consumption and export. Promotion of value addition through food processing has also been considered as an important strategy for doubling the farmers' income. Community Based Food Processing Ventures was undertaken for promotion of food processing based rural agripreneurship in Manipur. More than 20 different indigenous crops are being utilised for processing and value addition by the community processing units and more than 25 products manufactured which are quite popular in local market and some products are supplied to other states as well as selling the products using e-commerce platform. This venture was successful in empowering the women, in creating self-employment for rural youths and in promoting indigenous products for healthy living. It has also brought substantial changes in the socio-economic condition of the beneficiaries. Their average net profit increased significantly ranging from ₹ 3.50 lakhs to more than ₹ 7.5 lakhs annually which was earlier ₹ 35,000 to ₹ 45,000 per year. Besides, these units are also generating employment to the tune of 350 to 1,050 mandays per year. Hence, the venture not only enhanced their purchasing power but also provided a gainful employment throughout the year for a sustainable livelihood. From a job seeker, the beneficiaries have now become job-donor. This foodpreneurs also received many awards and recognitions. This enterprise could sustain livelihood of many women by generating employment and can also improve economic status of the family, society and nation as a whole. After entrepreneurship development, she becomes more self reliant, increases social participation, improves status of the family, increase influence and acceptability among fellow members. Her family socio-economic status also increases and improves children's educational quality.

Keywords: Community based, Foodpreneurs, Indigenous, Processing, Value addition

For correspondence: Y. Prabhavati Devi <prabhayumnam@rediffmail.com>

Inclusive Leadership in AgriFood: Integrating Women Farmers into Bihar's Agricultural Governance through JEEViKA and FPOs

Bineeta Satpathy, Vinita Kashyap, Tulika Kumari, Sangeeta Deo

Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur 848125, Bihar, India

Women constitute a substantial proportion of the agricultural workforce in Bihar, contributing nearly 70% of labour in crop production, livestock management, and post-harvest activities. However, their participation in agricultural governance and leadership has traditionally remained limited due to structural, social, and institutional constraints. This paper examined how the JEEViKA program Bihar's State Rural Livelihoods Mission has emerged as a transformative institutional model for integrating women farmers into agri-food governance through collective action and Farmer Producer Organizations (FPOs).

JEEViKA has mobilized over 9 million rural women into approximately 912,000 Self-Help Groups (SHGs) across 38 districts, federated into more than 59,000 Village Organizations and nearly 1,000 Cluster Level Federations. These grassroots institutions have strengthened women's access to finance, knowledge, and markets while laying the foundation for leadership development. Building on this platform, JEEViKA has facilitated the formation of women-led Farmer Producer Organizations, enabling small and marginal women farmers to collectively participate in agricultural value chains. Between 2014 and 2020, over 285,000 women farmers were integrated into commodity-based FPOs focusing on cereals, vegetables, dairy, and seed production.

Empirical evidence from Bihar indicated that women-led FPOs have enhanced producer bargaining power and market access, resulting in 15-20% higher price realization for member farmers compared to individual sales. Financial inclusion has been a critical enabler: JEEViKA SHGs have mobilized more than ₹1,056 crore in member savings and leveraged over ₹10,650 crore in institutional credit, facilitating investments in agriculture, livestock, and agri-enterprises. Additionally, the program has supported the emergence of over 648,000 women entrepreneurs, many of whom are engaged in agri-based and allied activities.

The paper argues that the integration of women farmers into FPO governance as board members, office bearers, and decision-makers represents a significant shift from beneficiary-oriented approaches toward inclusive agricultural leadership. This model has improved transparency, accountability, and responsiveness in local agricultural institutions while enhancing household incomes and food security. The findings highlight JEEViKA's women-centric FPO framework as a scalable and replicable pathway for inclusive agri-food governance. Policy implications underscore the need for gender-responsive institutional design, sustained capacity building, and targeted public investment to strengthen women's leadership in India's agri-food systems.

Keywords: Agri-food governance, Collective action, Financial inclusion, Institutional empowerment, Women-led FPOs

For correspondence: Bineeta Satpathy <bineeta.satpathy@rpcau.ac.in>

Synthesis of Agripreneurial Excellence: A Thematic Analysis of Women-Led Agricultural Enterprises

V.K. Sajesh, Lijo Thomas, S.R. Maneesha, T.E. Sheeja

ICAR-Indian Institute of Spices Research, Marikkunnu, Kozhikode 673012, Kerala, India

This study examined the entrepreneurial trajectories of six women leaders who have transformed India's agricultural sector through innovation, scientific rigour, and community-centered business models. Drawing on qualitative analysis of their diverse journeys spanning a PhD holder in Kodagu, an economics graduate in Calicut, and a Mumbai-based entrepreneur this research identified five critical success factors: (1) strategic application of scientific knowledge through institutional partnerships, particularly with research organizations like IISR via technology commercialization and business incubation (2) establishment of transparent and ethical supply chains, (3) resilience in navigating sector-specific challenges, (4) integration of digital technologies, and (5) development of farmer-centric business frameworks.

The findings revealed that these entrepreneurs have successfully disrupted conventional commodity-driven agricultural models by prioritizing product quality, supply chain traceability, and farmer empowerment. Their transitions from academic, domestic, or student backgrounds to leadership positions in award-winning, profitable enterprises demonstrate a significant paradigm shift in agribusiness leadership.

Beyond individual achievement, these women entrepreneurs are generating substantial socioeconomic impact through rural economic revitalization, employment generation, and the establishment of sustainable, health-focused agricultural standards with national and global relevance. This research contributes to understanding how women's entrepreneurship in agriculture can drive sectoral transformation while advancing food security, sustainability, and inclusive economic development objectives.

Keywords: Agricultural innovation, India, Rural development, Supply chain transparency, Sustainable agriculture, Women entrepreneurship

For correspondence: V.K. Sajesh <sajeshvk@gmail.com>

Clinical Examination of Foxtail Millet-Based Food Products and their Implications on Biochemical Markers in Adults with Impaired Fasting Glucose

Aditi Sewak, Renuka Aggarwal

Punjab Agricultural University, Ludhiana 141004, Punjab, India

Impaired fasting glucose (IFG) is an early metabolic abnormality preceding type 2 diabetes. Low-glycemic index, high-fibre foods such as foxtail millet (*Setaria italica*), rich in resistant starch and bioactive compounds, may help improve metabolic regulation. Therefore, the present study investigated the effect of standardized foxtail millet-based food products on glycemic control, lipid profile, and hormonal markers in adults with IFG.

A 12-week controlled supplementation trial was conducted among 60 adults (30-55 years) with IFG whereby the experimental group consumed a standardized foxtail millet bar or vegetable dalia (>10 g resistant starch and >7 g dietary fibre/day) with breakfast. Biochemical and hormonal parameters were assessed at baseline and post-intervention with evaluation using HOMA-IR and HOMA- β .

The experimental group showed significant reductions in insulin levels (7.7-11.0%), and HOMA-IR (16.1-19.4%). Improvements were also observed in lipid profile. Adiponectin levels increased (4.1-11.4%) while leptin levels decreased (15.7-23.7%) post supplementation trial.

Regular consumption of foxtail millet-based foods improved glycaemic and lipid metabolism, and hormonal balance in individuals with IFG, indicating its potential as a culturally acceptable sustainable dietary strategy to prevent diabetes progression.

Keywords: Adiponectin, Foxtail millet, Impaired fasting glucose, Insulin resistance, Lipid metabolism, Nutritional intervention, Prediabetes

For correspondence: Aditi Sewak <aditi-fn@pau.edu>

Women as Custodians of Indigenous Food Systems: A Socio-Ecological Analysis of Tribal Communities in Nagaland, India

T. Amrutha¹, A.K. Mohanty¹, Divya Parisa¹, A.K. Singha¹, Mainak Ghosh¹, P.K. Pathak¹, Bendangla Imsong², H.R. Chikkathimme Gowda³, K.N. Pavithra⁴

¹ICAR-Agricultural Technology Application Research Institute (ATARI), Zone VII, Umiam 793103, Meghalaya, India; ²Krishi Vigyan Kendra, Dimapur, ICAR-Research Complex for the North-Eastern Hill Region (RCNEHR), Meghalaya, India ³ICAR-RCNEHR, Meghalaya, India; ⁴ICAR-Indian Agroecological Research Institute, Hazaribagh 825405, Jharkhand, India

Nagaland's traditional food systems, shaped and sustained largely by women, offer a culturally embedded and ecologically grounded pathway for promoting women-led entrepreneurship in Northeast India. This study examined the role of women as custodians of indigenous food systems in selected tribal districts of Nagaland-Dimapur, Mokokchung, Mon, and Wokha representing diverse agro-ecological and ethnic contexts. Using a multistage purposive sampling approach, data were collected from 109 tribal households through group discussions, semi-structured interviews, and participant observation. The findings revealed that the traditional foods are predominantly based on locally available crops, forest produce, livestock products and wild edibles including taro leaves (*Colocasia esculenta*), tapioca (*Manihot esculenta*), bamboo shoots (*Phyllostachys edulis*), foxtail millet (*Setaria italica*), wild edible mushroom, and roselle (*Hibiscus sabdariffa*). Women play a central role in resource selection, food safety, and indigenous processing knowledge transmitted intergenerationally through household practices and rituals. Preservation techniques such as drying, fermentation, pickling, and ash-based processing extend product shelf life (12-24 months), enhancing year-round food availability and nutritional security. Despite a high labour burden, women sustain these practices due to their cultural and livelihood significance. Marketing channels identified are mainly informal, dominated by producer-buyer and producer-retailer-buyer linkages. The study further demonstrated that agricultural festivals are closely aligned with farming cycles and serve as important socio-cultural spaces where women exercise authority through food preparation, knowledge exchange, and ritual practices. Overall, indigenous food systems in Nagaland function as women-managed socio-ecological systems that simultaneously support nutrition, livelihoods, cultural continuity, and agrobiodiversity conservation. Strengthening women's roles in traditional food value chains offers significant potential for gender-responsive development and indigenous entrepreneurship.

Keywords: Agrobiodiversity conservation, Indigenous food systems, Traditional processing, Women custodians, Women-led entrepreneurship

For correspondence: T. Amrutha <amruthakbb@gmail.com>

Women Transforming Agriculture: Inspiring Journeys of Success and Empowerment

Tusar Ranjan Sahoo, B. Malathi, R. Sruthi, Shaik N. Meera

ICAR-Agricultural Technology Application Research Institute, Zone X, Hyderabad 500059, Telangana, India

Women entrepreneurs in agriculture have emerged as key drivers of innovation, sustainability, and rural empowerment across India. This study documented the success stories of women farmers from Tamil Nadu (Kallakurichi and Vellore districts), Puducherry, and Telangana (Hanmakonda), who have transformed conventional farming into diversified, organic, and market-oriented enterprises. These women overcame socio-economic barriers, limited access to technology, and market constraints to establish profitable and sustainable agricultural systems. Through structured interventions by Krishi Vigyan Kendras (KVKs), including on-campus and off-campus training, exposure visits, on-farm demonstrations, and continuous technical guidance, these women adopted diversified organic cropping systems integrating cereals, pulses, vegetables, fruits, and fodder crops. On-farm production of organic inputs such as vermicompost, *jeevamirth*, and botanical pest repellents reduced dependency on chemical fertilizers by 25-40%, improved soil fertility, and enhanced crop productivity by 15-30% over three cropping seasons. Direct marketing initiatives and value addition further strengthened livelihoods. Women farmers achieved annual net incomes ranging from ₹3.5 lakh to ₹10.97 lakh, generated employment for over 1,500 local farmers, and reduced dependence on intermediaries. Several women, including Mrs. P. Sumathi, Smt. G. Bakkiyavathy, and Ms. Anitha Chinnala, emerged as master trainers, resource persons, and role models, mentoring hundreds of farmers and SHG members. Their enterprises also promoted community-level adoption of organic and sustainable practices, contributing to food security and resilient agri-food systems. These case studies highlight how knowledge, innovation, and institutional support can empower women, break socio-economic barriers, and create replicable models of sustainable agriculture. They underscore the pivotal role of women-led enterprises in advancing inclusive rural development, fostering entrepreneurship, and ensuring long-term sustainability in the agri-food sector.

Keywords: Agri-food systems, Income enhancement, KVK interventions, Organic farming, Sustainable agriculture, Women entrepreneurship

For correspondence: Tusar Ranjan Sahoo <tusarranjan95@gmail.com>

Economic Empowerment of Women through Diversification of Agricultural Enterprises - Case Studies from ICAR-KVK, Gadag, Karnataka

Sudha V. Mankani, Vinayaka H. Niranjana

ICAR-K.H. Patil Krishi Vigyan Kendra, Hulkoti, Gadag 582205, Karnataka, India

Women play a significant role in agriculture and household management by handling multifaceted responsibilities. Women constitute nearly 50% of the total population and contribute substantially towards enhancement of productivity and production in the agricultural sector. Research suggests that women's empowerment accelerates a country's economic growth and supports the achievement of the Sustainable Development Goals. To attain these goals, technological and economic empowerment at the grassroots level along with access to new technologies, training, research, and extension services plays a crucial role in improving the lives of rural women. In this context, ICAR-K.H. Patil Krishi Vigyan Kendra, Hulkoti, Gadag District, has been actively involved in empowering women in agriculture and allied sectors, including PHT and value addition. As a result of KVK interventions, many farm women have come to the forefront, demonstrating excellence across various domains. Here are two such case studies of women achievers who reached significant milestones. Smt. Mangala K. Neelgund is a B.Sc. (Agri.) graduate. With the technical support from KVK, she adopted IFS and ventured into value addition of *Byadagi* chilli which is an ODO crop of Gadag District. Her diversified agricultural enterprise included a unit of 250 sheep and goats, 100 poultry birds, vermicompost unit, dairy unit, nutri-garden, perennial fodder production and chilli processing unit. She is actively involved in online and off-shoot marketing and has emerged as a role model for the farming community. She provides guidance to farmers, farm women and rural youth in adopting sustainable and profitable agricultural practices. Through these integrated activities, her net annual income stands at ₹12-15 lakhs and she was honoured with the prestigious Millionaire Farmer Award during 2023-24.

Smt. Shyamala Karuru, progressive farm woman from Binkadakatti village of Gadag block, manages 20 SHGs involved in various rural activities. With the technical guidance from KVK, she initiated processing of dry chillies into chilli powder and masala chilli powder, enabling her to earn higher income compared to selling raw produce. To further expand her enterprise, she purchased a turmeric powder-making machine and began marketing. During 2024-25, she acquired a roti-making machine under the PMFME scheme, elevating her enterprise to new heights. She markets her products through KVK outlets, off-shoot marketing, and retail outlets in Gadag city. As a result of these entrepreneurial activities, her annual income increased from ₹ 30,000 to ₹ 5.0 Lakh. These achievements were made possible through continuous support, guidance, and handholding by KVK in empowering the rural community.

Keywords: Chilli, Diversified enterprisers, Technical guidance, Value addition

For correspondence: Sudha V. Mankani <kvkhulkoti@gmail.com>

Strategic Development of a Vegan Field Pea-Derived Probiotic Frozen Dessert as a Functional Dairy Alternative

Aditi, Jaspreet Kaur

Punjab Agricultural University, Ludhiana 141004, Punjab, India

Women play a vital role in agri-food systems, particularly in crop utilization, food processing and household nutrition, yet their contributions are often under-represented in value-added food innovation. This study focused on the development of a vegan probiotic frozen dessert from field pea (*Pisum sativum* L.), highlighting its potential as a sustainable, nutritious and women-driven food innovation within agri-food systems. Also, rising vegan dietary trends and dairy related intolerances further highlight the relevance of this plant based dessert as an inclusive alternatives to conventional dairy products.

Field pea is a climate-resilient, protein-rich legume crop commonly regards as poor man's meat widely cultivated in many regions by smallholder farmers. In this research, field pea milk was used as the base matrix for formulating a vegan probiotic frozen dessert. Conventional milk fat which is high in saturated fat and trans-fat was fully replaced with oleogel as a structured lipid system to reduce saturated fat content while maintaining desirable texture and stability. Probiotics were added prior to freezing to enhance the functional value of the product. The frozen dessert formulations were evaluated for physicochemical stability, texture-related parameters and storage acceptability under frozen conditions. The optimized formulations containing oleogel demonstrated superior stability with minimal phase separation and desirable consistency. After freezing, the product exhibited a near-neutral pH (~6.5), indicating suppression of further acidification due to frozen storage and making the dessert more acceptable to consumers compared to fermented dairy-based products. The field pea frozen dessert remained safe and suitable for consumption for up to 30 days of frozen storage, maintaining overall product quality.

The findings highlight the feasibility of developing a plant-based, probiotic frozen dessert using locally available legumes and simple processing techniques. From a women-in-agriculture perspective, such products offer strong potential for small-scale, women-led food enterprises, enabling value addition to legumes, income diversification and improved access to nutritious, plant-based foods. The use of oleogel technology further supports healthier fat alternatives without reliance on hydrogenated fats. Overall, this study demonstrates that vegan frozen desserts based on field pea can serve as a sustainable and functional food product while supporting women's participation in agri-food value chains, nutrition security and innovation in plant-based food systems.

Keywords: Field pea, Frozen dessert, Oleogel, Probiotic, Vegan diet

For correspondence: Aditi<aditichoudbary402@gmail.com>

Invisible Labour, Unequal Gains: Gendered Disparities and the Promise of Women-Led Collectives in the Sundarbans

Kousik Mallick¹, Sanchayeeta Misra¹, Sukamal Sarkar¹, Mohammad Mainuddin², Rupak Goswami¹

¹Integrated Rural Development and Management Faculty Centre, Ramakrishna Mission Vivekananda Educational and Research Institute, Narendrapur, 24 Parganas 700103, West Bengal, India; ²CSIRO Land and Water, CSIRO Environment, Australia

In the rice-based agrarian economy of the Indian Sundarbans, women play a pivotal role across all stages of rice cultivation, from land preparation to post-harvest processing. Yet, they remain excluded from decision-making roles and exercise limited control over farm income. These gendered inequalities persist within a broader context of inadequate profitability to sustain livelihoods, shaped by geographic isolation, poor infrastructure, and limited access to stable markets. Within this setting, women's collectives offer a pragmatic institutional pathway to bridge the persistent disconnect between women's labour contributions and their economic agency in agriculture. Drawing on time-use data from 50 smallholder households in Satjelia Island, this study estimated that women contribute over 60% of total labour hours in paddy cultivation. However, 91.8% of the income from paddy sales is managed by male household members, as farm earnings are commonly treated as pooled household income, leaving women with little or no direct authority over financial decisions. Qualitative findings revealed divergent perceptions among women farmers: while many view their agricultural labour as a familial obligation aimed at reducing hired labour costs and ensuring household food security, others express strong aspirations for financial autonomy and greater participation in farm-related decision-making. Several women highlighted the need for enhanced knowledge and skills to manage farming and farm income independently, particularly during periods of seasonal male outmigration. The study employed a qualitative 'what-if' scenario to assess the potential impact of forming women-led Farmers Producer Companies (FPCs) on enhancing the returns to women's labour. Using primary data on landholding, yields, production expenses, and sales alongside proxy impact parameters from established FPCs in Indian Sundarbans, we estimated how collective action through a women-led FPC could improve farm profitability and strengthen women's economic agency by enhancing decision-making power and control over farm income. The findings highlight prevailing market inefficiencies, where women farmers are compelled to sell paddy to local aggregators at depressed prices while bearing high costs for machinery rental and input procurement. By stimulating an FPC-enabled system, the women farmers could significantly reduce these costs through shared purchases and services, and collective bargaining in the market. In doing so, women farmers could significantly improve their net returns and reposition themselves as economic stakeholders within their households and communities. This research reimagines local value chains through the lens of gendered collective agency, positioning women's labour not merely as subsistence work but as a catalyst for equitable, resilient, and sustainable agrarian transformation.

Keywords: Economic agency, Farmer Producer Companies, Gendered labour inequality, Rice-based economy, Women's collectives

For correspondence: Kousik Mallick <kousik96smile@gmail.com>

What Enables Women's Economic Empowerment in Agri-food Systems? Emerging Evidence from South Asia and Australia

Mallika Roy^{1,2}, Vanita Yadav¹, Anita Medhekar³

¹Western Sydney University, New South Wales, Australia; ²University of Chittagong, Bangladesh; ³Central Queensland University, Australia

Gender inequality in agri-food systems is not only unjust but also economically damaging. Across the world, restrictive gender norms and women's unequal access to land, finance, technology, and other critical resources suppress productivity and drain billions of dollars from agribusiness value chains each year. Despite contributing a substantial share of agricultural labour, women remain systematically disadvantaged, limiting the potential of the entire sector. Yet, there is scarce empirical evidence linking labour participation, market access, and resilience across diverse economies that continues to hinder the design of effective policies for inclusive sustainable development.

Addressing this critical gap, our study systematically mapped the diverse body of knowledge using a hybrid review method combining bibliometric analysis and thematic qualitative synthesis on women's economic empowerment in agri-food systems. Focusing on South Asia and Australia, we conducted a literature search from the year 1990 to 2026 using the Scopus database and found more than 1,000 relevant studies on gender, agri-food systems, employment, and financial inclusion. We used VOS viewer software to assess collaboration patterns, thematic structures, and research gaps.

Our results revealed interesting comparative insights. In South Asia, we found India (n=598) and Bangladesh (n=115) dominate in the number of published studies, reflecting strong research attention to South Asian agrarian contexts. In contrast, in Australia (n=102), a more developed economy, studies were mainly policy and labour market oriented.

Since 2015, the literature has shifted from descriptive to more analytical, policy-oriented research focus. Yet fragmentation persists, with limited integration across labour market participation, food systems, and climate resilience. The role of digital finance, value chains, and e-commerce in strengthening women's economic agency also remains underexplored.

Notably, our study made a conceptual contribution by identifying four dominant themes in the literature: (i) women's employment and livelihood security, (ii) food security and nutrition outcomes, (iii) climate change, vulnerability, and resilience, and (iv) financial inclusion, microfinance, and market integration. Using thematic analysis, we developed an integrated conceptual framework that illustrates the drivers of women's economic empowerment, namely employment and market participation, mediated by food security and climate resilience, and shaped by institutional, social, and technological factors.

Aligned with SDG-5 (Gender Equality), SDG-8 (Decent Work and Economic Growth), SDG-13 (Climate Action) and SDG-17 (Public-Private-Partnerships), our framework offers policy and practice implications. We advance theory and practice by showing how agri-food value chains and financial inclusion connect women's labour participation to sustainable livelihoods and economic empowerment in agri-food systems.

Keywords: Agrifood value chains, Research gaps, Technological factors, Women participation

For correspondence: Vanita Yadav <vanita.yadav@westernsydney.edu.au>

Enhancing Rural Economies: Food Processing and Value Addition by Women Entrepreneur in Uttara Kannada District

Vijayalaxmi S. Nayak¹, Ravi Y.², Roopa Patil¹, U. Shwethakumari¹, G.J. Ranganatha¹, D.K. Harish¹, Amit Pujar¹

¹ICAR-Krishi Vigyan Kendra, Near Forestry College, Banavasi Road, Sirsi 581401, Karnataka, India; ²AICRP (Women in Agriculture) University of Agricultural Sciences, Dharwad, Karnataka, India

Entrepreneurship in food processing and value addition plays a vital role in enhancing rural livelihoods and income generation. The present case study highlights the entrepreneurial journey of a small-scale food processing enterprise established by Smt. Mamatha Bhat Shamemane, a resident of Shamemane village in Uttara Kannada district. Coming from a middle-class family, she faced financial challenges in managing household responsibilities, which motivated her to pursue self-employment. With a strong desire to become economically independent, she established a small-scale processing unit for jackfruit, banana powder and kashaya powder during 2021-22.

Prior to starting the enterprise, Smt. Mamatha Bhat underwent skill-oriented training on food processing and value addition at Krishi Vigyan Kendra (KVK), Uttara Kannada. Post training, with institutional support from KVK and other departments, she was provided with essential processing equipment including a dryer, pulverizer, microwave oven and sealing machine, which enabled her to establish her own processing unit.

The enterprise produces a range of value-added products such as jackfruit seed powder, raw banana powder, banana chips and kashaya powder, marketed under the brand name Deeksha Home Made Products. The skill-based training significantly enhanced her technological adoption in processing, nutrient analysis and marketing. The adoption of improved processing technologies resulted in enhanced product quality and marketability. Consequently, the enterprise generated higher net returns, with an annual income of approximately ₹ 9-10 lakh during the year 2022-23. Now, she runs a successful enterprise, her products cater to both national and international customers and her annual income continues to increase steadily year after year. The study clearly demonstrated that skill development training and institutional support play a crucial role in transforming rural women into successful food processing entrepreneurs and contribute significantly to income enhancement.

Keywords: Food processing, Institutional support, Skill development, Value addition, Women entrepreneurship

For correspondence: Vijayalaxmi S. Nayak<shiva.seetavijay10@gmail.com>

Building Women-Led Rural Enterprises for Agricultural Transformation: An Approach Rooted in Gender and Social Inclusion (GESI)

Parvathy M. Prasad, Syamkrishnan Aryan

WELL Labs, IFMR, 9, Krishna Rd, Basavanagudi, Bengaluru 560004, Karnataka, India

Women play a critical yet often undervalued role in rural agri-food and water systems. In drought-prone regions such as Raichur, structural constraints, including limited access to skills, assets, and decision-making spaces, have historically restricted women's participation in enterprise development and leadership. This paper presents a field-tested, women-centric enterprise model piloted by WELL Labs that demonstrates how women-led enterprises can drive inclusive rural transformation in agri-food systems and water governance.

The model integrated three locally embedded enterprise pathways, Bio-Resource Centres (BRCs), Village-Level Entrepreneurs (VLEs), and the *Jal Vidyani* (community hydrologist) cadre, supported by a structured Gender and Social Inclusion (GESI) framework. Together, these pathways enable women to transition from informal agricultural labour to formal roles as service providers, enterprise managers, and technical leaders in water and agriculture.

Baseline assessments across ten villages in Raichur revealed low representation of women in agricultural institutions and economic decision-making. In response, WELL Labs, in collaboration with IWWAGE, co-designed a targeted Gender Training and Enterprise Readiness Program focused on leadership development, confidence building, and enterprise skills. Women are supported to operate BRCs supplying agroecological inputs, manage custom hiring and mechanisation services as VLEs, and deliver water budgeting and irrigation management services as trained *Jal Vidyanis*.

These enterprise pathways are reinforced through mentorship, exposure visits, and a developing Gender Integration Framework that embeds inclusion across institutional design, financing, and governance. Early outcomes indicated that women participants are not only generating independent incomes but also assuming leadership roles within water user groups, producer collectives, and village-level institutions.

The paper demonstrates how integrating technical skilling, enterprise incubation, and gender-transformative capacity building can create sustainable, women-led rural enterprises with system-level impact. The Raichur experience offers a scalable and replicable model for advancing women's economic leadership and entrepreneurship as a foundation for resilient and inclusive rural transformation, directly aligning with the GCWAS 2026 focus on women-led enterprises, mentorship, and leadership in agri-food systems.

Keywords: Enterprise incubation, Gender inclusion, Rural transformation, Water governance, Women-led enterprises

For correspondence: Parvathy M Prasad <c-parvathy.prasad@ifmr.ac.in>

Emerging Entrepreneurship Opportunities to Empower and Enrich Women Farmers

Alison Laing¹, Prateek Bhattacharya², Kalyan K. Das², Swaraj Dutta³, Arunava Ghosh², K.J. Raghavendra⁴, Bholanath Saha³, Raghuveer Singh⁴, Mahesh K Gathala¹

¹International Maize and Wheat Improvement Center (CIMMYT)-India, NASC Complex, DPS Marg, New Delhi 110012, India; ²Uttar Banga Krishi Viswavidyalaya, Cooch Behar, West Bengal, India; ³Bihar Agricultural University, Sabour, Bihar, India; ⁴ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut, Uttar Pradesh, India

Current and recent research has demonstrated the potential for emerging agronomic practices, such as mechanized planting and intensification in a range of cropping systems, to improve smallholder farmers' productivity and profitability while eliminating the drudgery often associated with women's agricultural labour. Within these innovative practice, we observed opportunities for women farmers specifically to generate additional household income while contributing to household and national food and nutrition security. These include: specialist production of rice seedlings for mechanized transplanting; additive intercropping of wide-row crops, particularly close to the homestead; producing vegetable saplings (e.g. broccoli, cauliflower, melons, cucumbers and many others) for other farmers to purchase and use in homestead or commercial cultivation; extending women's participation across agronomic value chains by cooking and selling pickles (achaar) from on-farm vegetable production; and using the by-products of these vegetables to improve the diet and growth of livestock. These emerging opportunities are feasible within women farmers' existing lives and cultural practices: they can be undertaken from a base within the family homestead, do not require significant off-farm travel, and can be incorporated into farmers' current daily activities. These opportunities have been observed in research projects across the Indo Gangetic Plains and in a range of broadacre crops including sugarcane-, maize-, and rice-based cropping systems. By increasing women's active participation along agronomic value chains, and by facilitating the intensification and diversification of India's production systems, these emerging opportunities empower women while concurrently increasing the nation's self-reliance in oilseed and pulse production, and increasing overall national food security. In this presentation, we showcase these emerging opportunities to empower and enrich women farmers and highlight ways to further mainstream and scale these innovative practices through engagement with policy and private-sector partners as part of nationwide actions to achieve *Viksit Bharat* targets.

Keywords: Agronomic value chains, Cropping system intensification, Indo Gangetic Plains, Mechanized planting, Women's income diversification

For correspondence: Alison Laing <a.laing@cgiar.org>

Women-Led Agripreneurship and Inclusive Innovation: Evidence from MANAGE-CIA Incubated Startups in India

Sandipamu Raahalya, Saravanan Raj

National Institute of Agricultural Extension Management (MANAGE), Rajendranagar, Hyderabad 500030, Telangana, India

Women entrepreneurs are emerging as powerful agents of economic transformation in India's agri-food systems. However, their participation in agribusiness remains constrained by limited access to finance, markets, mentorship, and institutional support. Agribusiness incubation has become a key strategy for enabling women to overcome these barriers and achieve sustainable livelihoods through entrepreneurship.

This paper presents selected case studies of women-led startups supported by the MANAGE Centre for Innovation and Agripreneurship (MANAGE-CIA) at the National Institute of Agricultural Extension Management (MANAGE), India. The MANAGE incubation program has supported 562 incubatees across 13 cohorts, including 137 women entrepreneurs (24.4%). The startups operate across key focus areas such as food technology, value addition, farm mechanisation, dairy, agricultural inputs, waste-to-wealth solutions, supply chain management, agro-processing, AI/IoT-based innovations, and animal husbandry.

The case studies highlight the entrepreneurial journeys of women founders, the nature of their business innovations, and the outcome achieved in terms of income generation, employment creation and market access. Several startups also promote sustainable practices and value-added products, enhancing income stability for both entrepreneurs and farming communities.

Women's engagement in MANAGE-CIA's broader knowledge and networking platforms further reflects growing participation in agripreneurship. The Saturday Agri Startup Webinar Series, comprising 275 webinars, reached 56,811 participants, including 10,047 women (17.7%). These sessions provided exposure to emerging technologies, market trends, policy insights, and entrepreneurial best practices, strengthening women's business readiness and confidence.

Additional ecosystem initiatives also supported women's inclusion. In the Pre-Incubation Program, women constituted 19.5% of participants, while in the Digital Marketing Skills for Agri-Startups Program, women accounted for 24.5%. Higher representation was observed in Stakeholder Connect program (40.1%), MANAGE Agri Eureka mentoring (43.1%), and Entrepreneurship Development Program (48.0%), indicating increasing women's participation in advanced business and networking platforms.

The case studies underline the importance of gender-responsive incubation models in promoting women's economic inclusion. The MANAGE-CIA experience offers valuable insights into how structured support systems can empower women entrepreneurs and contribute to building more inclusive and resilient agri-food systems in India.

Keywords: Agribusiness incubation, Agri-startups, Case studies, Economic inclusion, India, Women entrepreneurs

For correspondence: Sandipamu Raahalya <sandipamuraahalya@gmail.com>

Fostering She-Entrepreneurship vis-a-vis Marketing Linkage in MKSP and non-MKSP Regions of Bihar: Feedforward Neural Network Architecture

Sudhanand Prasad Lal¹, Kumari Sushmita², Sangeeta Deo¹

¹Dr. Rajendra Prasad Central Agricultural University, Pusa 848125, Bihar, India; ² Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, India

The Standardized Octa-dimensional Farm Women Sustainable Livelihood Security Index (OFWSLSI) was developed and standardized for livelihood analysis and women empowerment in 800 respondents, 400 non-MKSP (Samastipur and East Champaran) and 400 MKSP (Muzaffarpur and Madhubani). Market Inclusion Security was one of the 8 dimensions of Octadimensional Farm Women Sustainable Livelihood Security Index (OFWSLSI). Market Inclusion Security was studied in details and it was found that in MKSP, its value was 0.4920 ± 0.0041 ; while in non-MKSP, its figure was just 0.4178 ± 0.0037 , *i.e.* much below the maximum potential score of 1. There was a significant difference between MKSP and non-MKSP with z-value of 13.34 ($p=0.001$) which clearly represent edge of MKSP adopted region. In MKSP, aiming at social and economic empowerment of the rural poor and improving their livelihoods by developing institutions like SHGs and their federations enabling them to access and negotiate better services, credit and assets from public and private sectors, JEEVIKA is an initiative of Government of Bihar for poverty alleviation; which the World Bank eulogized through phrase 'unleashing the power of women's collectives for rural development' and 'Bihar Transformative Development Project'. Canonical Correlation revealed that she-preneurship ($r=0.367$) and marketing inclusion (0.472) as dependent variables was determined by Government Support through Jeevika ($r=0.634$); training through institutions ($r=0.551$); peer learning ($r=0.492$) and ICT know how ($r=0.351$) while the model strength was computed through eigen value 91.27% and was 0.452 ($p=0.01$). In non-MKSP, the determining independent variables were extent of support from male family members ($r=0.448$); hands-on learning within families ($r=0.381$) while she-preneurship was found to be insignificant ($r=0.252$) and marketing inclusion (0.318) as dependent variables was determined; while the model strength was revealed by eigen value 83.48% and was 0.339 ($p=0.05$). The findings underscore the critical role of government support and institutional training in facilitating market linkages for women entrepreneurs in Bihar. Model validation using radial basis function networks demonstrated 91.42% accuracy in MKSP intervention areas. The finding highlights the significance of government support and training through institutions in linking she-preneurs to the market in Bihar. The model was further validated through Feedforward Neural Network Model and the model accuracy was found to be 91.42% in the MKSP intervention areas

Keywords: Canonical Correlation, Marketing Linkage, MKSP, Neural Network, Women's empowerment, Women in agriculture

For correspondence: Sudhanand Prasad Lal <sudhanand.lal@rpcau.ac.in>

Gender Gaps in Crop Commercialization: Evidence from the Eastern Gangetic Plains

Ezaboo Beniwal

International Food Policy Research Institute, New Delhi 110012, India

Widespread transformation of food, land, and water systems is occurring amid the climate crisis, especially in developing countries. An important driver and outcome of this transformation is the increasing commercialization of agriculture, with a growing share of agricultural households selling a larger proportion of their produce in local and global markets. However, there remains limited knowledge about the local drivers of, and constraints to, increasing household commercialization. Using primary data from bordering regions of the Eastern Gangetic Plains in Bangladesh, India, and Nepal, this paper mapped the extent of household crop commercialization in each region and identifies a critical constraint to the sale of crop produce: the gender of the main farmer. Across all three regions, households with Female Main Farmers (FMFs) were less commercialized. FMF households in Bangladesh sold 51% of their produce (compared to 62% otherwise), in India sold 44% (versus 59%), and in Nepal sold 29% (versus 43%). Among households that sold at least some produce in crop markets, the gender gap persisted but narrowed. In Bangladesh, commercial FMF households sold 64% of their produce (compared to 68% otherwise), in India sold 54% (versus 64%), and in Nepal sold 45% (versus 55%). This suggests that a larger share of FMF households had zero sales and no engagement with crop markets. This gender gap in commercialization reflects greater constraints faced by female farmers in accessing crop markets, as well as gendered expectations regarding roles within the crop production cycle. Evidence from a second household dataset collected in the same baseline regions shows that in FMF households, women handled day-to-day production activities in all households but did not participate in market-related activities, such as purchasing inputs, in 10 to 15% of households. In contrast, in households with Male Main Farmers (MMFs), men handled market-related activities in all households but did not engage in day-to-day production activities in 12 to 15% of households. These findings highlight the need for policy attention toward developing female-friendly agricultural markets and value chains in South Asia. The study is particularly relevant because the expansion of commercialization has important implications for equity and inclusion.

Keywords: Agricultural commercialization, Eastern Gangetic Plains, Female main farmers, Gender market gap, Market access constraints

For correspondence: Ezaboo Beniwal <e.beniwal@cgiar.org>

Tracing Gender Integration across Agricultural Policies supporting Diversification in the Eastern Gangetic Plains

Aditi Pradhan¹, Sucharita Sen², Tamara Jackson¹

¹Adelaide University, South Australia, Australia; ²Centre for the Study of Regional Development, Jawaharlal Nehru University, New Delhi, India

Women constitute a substantial share of the agricultural workforce in South Asia. In the Eastern Gangetic Plains, dominated by smallholder farming systems, feminization of agriculture continues as male out-migration increases women's roles in farm-related labour. Yet evidence consistently shows that women face greater constraints in diversifying beyond subsistence cereal production, including limited access to land, credit, irrigation, market information, and extension services. Agricultural diversification is increasingly promoted as essential for smallholder resilience, nutrition, income growth and sustainability. If diversification policies fail to reach women farmers, these benefits will be inequitably distributed.

While numerous studies document gender gaps at the farm level, less attention has been paid to whether agricultural policies supporting diversification themselves adequately recognize and address women's distinct roles and barriers. Do such policies acknowledge that 'farmers' are not a homogenous category? Do they recognize women's contributions to diversified farming systems? Do they identify the specific constraints women face? Do they set measurable targets for women's participation and allocate dedicated resources to achieve them? And critically, do gender provisions survive translation from high-level policy strategies and frameworks through implementation program to the service delivery policies that shape practice on the ground?

This paper examined gender integration in agricultural diversification policies across Bangladesh, India (West Bengal), and Nepal, three countries sharing the Eastern Gangetic Plains. The analysis applied a framework assessing Recognition (whether policies disaggregate the category of farmer, acknowledge women's roles, and identify gender-specific constraints) and Intentionality (whether policies articulate measurable targets and allocate dedicated resources for women). Using qualitative content analysis, the framework was applied across three policy tiers: strategic frameworks, implementation programs, and service delivery policies, drawing on nine policy documents selected through a unified functional logic.

The analysis revealed a pattern of 'gender fade' across policy tiers. Strategic policies tend to include more substantive gender provisions than implementation policies, which in turn contain more than service delivery policies. While strategic policies may recognize women's agricultural contributions, implementation policies often lack gender-disaggregated targets, and service delivery policies frequently omit specifications for reaching women farmers, such as women-targeted outreach strategies, timing accommodations, or gender-sensitive staffing requirements. By identifying this process of policy attenuation, the paper shifts the problematization from one of mere policy absence to one of systematic dilution as gender commitments move from strategy setting to delivery frameworks, highlighting the necessity of building capacity to deliver and embedding gender accountability across all tiers of agricultural policies.

Keywords: Eastern Gangetic plains, Gender fade, Gender specific constraints, Women's contribution

For correspondence: Aditi Pradhan <aditipradhan.jnu@gmail.com>



**POSTER
PRESENTATIONS**



Entrepreneurship - Development Programme through Value Addition

I. Devika, G. Chitra

Krishi Vigyan Kendra, Mitraniketan, Thiruvananthapuram 695543, Kerala, India

Women play a pivotal role in shaping the socio-economic development of the nation. In addition to managing household responsibilities, they make substantial contributions to agriculture, livestock, and allied sectors. Recognizing their critical role, ICAR Krishi Vigyan Kendra (KVK), Thiruvananthapuram, has undertaken focused efforts to empower women by enhancing their technical knowledge, entrepreneurial competencies, and access to resources. Through structured women empowerment initiatives, capacity building program, and facilitation of access to inputs, technologies, and institutional support, these interventions aim to promote sustainable livelihoods and inclusive rural development.

ICAR KVK, Thiruvananthapuram, conducted Entrepreneurship Development Program (EDPs) and need-based training program at both the KVK campus and in rural villages, with program durations ranging from one to five days. The major thematic areas included value addition in fruits and vegetables, tuber crops, and spices; women and child care; food processing and cooking; and dehydration of fruits and vegetables. These program are designed to strengthen technical skills, improve product quality, and enhance market readiness among rural women and aspiring entrepreneurs. Over the past five years, more than 500 participants have benefited from these training and entrepreneurship development initiatives, enabling them to acquire practical skills and knowledge essential for enterprise establishment and expansion.

As a direct outcome of these capacity-building efforts, 87 women have successfully established their own enterprises and brands with official registration under the Food Safety and Standards Authority of India (FSSAI), Ministry of Health and Family Welfare, Government of India. These entrepreneurs market a wide range of value-added products through village-level exhibitions, local markets, district-level outlets, and inter-state exhibitions. Ten entrepreneurs have established their own retail outlets, while others supply to wholesale markets. In addition, 15 farmers have collectively established a shared retail outlet.

The value-added products have received positive consumer acceptance and have fetched premium prices in local markets. Consequently, the women entrepreneurs are now earning an average monthly income of approximately ₹25,000, leading to improved household income, enhanced economic independence, and strengthened local economic development. These outcomes demonstrate the effectiveness of value addition-based entrepreneurship as a sustainable rural livelihood strategy.

Keywords: Empowerment, Entrepreneurship development, Income generation, Rural livelihoods, Value addition, Women

For correspondence: I. Devika <devikvkmitra@gmail.com>

Unlocking Women's Entrepreneurship through Indigenous Food Systems in Northeast India

Amrutha T.¹, Monica Suresh Singh², Prabhavati Devi³, A.K. Mohanty¹, Tarun Kumar Das², Divya Parisa¹, Mainak Ghosh¹, P.K. Pathak¹

¹ICAR-Agricultural Technology Application Research Institute (ATARI), Zone VII, Umiam 793103, Meghalaya, India; ²Krishi Vigyan Kendra, West Garo Hills, ICAR-Research Complex for North Eastern Hill Region (RC NEHR), Umiam 793103, Meghalaya, India; ³KVK, Imphal East, Central Agricultural University, Imphal 795149, Manipur, India

The study documented the entrepreneurial journeys of two women agripreneurs from Northeast India Smt. Leisangthem Romee Devi of Manipur (AMI Food Products) and Smt. Baldilla T. Sangma of Meghalaya (Ama Food Product) to illustrate how women overcome socio-economic constraints to build resilient agribusinesses in resource-rich yet underdeveloped regions. Both entrepreneurs transitioned from traditional livelihood activities such as homemaking, embroidery, and small-scale farming to food processing enterprises with support from Krishi Vigyan Kendras (KVKs) through capacity building, technology adoption, and market linkages. Value-chain innovations played a critical role in enterprise growth. Adoption of a 25 kg cabinet solar dryer enabled Romee Devi to double production of dehydrated candies and indigenous confectionery products, while processing machinery facilitated Baldilla Sangma's scale-up of pickles, chips, powders, fruit wines, and juices using locally available crops. Integration of traditional knowledge with eco-friendly technologies reduced post-harvest losses, extended shelf life, preserved nutritional quality, and enhanced market value of indigenous produce. KVK-facilitated branding, licensing, and institutional exposure transformed market access from localized sales to structured networks, exhibitions, and inter-state demand. The enterprises generated significant social impacts, including women's empowerment, employment generation, cultural preservation, and community inspiration, while challenging traditional gender norms. Economic performance improved substantially, with Sangma's enterprise achieving a benefit-cost ratio of 3.26 and Devi attaining stable income and household security. These success stories demonstrate the transformative potential of women-led, low-capital agribusiness models in promoting inclusive, sustainable livelihoods and regional development in Northeast India, underscoring the need for policy support to scale such initiatives.

Keywords: Cultural Perervation, Eco-friendly technologies, Processing, Regional development, Women agripreneurship

For correspondence: Amrutha T.<amruthakbb@gmail.com>

Horticulture Empowerment through Banana Cultivation- A Case Study of Sahibganj, Jharkhand, India

Supriya Singh, Sanjeev Kumar, Ashok Kumar

Krishi Vigyan Kendra, Sahibganj 816109, Jharkhand, India

In Jharkhand state, horticulture plays a pivotal role in agricultural diversification. Farmers are now shifting from monocropping and adopting short duration high potential vegetable and flower cultivation in the cropping system and rice fallow areas during *rabi* / summer seasons so as to reduce risk from climate change, market shocks, improving soil health and enhanced income. The state is comprising of 24 districts and Krishi Vigyan Kendras of the districts are actively involved in imparting training for capacity building program, OFTS, FLDs, other mandated activities and all the program allotted by Central and state governments from time to times which has not only helped in growth of horticulture sector but others too.

The present study is of Smt. Preeti Devi, a progressive farm women from Taljhari block, Sahibganj district who has undertaken banana cultivation on commercial scale. Earlier, Smt. Preeti's family was going through hardships and financial crisis. But, due to her keen interest and support in form of capacity building program on scientific banana cultivation package and practices, marketing, processing, etc. from scientists of Krishi Vigyan Kendra and technical backstopping from time to time, saplings and input from District Horticulture Office and the support from JSLPS Chand Self Help Group, her farm has now become a "Model Demonstration Farm for Commercial Banana Cultivation" for whole district. Smt. Preeti's annual income has grown by 400%, 12 mandays has been created and as of now, she has 3 sources of income *viz.* banana production, Krishak Sakhi Services and from agricultural activities, which her family is utilizing for children's education, reinvesting in agricultural activities, saving in SHG group etc. Smt. Preeti is financially independent, her financial literacy has increased and now she has decision making role in her family. Also, as Lakhpati Didi, she has become a role model for many farm women of the district.

Keywords: Banana cultivation, Horticultural diversification, Krishi vigyan kendra, Sustainable livelihoods, Women empowerment

For correspondence: Supriya Singh <sahibganjkvk@gmail.com>

Role of KVK in Empowering Women to Attain New Heights

Sangita Kumari, Pramod Kumar Choudhary

Krishi Vigyan Kendra (KVK), Sheikhpura 811105, Bihar, India

Empowerment is a process which help the people to have their control over the factors which affect lives. Krishi Vigyan Kendra being technology dissemination centre not only it transferred the technology but also it has played a very big role in capacity build up of farm women in Sheikhpura district. It has conducted many awareness, education and empowerment program. Each and every program conducted by the KVK attracts maximum number of women participants with the expectation of learning new things in each time and KVK is fulfilling their desires by doing innovative works every time.

The important factors like education, size of holding, house status, income, farm power, media exposure contributed significantly towards women empowerment. The KVK organizes many training program for capacity building of rural women in the area of Mushroom production, Value addition, Rural craft, Nursery management, Poultry management, Natural and Organic farming, etc. leads to empowerment of farm women economically, socially and nutritionally. The activity of KVKs empowering the women through technological empowerment, economic empowerment, psychological empowerment, social empowerment, capacity building, income generating activities, leadership development decision making power. The Farm women also enlightened about the work simplification, drudgery reduction tools, celebration of various important days and campaign marketing management, etc. The KVK also help to mobilize SHGs through technology dissemination, credit mobilization and monitoring and motivation of the group. The KVK encourage farm women to establish Nutritional Kitchen Garden in their backyard under NARI program and MEP program. They are also doing backyard poultry and mushroom farming to eradicate Malnutrition.

Keywords: Capacity building, Krishi Vigyan Kendra, Nutritional security, Self-help groups, Women empowerment

For correspondence: Sangita Kumari <sangitajk7@gmail.com>

Challenges and Prospects of Farm Women in the Cold Arid Ladakh

Jigmet Yangchan

School of Agriculture Science and Technology, University of Ladakh, Stakna, Leh 194101, Ladakh, India

Farm women play a pivotal role in sustaining high altitude agriculture under extreme agro-climatic condition in the cold arid region of Ladakh, where nearly 70% of rural households depend directly or indirectly on agriculture and allied activities. Women contribute 60-80% of farm labour, particularly in field preparation, sowing, weeding, manure application, irrigation, harvesting, and livestock management. However, they face multiple constraints. Severe harsh climate stress (under + 32°C to -30°C), including low precipitation (less than 100 mm annually) and declining snowfall, has intensified water scarcity, increasing women's drudgery in irrigation management. Small and fragmented landholding (average below 1ha), short growing season of 4-5 months limited access to credit, extension services and land ownership further restrict their productivity and decision-making power. Out-migration of men has also increased women's workload rising as male involvement decline. Despite these challenges, significant prospects are emerging. Introduction of polyhouse and greenhouse technologies has enabled women to produce vegetables year-round resulting in 30-150% income increases in several intervention villages. Women led self help group (SHG's) engaged in vermicomposting, seed production, and value addition has annual earning ranging from 1.5-2.5 lakh per group. Government and institutional like KVK's agriculture departments, NGO's, etc. support through skill training, climate resilient farming practices and women centric rural enterprises are strengthening their economic resilience. Overall, empowering farm women through technology, institutional access and market linkages is crucial for sustainable agriculture and livelihood security in Ladakh fragile ecosystem.

Keywords: Climate resilient, Drudgery, Livelihood Sustainable agriculture, Water scarcity

For correspondence: Jigmet Yangchan <jigmet_chan@yahoo.co.in>

Impact Assessment of Punjab State Rural Livelihood Mission (PSRLM) on Psychosocial Empowerment of Farm Women

Prachi Bisht, Shikha Sharma

Punjab Agricultural University, Ludhiana 141004, Punjab, India

The present pilot study assessed the psychosocial impact of PSRLM (Punjab State Rural Livelihood Mission) on farm women using a descriptive research design. The study was conducted on a sample of 200 farm women enrolled under the MKSP scheme, and data were collected through a self-designed, structured questionnaire capturing key psychosocial dimensions relevant to women's empowerment in agricultural and livelihood contexts. The findings revealed a strong and consistent positive impact of MKSP across all assessed dimensions. High mean scores were observed for psychological empowerment (0.84) and decision-making autonomy (0.83), indicating significant enhancement in self-confidence, self-worth, and active participation of women in household, farm, and livelihood-related decisions. Improved social recognition and status (0.82) reflected greater respect, visibility, and acceptance of women as farmers and economic contributors within their families and communities. Substantial gains were also recorded in economic confidence and financial control (0.79) and social participation and mobility (0.78), suggesting increased financial self-reliance, independent mobility, and engagement in social and market-oriented activities. Strengthened collective action and institutional linkages (0.76) further highlighted improved participation in self-help groups, networking, and access to institutional support systems. Overall, the consistently high mean values across psychosocial dimensions confirm that MKSP is highly effective in fostering holistic psychosocial empowerment and social inclusion among farm women, underscoring its potential as a transformative women-centric agricultural intervention.

Keywords: Farm women, Mahila Kisan Sashaktikaran Pariyojana, Punjab State Rural Livelihood Mission, Psychosocial empowerment, Self-help groups

For correspondence: Prachi Bisht <bishtprachi@pau.edu>

Attitude of Farm Women toward Agriculture and Allied Sector in the Deccan Plateau of Marathwada Region

S.R. Jakkawad, Neeta Gaikwad, Sadiya Yasmeen

Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani 431402, Maharashtra, India

Sampling was done at four stages *viz.* the selection of district, selection of Blocks, selection of villages and selection of respondents. The study was conducted in Deccan Plateau of Marathwada region of Maharashtra state. From this region, Parbhani, Hingoli, Beed and Jalna districts were selected randomly. The selection two blocks were done randomly from each district. Thus, total eight blocks were selected. From each selected blocks, two villages were selected randomly. Thus, total eight villages were selected. From each selected village, beneficiaries were selected randomly. In this way, a total 1,200 beneficiaries were selected as respondents. The interview schedule was prepared on the basis of objectives of the study for collecting data. The data gathered via the interview schedule was coded, categorized and evaluated. The following statistical techniques were applied for interpretation and deriving conclusions: Frequency and Percentage, Mean and Standard Deviation. Based on that, the responses given by respondents had strongly agreed to the statement “Agriculture is the life line of our country” (Rank 1). This emotional attachment is further reflected in high agreement rates for statements such as “Farming teaches reality of life,” which was agreed/strongly agreed upon by 98.17% (49.42% strongly agreed; 48.75% agreed, Rank 2), and being “Proud to own farm land,” agreed/strongly agreed upon by 91.17% (58.25% strongly agreed; 32.92% agreed, Rank 3). Other strongly favoured statements included the belief that “One can come closer to the nature by getting engaged in agriculture” (Rank 4, 998.00 mean score) and feeling “Freedom to work in my own way in agriculture” (Rank 5, 982.5 mean score). However, the survey also exposed significant dissatisfaction regarding external support and the inherent stress of farming. The most negatively perceived statement was “Govt support aid in better agriculture,” which 61.77% of respondents disagreed with (Rank 32). Furthermore, nearly half the respondents (49.92%) disagreed that “Practicing agriculture is not stressful” (Rank 31).

Keywords: Agricultural perception, Attitude toward agriculture, Deccan plateau, Farm women, Marathwada region

For correspondence: S.R. Jakkawad <sunilduttjakkawad@gmail.com>

Role of Nutri Gardens in Enhancing Nutritional Security and Income of Rural Households

B. Divya Sudha¹, S. Sreenivasulu¹, J.V. Prasad², Shaik N. Meera²

¹Rashtriya Seva Samithi (RASS)-Krishi Vigyan Kendra, Tirupati, Chittoor 517520, Andhra Pradesh, India; ²ICAR-Agricultural Technology Application Research Institute (ATARI), Zone-X, Hyderabad 500059, Telangana, India

India possesses a wide diversity of indigenous fruits and vegetables that play a vital role in ensuring household nutritional security. The organized cultivation of these crops in the limited land available around homes is commonly referred to as a nutrigarden. The present investigation was carried out in ten selected villages of the K.V. B. Puram, Karavetnagaram, Renigunta, Tirupati rural mandals in Chittoor and Tirupati districts, Andhra Pradesh, to assess the impact of nutri gardens on nutritional security and income of rural households. Simple random Sampling was adopted, and a total of 120 respondents were selected randomly from beneficiaries associated with the Rashtriya Seva Samithi (RASS) - Krishi Vigyan Kendra, comprising 60 households practicing nutrition gardening and 60 without such gardens. Primary data were gathered through a structured interview schedule. Findings indicated that an area of approximately 200-300 m² was sufficient to meet the vegetable requirements of a family consisting of 4-5 members. Following the establishment of nutri gardens, vegetable availability and household consumption showed a substantial improvement, with production increasing by nearly 90% and calorie intake rising by about 50%. A considerable proportion of respondents (around 35%) also reported an increase in annual household income through surplus vegetable sales ₹ 2400 per month. However, challenges such as irregular water availability, inadequate access to quality inputs, and rising input costs were reported as major constraints in the effective management of nutri gardens.

Keywords: Household income, Krishi Vigyan Kendra, Nutri gardens, Nutritional security, Rural livelihoods

For correspondence: B. Divya Sudha<divyasudhaburada@gmail.com>

Empowered to Export: The Transformational Journey of a Woman Entrepreneur from Rural Andhra Pradesh

Thodeti Manasa, G. Ramesh

Krishi Vigyan Kendra, Darsi, Prakasam, Acharya N G Ranga Agricultural University, Guntur 523247, Andhra Pradesh, India

Women entrepreneurship has emerged as a powerful instrument for economic empowerment, social inclusion, and sustainable rural development. This paper presents the inspiring success story of a woman entrepreneur from Yerragondapalem village, Prakasam District of Andhra Pradesh, who transformed a locally available agricultural resource into a globally competitive enterprise with the technical support of Krishi Vigyan Kendra (KVK), Darsi.

Coming from a rural background with limited initial resources, she identified the nutritional and commercial potential of moringa (*Moringa oleifera*) and aspired to create a sustainable livelihood through value addition. With continuous guidance and technical interventions from KVK, Darsi, including improved cultivation practices, post-harvest handling, processing techniques, quality control, and capacity building, she successfully established a moringa powder processing unit. These scientific practices enabled her to scale production to ton-level quantities while maintaining high quality standards. The technical support provided by KVK, Darsi played a crucial role in enabling the entrepreneur to meet food safety norms, adopt hygienic processing methods, and align production with export-quality requirements. As a result, she successfully accessed national and international markets, exporting moringa powder and contributing to income generation and foreign exchange earnings.

Beyond economic success, her enterprise has created employment opportunities for rural women, enhanced skill development, and strengthened community participation, thereby promoting inclusive growth. Her journey stands as a testimony to how institutional support, combined with individual determination and innovation, can overcome socio-economic challenges faced by rural women. This case study highlights the vital role of KVKs as catalysts of women-led agribusiness development and demonstrates that with timely technical support, training, and market linkage, rural women entrepreneurs can emerge as successful global players. The story serves as a strong motivational model for aspiring women entrepreneurs and policymakers aiming to promote sustainable, women-centric rural enterprises.

Keywords: Export-oriented agribusiness, Krishi Vigyan Kendra, Moringa (*Moringa oleifera*), Value addition, Women entrepreneurship

For correspondence: Thodeti Manasa <manasamsd11@gmail.com>

The Significance of Cosmopolite Orientation and Capacity Development Programs in Embracing Poultry Farming

Aparna Gupta, Satbir Singh

Krishi Vigyan Kendra, Ropar, Punjab Agricultural University, Ludhiana, Rupnagar 140001, Punjab, India

Krishi Vigyan Kendras (KVKs) facilitate vocational and capacity-building training initiatives grounded in the concepts of “Teaching by Doing” and “Learning by Doing” for farmers, farm women, and rural youth, aiming to enhance skills, encourage self-employment, and bridge the gaps between research and practical application. Since 2018, KVK, Ropar, Punjab, has implemented eight capacity-building programs focused on scientific poultry farming, training a total of 136 farmers. An impact analysis study was carried out by KVK during September-October 2025. Former trainees were contacted, and adopters were visited to evaluate the level of entrepreneurship. The adoption rate stood at 26.47% for poultry (6.67% backyard + 19.85% commercial). Gender analysis depicted 66.67% (6/9) backyard units and 7.40% commercial units were being maintained by farm women. Economic analysis showed that commercial intensive poultry farming yielded around ₹2.00 lakh from just 0.15 acre/year (flock size 5000), highlighting the high income-generating potential of the enterprise. While backyard poultry yielded ₹ 2000-5000/- per month depending upon the flock size of 50-100 birds. Regression analysis revealed that the cosmopolite nature of trainees was the strongest predictor of adoption enterprise ($r = 0.851$), followed by education, age, employment and landholding. The model was highly significant ($p < 0.001$) with $R^2 = 0.780$ (poultry). Furthermore, trained farmers achieved markedly better biological performance poultry mortality 2-3% (vs. 7-9% in non-trained). RBQ analysis of risk mitigating factors by adopters indicated that superior strains (I), continuous technical backstopping by KVK (II), preventive measures’ knowledge and timely practice (III), practical exposure during training (IV), active peer-learning networks(V), assured input supply (VI), and stable market demand (VII) were the factors behind success. KVK Ropar interventions demonstrates that well-designed, hands-on training programmes significantly enhance adoption, profitability, and resilience of poultry farming. The strong correlation of adoption with cosmopolite outlook and education underscores the need for targeted selection and intensive follow-up support.

Keywords: Capacity building, Cosmopolite orientation, Krishi Vigyan Kendra (KVK), Poultry farming adoption, Rural entrepreneurship

For correspondence: Aparna Gupta <aparna@pau.edu>

Determinants of Adoption and Enterprise Performance among Poplar Nursery Trainees of KVK Ropar

Ankurdeep Preety, Satbir Singh

Krishi Vigyan Kendra, Ropar, Punjab Agricultural University, Ludhiana, Rupnagar 140001, Punjab, India

Krishi Vigyan Kendras (KVKs) empower rural communities with skills and knowledge for sustainable farming and economic independence, fulfilling their mandate for rural development. Commencing in 2018 and lasting until 2025, the KVK, Ropar, Punjab, executed a series of eight training programs focused on enhancing farmers' expertise in poplar nursery cultivation, which benefited 120 participants. To measure the outcomes, an impact assessment was conducted in October and November 2025, during which old trainees were contacted and successful adopters were visited to assess their entrepreneurial advancement. The findings showed that 27.4% of the trainees had adopted poplar nursery cultivation. Additionally, the enterprise proved to be economically advantageous, with net returns estimated at around ₹1.25 lakh per acre per year, underscoring its substantial income-generating capacity. Statistical analysis of adoption and independent variables of Poplar nursery production trainees indicated that 'Adoption' has highest positive correlation (0.741) with KVK linkage of the trainees and significant correlation with the variables KVK linkage, education, age and land, and non-significant correlation with employment status of the trainee farmers. The linear regression analysis resulted in $R^2 = 0.599$ (Adjusted $R^2 = 0.581$), showing a moderately strong fit. The F-stat=34.062, p-value= 0.000, indicated statistically significant model. Additionally, it was observed that the trained farmers exhibited better performance of the nursery, with reduction of mortality rate from 12-15% as compared to 18-22% among non-trained farmers. The Rank-Based Quotient (RBQ) analysis of adopters identified the principal determinants of risk mitigation as: practical exposure during training (I), irrigation management (II), preparation of planting material (III), timely pruning operations (IV), weed management (V), fertilizer management (VI), and integrated pest and disease management (VII). These findings substantiate that systematically designed, experiential training interventions implemented by KVK Ropar significantly enhance adoption rates, economic viability, and enterprise resilience in poplar nursery production. The positive correlation between adoption intensity and farmers' linkage with KVK and educational attainment underscores the necessity of strategic beneficiary selection coupled with sustained post-training support mechanisms to maximize impact.

Keywords: Agroforestry entrepreneurship, Adoption behaviour, Capacity building, Krishi Vigyan Kendra, Poplar nursery cultivation

For correspondence: Ankurdeep Preety<ankurdeeppreety@pau.edu>

Enhancing Nutritional Security and Rural Livelihoods through Integrated Farming Systems: A Case Study of Kumbarkoppa Village

Rajeshwari M. Desai¹, Surekha Sankangoudar¹, K.J. Sannapamma¹, Vinutha Muktamath¹, Y. Ravi¹, Mridul Devi²

¹University of Agricultural Sciences, Dharwad 580005, Karnataka, India; ²ICAR-Central Institute for Women in Agriculture, Bhubaneswar 751003, Odisha, India

The Nutri-Smart Village (NSV) Program is a strategic, community-based initiative designed to address malnutrition and strengthen nutritional security in rural areas through nutrition-sensitive agricultural interventions. Rural households often face challenges such as limited dietary diversity, inadequate awareness of balanced nutrition, and low adoption of sustainable farming practices. This study evaluated the effectiveness of Integrated Farming Systems (IFS) under the NSV Program in improving household nutrition and rural livelihoods.

The study was conducted in Kumbarkoppa village of Dharwad district, selected based on geographical suitability and accessibility. Using purposive random sampling, 100 rural women with access to farm or backyard space and willingness to adopt IFS interventions were selected. Primary data were collected through focus group discussions, stakeholder interviews, and structured surveys. Household dietary diversity, farming practices, and economic outcomes were assessed by comparing baseline data from 2022 with post-intervention data from 2023.

The NSV interventions adopted a multi-sectoral approach, including nutrition awareness program, distribution of vegetable seed kits, promotion of kitchen gardens, and introduction of poultry farming. The results demonstrated notable economic gains, with net income from farm produce increasing from ₹1,41,000 to ₹1,61,750, resulting in an overall seasonal profit rise of ₹31,300. Successful integration of enterprises such as dairy, sericulture, and fishery increased farm income in selected households from ₹2,05,000 to ₹2,97,500. Crop diversification was observed in over 60% of households, while 70% adopted improved nutrition practices.

Overall, the NSV Program led to enhanced nutritional security, a 25-30% reduction in child malnutrition, and a 20-40% increase in farm income. Active participation of women through kitchen gardening and village-level committees highlights IFS as a scalable and sustainable model for improving nutrition, livelihoods, gender equity, and rural food security.

Keywords: Farm income, Integrated farming system, Nutritional security, Nutri smart village, Rural livelihood

For correspondence: Rajeshwari M. Desai <rajeshwarimd@uasd.in>

From Urban Struggle to Rural Prosperity: Mrs. Kavitha's Farm Success

Atheefa Munawery¹, Kamalabai Koodagi¹, S. Kavitha², D.K. Suresh¹, H.M. Mahesha¹, B. Divya¹, K.B. Apoorva¹, Darshan¹

¹Krishi Vigyan Kendra, Mandya, University of Agricultural Sciences, Bengaluru, Mandya 571405, Karnataka, India; ²Progressive Farm Woman, Nagamangala, Mandya, 571432 Karnataka, India

Mrs. Kavitha pausing her undergraduate studies married to Mr. Nagaraju worked at a coffee shop in Bengaluru earning ₹ 15,000 per month. Yet the city life brought no joy - only pollution and drudgery. They hail from small village Burudugunte in Nagamangala taluk, Mandya district. Dreaming of a farmhouse back home, the couple returned to their roots and began farming traditional crops like paddy, finger millet, tomato, brinjal, onion, capsicum, etc. without proper knowledge, yields were decent but incomes low and delayed. Seeking daily income options, they turned to ICAR-Krishi Vigyan Kendra at V. C. Farm, Mandya. Through skill based trainings and method demonstrations, they learned package of practices, integrated farming, seed treatment, soil test based nutrient management and eco-friendly pest and disease control and climate smart sustainable practices. Supported by the Departments of Agriculture and Horticulture, they accessed subsidized micro-irrigation systems and inputs.

They shifted to rotational vegetable cropping, timing harvests for peak market demand. Noticing the high flower demand during visits, they planted tuberose, jasmine varieties and rose scented geranium- unlocking steady daily income. Their integrated farm now includes a nutrigarden, indigenous cereals, vegetables, fruits and medicinal plants and animal husbandry (indigenous breed). To cut the drudgery, they used cycle weeders and bullock drawn single ploughs. Dairy (indigenous breeds) with value added products, goat rearing and on farm composting of residues complete their sustainable model. Today, improved technologies yield a net monthly income of ₹80000 to ₹100000/- bringing in smiles and prosperity in her life. Mrs. Kavitha's active role in agriculture has earned recognition from the Agriculture Department, University of Agricultural Sciences (Bengaluru and Mandya) and various forums. She now serves as a resource person, inspiring rural women to thrive in agriculture. Fueled by her vision for success, Smt. Kavitha with her husband and other friends have formed the registered farmer's group Nagamangala Taluk Organic Growers with 60 members. They are united in promoting organic practices and inspiring rural youth towards healthy, sustainable livelihoods.

Keywords: Climate-smart agriculture, Integrated farming system, Krishi Vigyan Kendra, Organic farming collective, Women empowerment

For correspondence: Atheefa Munawery<ayeeefa106@gmail.com>

Empowering Rural Women through Value-Added Agri-Food Enterprises

Anjali Verma¹, S.K. Tomar¹, P.K. Mishra¹, V.B. Singh¹, Prem Shankar¹, Hariom Mishra¹, R.V. Singh¹, Patiraj Verma²

¹Krishi Vigyan Kendra, Basti, Acharya Narendra Deva University of Agriculture and Technology, Ayodhya 272131, Uttar Pradesh, India; ²H.No. 206, Jalapur, Manikpur, Basti 224143, Uttar Pradesh, India

Women play a key role at every stage of the agri-food value chain, yet their economic contribution often remains undervalued due to limited access to skills, finance, and markets. This paper presents extension-led, women-focused agri-food entrepreneurship models implemented through Krishi Vigyan Kendra interventions, showing how capacity building, value addition, and institutional support can strengthen women's economic participation and leadership. Based on field experiences, the study highlights three extension-led models:

(i) Women-led Value Addition Model, (ii) Nutrition-Sensitive Enterprise Model and (iii) SHG-Based Collective Marketing Model. Women were trained in hygienic processing, standardization, packaging, branding, and market linkage. As a result, participating women reported 20-40% increase in household income, improved decision-making at the family level, and higher confidence in managing enterprises. Improved awareness and availability of processed foods also contributed to better household nutrition. The study identified key enabling factors such as convergence with government schemes, access to microfinance through SHGs, and continuous mentoring by KVK scientists. These low-cost, locally adaptable models are easily replicable and demonstrate the strong potential of women-led agri-food enterprises in building inclusive, resilient, and sustainable agri-food systems.

Keywords: Agri-food value addition, Nutrition-sensitive enterprises, Rural livelihoods, Self-help groups (SHGs), Women entrepreneurship

For correspondence: Anjali Verma<anjali190191@gmail.com>

Persimmon Cultivation in Phek District of Nagaland Hills: A Farmer-Led Success Story

Sanjeev Kumar Singh¹, T. Esther Longkumer¹, Hannah K. Asangla¹, K.S. Manjunath¹, S. Girish Patil²

¹Krishi Vigyan Kendra Phek 797107, Nagaland, India; ²ICAR-National Research Centre on Mithun, Medziphema 797106, Nagaland, India

Persimmon cultivation has emerged as a high-value, climate-resilient horticultural enterprise in the mid-hill regions of Nagaland, demonstrating significant potential for enhancing farm income and livelihood security. This case study documented the successful experience of Mrs. Vezokholu Chuzho, a progressive farmer from Thipuzu village, Phek district, Nagaland, who initiated persimmon cultivation in 2005 with limited planting material and gradually expanded production through scientific management and nursery development. Continuous technical backstopping and capacity building by ICAR-Krishi Vigyan Kendra (KVK), Phek under the National Innovations in Climate Resilient Agriculture (NICRA) project played a pivotal role in scaling up the enterprise. Key interventions included the use of quality planting material, grafting-based nursery raising, scientific orchard management, soil and water conservation measures, climate-resilient practices, post-harvest management, value addition, and strengthened market linkages. As a result, persimmon cultivation achieved an average yield of 168.07 q ha⁻¹ with a gross income of ₹ 16.80 lakh ha⁻¹, net income of ₹ 13.43 lakh ha⁻¹, and a high benefit-cost ratio of 4.98, indicating excellent economic viability. The success of this model led to horizontal spread, with over 240 farmers adopting persimmon cultivation across approximately 17 ha in nearby villages. The establishment of a fruit processing and cold storage cluster under the SFURTI (Scheme of Fund for Regeneration of Traditional Industries) scheme further enhanced value addition, employment generation, and regional entrepreneurship. Overall, the study highlights persimmon cultivation as a profitable, socially acceptable, and climate-resilient horticultural option with strong potential for scaling up in the Northeastern Hill region of India.

Keywords: Climate-resilient horticulture, Farmer-led innovation, High-value crops, Northeastern hill agriculture, Persimmon cultivation

For correspondence: Sanjeev Kumar Singh <sanjeevs99@gmail.com>

Smart Farming for Women: Using Digital Tools for Sustainable Agriculture

Neetish Kumar, Praveen Jakhar, Ananta Sarkar

ICAR-Central Institute for Women in Agriculture, Bhubaneswar 751003, Odisha, India

Smart farming employs digital technologies to revolutionize agriculture. These tools boost productivity, promote financial independence, and support sustainable practices that protect the environment. Women form a major part of the global agricultural workforce, yet they often face barriers like limited access to resources, information, and decision-making roles. The study addresses these challenges through digital innovations such as mobile apps, precision farming technologies, and e-commerce platforms. These technologies provide women with vital resources to refine farming techniques, increase crop yields, and access better markets. Real-time data on weather, soil conditions, and pest alerts enables informed decisions, enhancing efficiency, cutting losses, and minimizing environmental harm. Awareness creation among farm women about digital agriculture using hands-on methods like drone technology demonstrations, video presentations, and structured training modules has been done. It reaches over 10,000 women across 80 villages in Odisha through 135 drone demonstrations. To assess impact, the study developed a structured questionnaire evaluating digital literacy levels what women know and can do with these tools. A comprehensive data analysis was conducted among farm women (600 nos.) to evaluate their access to and proficiency in using digital tools for agricultural purposes. The results revealed that although mobile phone ownership (77.85%) is widespread, actual digital literacy and the ability to use advanced digital applications vary considerably. Most participants were comfortable with basic phone functions such as calling (83.2%) and messaging (58.96%), while fewer women used applications like Whatsapp or conducted internet searches (44.97%). Only a small proportion (39.20%) utilized specialized e-finance tools. The study also highlights key government schemes, including the Digital Agriculture Mission and NAMO Drone Didi, to connect women with support opportunities. Preliminary results showed growing knowledge and confidence, bridging the digital divide. Ultimately, these technologies streamline operations, reduce costs, and deliver information directly to users. They foster inclusive, resilient agriculture that elevates women's contributions. The work demonstrates that targeted interventions can empower farm women, driving sustainable development in Odisha and beyond.

Keywords: Digital agriculture, Digital literacy, Precision agriculture, Smart farming technologies, Women empowerment

For correspondence: Neetish Kumar<neetish.kumar@icar.org.in>

Promoting Nutri-Gardens in Kiphire: A Women-Led Pathway to Food and Nutritional Security

K. Srilekha¹, Manjunath S. Tondihal¹, C.S. Karibasappa¹, Alok Dube¹, L.J. Bordoloi¹, A.K. Mohanty², H. Kalita³

¹Krishi Vigyan Kendra, Kiphire, ICAR-Research Complex for North Eastern Hill Region (RC NEHR), Nagaland Centre, Kiphire 798611, Nagaland, India; ²ICAR-Agricultural Technology Application Research Institute (ATARI), Zone VII, Umiam 793103, Meghalaya, India; ³ICAR-RC NEHR, Nagaland Centre, Dimapur 797106, Nagaland, India

Women are central to household food systems, influencing dietary diversity and nutritional adequacy. In Kiphire district of Nagaland, India, monotonous food habits and low fruit-vegetable intake increase the susceptibility to micronutrient deficiencies. To address this, a Frontline Demonstration (FLD) was conducted on 0.035 ha with 5 women-led nutri-garden demonstrations, designed to diversify diets and strengthen food security.

Daily per capita consumption estimates revealed substantial contributions from vegetables such as tomato (293 g/day), cabbage/onion (207 g/day), and brinjal (257 g/day) for one nutri-garden over a period of 4 months. Nutrient adequacy analysis showed that nutri-gardens provided 85% of dietary fiber RDA, 124% of magnesium RDA, and 350% of vitamin C RDA for moderately working men, while women achieved 82% of dietary fiber RDA, 130% of magnesium RDA, and 280% of folate RDA. Deficits persisted in calcium (51-64%), iron (27-73%), zinc (30-40%), and vitamin B12 (0%). Importantly, the average Composite Household Food Security Index (CHFSI) was 59 among participating households, reflecting enhanced dietary diversity, reduced vulnerability to micronutrient deficiency, and greater resilience in food access. Women's leadership in planning, cultivating, and managing nutri-gardens not only improves nutritional outcomes but also reinforces their agency in local agri-food systems.

This study demonstrates that community-driven, women-led nutri-gardens are a replicable model for advancing food and nutritional security, bridging micronutrient gaps, and empowering women as agents of change in agri-food systems.

Keywords: Dietary diversity, Food and nutritional security, Micronutrient adequacy, Nutri-gardens, Women-led agriculture

For correspondence: K. Srilekha <srilekhafsn@gmail.com>

Millets Attaining New Heights in East Singhbhum District of Jharkhand: A Pathway for Women Empowerment

Seema Singh¹, Rekha Sinha²

¹Krishi Vigyan Kendra, East Singhbhum, Jamshedpur 832304, Jharkhand, India; ²Birsa Agricultural University, Ranchi 834006, Jharkhand, India

Millets, traditionally grown in rainfed and tribal agro-ecosystems, are re-emerging as climate-resilient and nutrition-rich crops with significant potential for livelihood enhancement and women empowerment. In East Singhbhum district of Jharkhand, millets such as finger millet, little millet, foxtail millet, and barnyard millet have gained renewed importance owing to targeted interventions under government programmes, Krishi Vigyan Kendra (KVK) initiatives, and women-centric livelihood missions. The present study documents the role of millet-based interventions in strengthening women's socio-economic status while promoting sustainable agriculture in the district since 2021-25. KVK conducted capacity building program focusing on improved millet varieties, scientific production practices, seed management, and low-cost processing technologies were implemented among 600 farmwomen and Self-Help Groups (SHGs) in convergence with JSLPS in the district. Emphasis was laid on value added products *i.e.* *madua* flour, *madua* laddu, nimki, cookies, nutritional awareness, entrepreneurship development, and market linkage support by training and demonstrations. On facilitated farmwomen's participation in activities such as millet cultivation, primary processing, preparation of ready-to-cook and ready-to-eat products, and local marketing. Adoption of small-scale processing units and traditional recipes improved household nutrition while generating additional income.

The interventions resulted in enhanced productivity, reduced production costs, and increased returns from millet cultivation. Women SHGs reported improved decision-making ability, economic independence, and leadership roles within households and communities. Millet-based enterprises contributed to income diversification, year-round employment, and strengthened resilience against climatic and market risks. Moreover, increased consumption of millets helped address micronutrient deficiencies among rural families, particularly women and children.

The study highlights that millets have transcended their traditional subsistence role and emerged as instruments of women empowerment and rural transformation in East Singhbhum. Convergence of research, extension, policy support, and women-led collectives has enabled millets to attain new heights in the district. Scaling up such integrated approaches can further enhance women's livelihoods, nutritional security, and sustainable agricultural development in tribal and rainfed regions of India.

Keywords: Climate-resilient crops, Millet-based livelihoods, Nutritional security, Self-help groups (SHGs), Women empowerment

For correspondence: Seema Singh <seema21jan@gmail.com>

Women's Roles and Decision-Making in Smallholder Dairy within Agri-Food Systems

Nidhi, Tulika Kumari, Simran

Dr. Rajendra Prasad Central Agricultural University, Pusa 848125, Bihar, India

This study examines gendered labour participation and decision-making in dairy-based agri-food systems, with a focus on women's roles within smallholder households. Primary data revealed that women independently performed most routine and labour-intensive tasks, including milking (56%), feeding (47%), shed cleaning (46%), water management (45%), and dung cake preparation (86%). Joint participation is widespread, exceeding 50% for activities such as animal washing, shed cleaning, and milking, highlighting the household-based nature of dairy production. Despite women's dominance in daily operations, control over strategic and capital-intensive decisions remains largely male-dominated: men alone make decisions in breeding (~60%), animal insurance (~59%), and financial activities such as loan acquisition and repayment (over 60%). Women's autonomous decision-making is strongest in routine activities (27-33%) but declines sharply in asset and finance-related domains. The findings reveal a clear mismatch between women's labour contributions and their decision-making authority, underscoring the need for gender-responsive policies that enhance women's access to assets, credit, and institutional services within dairy agri-food systems.

Keywords: Agri-food systems, Gender equality, Gender roles in agriculture, Smallholder dairy systems, Women's decision-making

For correspondence: Nidhi<nidhi.sinha@rpcau.ac.in>

Utilization Pattern of Agricultural Schemes among Farm Women and Constraint in Access: A Study from Jorhat District of Assam

Prastuti Bharadwaj, Mayuri Bora

Assam Agricultural University, Jorhat 785013, Assam, India

The present study on Utilization Pattern of Agricultural Schemes among Farm Women and Constraint in Access: A Study from Jorhat District of Assam was conducted to study the utilization of different Agricultural Schemes by farm women and constraint faced by them in availing the benefits of the schemes. The study was conducted in Jorhat District of Assam. Out of six development blocks of Jorhat district, three blocks were selected randomly for the study. From each block, two villages were selected randomly and twenty respondents from each village were selected. Total sample size for the study was 120. Data were collected through Interview schedule and analysed using appropriate statistical tests *i.e.* frequency, percentage, mean and chi square. Five agricultural schemes namely Pradhan Mantri Kisan Samman Nidhi (PMKISAN), Pradhan Mantri Fasal Bima Yojana (PMFBY), National Food Security Mission (NFSM), National Livestock Mission (NLM) and Pradhan Mantri Matshya Sampada Yojana (PMMSY) were included for the study. Data revealed that 55.00% had reported that they had placed their application for getting benefits under Pradhan Mantri Kisan Samman Nidhi (PMKISAN), while 36.67% applied for Pradhan Mantri Fasal Bima Yojana (PMFBY) and 28.33% applied for getting benefits under National Food Security Mission. Regarding receiving benefits under PMKISAN, 34.17% had received benefits while 23.33% got benefits under PMFBY scheme. 'Hesitation in asking about the schemes provided by the government' and 'lack of proper knowledge about the schemes' were the highly reported problems faced by the respondents in utilizing different agricultural schemes. It may be concluded that awareness regarding different schemes may be strengthened for enabling farm women in availing benefits under different agricultural schemes.

Keywords: Agricultural schemes utilization, Access constraints, Farm women, Government support programs, Rural development

For correspondence: Prastuti Bharadwaj <mayuri.bora@aaau.ac.in>

Gender Dynamics of Work Allocation and Household Consumption Patterns among Tea Plantation Workers in Assam

Tulika Borah, Pallabi Talukdar, Mandeep Digra, Pubali Saikia

All India Coordinated Research Project on Women in Agriculture, Assam Agricultural University, Jorhat 785013, Assam, India

The tea plantation sector is a vital component of Assam's economy and a major source of employment, particularly for women, who constitute more than half of the total workforce. Despite their significant contribution, tea plantation labour remains highly gender-segregated, influencing both work roles and household economic behaviour. The present study examined gender differences in the division of labour within tea gardens and the associated Monthly Per Capita Consumption (MPCC) patterns of workers' households in Assam.

The study was conducted in three randomly selected tea gardens of Jorhat district using primary data collected from 120 tea garden workers through a structured survey. Secondary data were also utilized to understand broader work distribution patterns. Tea plantation activities were classified into plantation and factory operations, and gender-wise participation across different tasks was analyzed. The findings revealed a pronounced gendered division of labour. Female workers are predominantly engaged in plantation activities (68.4%), particularly in tea leaf plucking, skiffing, manuring, and cleaning, while male workers are largely concentrated in factory operations (82.1%) and physically demanding or mechanized tasks such as digging, drainage maintenance, and application of plant protection chemicals. This systematic allocation of work reflects the institutionalized gendering of skills within the tea plantation system. The study also highlights emerging challenges due to increasing mechanization, which may disproportionately affect women workers if skill upgradation is not ensured.

Further, significant gender differences were observed in MPCC patterns. Households with female workers as the primary earners allocated a higher proportion of expenditure to food, clothing, and fuel, indicating a stronger focus on household sustenance. In contrast, households with male primary earners spent relatively more on transport, communication, entertainment, education, and discretionary items. The study underscores the need for gender-sensitive labour policies, skill development initiatives, and welfare interventions to promote equity and sustainability in the tea plantation sector.

Keywords: Assam, Consumption pattern, Gender division of labour, Mechanization, Tea plantation, Women workers

For correspondence: Tulika Borah <tulika.borah@aaau.ac.in>

A Conceptual Framework for Mainstreaming Gender in Climate Adaptation Strategies for the Kosi Region of Bihar

Alisha¹, M.K. Roy¹, Nityanand¹, Nilesh Kumar¹, Anjani²

¹Krishi Vigyan Kendra, Bihar Agricultural University, Raghopur, Simrahi Bazar, Supaul 852111, Bihar, India; ²ICAR-Agricultural Technology Application Research Institute, Patna 800014, Bihar, India

The Kosi region of North Bihar presents a unique paradox. It possesses high agrarian fertility and also suffers from extreme climate vulnerability. Significant male out-migration has accelerated the “feminisation of agriculture” in this area. Women now lead production, processing, and value chains. Despite over 60% participation in agriculture, very few women are on land, preventing them from accessing credit and government schemes. They are often considered unpaid household workers, which diminishes the value of their labour. National initiatives like the Mahila Kisan Sashaktikaran Pariyojana (MKSP) have made significant progress in empowering these women. However, the unique flood-prone nature of the Kosi basin presents specific challenges for implementation on the ground. This study analysed the “last-mile delivery” of climate adaptation strategies in this context. It identified that while gender-sensitive technologies exist, the adoption is often hindered by an “access gap”. This happens due to social constraints and a lack of land ownership. Consequently, women farmers face the “triple burden.” They manage productive labour, reproductive care, and social resilience during disasters. Drawing on field observations from the Krishi Vigyan Kendra (KVK) Supaul, in Bihar, the study proposed a “Home-Science-Led Resilience Model”. The study framework prioritised three key areas. First, it promoted Custom Hiring Centres for drudgery-reducing tools to ensure access without ownership costs. Second, it utilised ‘Poshan Vatikas’ (Nutri-gardens) and mushroom production to secure household nutrition during climatic shocks. Third, it strengthened Self Help Groups for value-added enterprises, such as Makhana processing, to buffer against crop failure. The study concludes that effective resilience requires integrating Home Science extension services with mainstream agricultural policy. This ensures that the benefits of state-led interventions effectively reach the woman farmers.

Keywords: Climate resilience, Feminisation of agriculture, Gender and climate adaptation, Nutri-gardens, Self-help groups

For correspondence: Alisha <alisharanabau23@gmail.com>

Empowering Women through Technical and Vocational Training

Suneeta Paswan, Kumar Sanjeev, Ragini Kumari, Sangeeta Kumari

Krishi Vigyan Kendra, Bihar Agricultural University, Agwanpur, Saharsa 852201, Bihar, India

Empowering women through Technical and Vocational Education and Training (TVET) is a crucial strategy for achieving gender equality and sustainable socio-economic development. Technical and vocational training provides women with practical skills, entrepreneurial knowledge, and access to employment opportunities that enhance their economic independence and social status. Despite progress in recent years, women's participation in vocational programs remains limited due to cultural barriers, gender stereotypes, and unequal access to resources. Integrating gender-responsive policies within TVET systems can help address these challenges by promoting inclusive curricula, safe learning environments, and support for women in traditionally male-dominated fields. Furthermore, partnerships between government, private sector, and community organizations can expand training opportunities and link women to labour markets. The study highlights the transformative potential of TVET in empowering women, fostering self-reliance, and contributing to national development goals through inclusive growth and social equity.

Keywords: Gender equality, Gender stereotypes, Skill development, Vocational education, Women empowerment

For correspondence: Suneeta Paswan <suneetapaswan@yahoo.com>

Socio-Financial Empowerment and the Constraints faced by Women Community Animal Health Workers (CAHWs): Evidence from the Pashusakhi Model in Bahraich District, Uttar Pradesh, India

Tarun Kumar, Mahesh Chander

Indian Veterinary Research Institute, Bareilly 243122, Uttar Pradesh, India

The role of women in livestock based agri-food systems is often undervalued and constrained by socio-cultural norms, which limits their economic independence and social recognition. The Pashusakhi model is a community based animal healthcare approach engaging rural women as Community Animal Health Workers (CAHWs), combining livelihood generation and ensuring delivery of primary veterinary services to livestock farmers in rural areas. The present study examined the financial and social empowerment outcomes and the constraints affecting the long-term sustainability of the Pashusakhi model. The primary data collection was done from 20 randomly selected Pashusakhis of 20 villages in Chitaura block of Bahraich district using structured interview schedule and Garratt ranking method. The feedback of Pashusakhis' work was also recorded from 100 livestock farmers in the region of study. The results showed significant improvement in financial empowerment, where 90% of the Pashusakhis transitioned from negligible or zero income before joining as Pashusakhi to earning incomes above ₹3000 per month after working as Pashusakhi. These earnings were reported to be generated through fee-for-service delivery such as vaccination, castration, deworming and First-aid. It is noteworthy, that 75% of the Pashusakhis reported to make free decisions on how to use their earned income. In terms of social empowerment outcomes, all 20 Pashusakhis reported improved status within their households with more participation in decision-making related to livestock related investments and income use. At the community level, these Pashusakhis emerged as a trusted livestock support system among small livestock farmers, with acknowledgement of advisory role and high levels of confidence in public speaking and community meetings. The study also identified constraints these women CAHWs face while discharging their duties in the field affecting the sustainability of the Pashusakhi model. The most critical constraint was lack of stable and regular income (mean Garret score of 75.35), followed by difficulty in managing household work and field responsibilities and lack of regular refresher training or knowledge updates. The study highlights the Pashusakhi model as gender-sensitive and socially inclusive method within livestock based agri-food systems. Although the Pashusakhi model enhances women's income, decision-making power, and community leadership, its sustainability is constrained by irregular income, dual burden, and limited institutional support and formal recognition of their work. Mainstreaming gender equality requires formal integration of women CAHWs into veterinary systems, predictable remuneration, continuous capacity building, and gender-responsive policy support along with institutional environment that recognize, support, and sustain their contributions.

Keywords: Community animal health workers, Livestock extension services, Pashusakhi model, Rural livelihoods, Women empowerment

For correspondence: Tarun Kumar <k.tarunmailme@gmail.com>

Status and Challenges of Women in Agriculture in YSR District (2014-2024)

S. Prasanthi, T. Mahesh Babu, I. Suresh Kumar Reddy, S. Manasa, K. Sai Maheswari, V. Shilpa Kala

Krishi Vigyan Kendra, Utukur, Rayachoti Road, Moolavanka, Cuddapah 516003, Andhra Pradesh, India

Agriculture in YSR District (Kadapa) is heavily dependent on women, who constitute the majority of the rural workforce. Despite the “feminization of agriculture” driven by male migration to urban centers, women’s contributions often remain invisible or undervalued. This study tracked the status of farm women from 2014 to 2024, highlighting their pivotal role in crop production and the emerging livestock sector.

In crop cultivation, women perform nearly 90% of labour in rainfed groundnut farming specifically sowing, weeding, and harvesting and dominate paddy transplanting in irrigated belts. While male migration has forced them into de facto managerial roles, they perform these tasks with high drudgery. Activities like manual weeding and groundnut picking are physically demanding, leading to widespread musculoskeletal disorders and Repetitive Strain Injury (RSI). This physical toll is compounded by the “double burden” of managing domestic chores alongside farm labour, often resulting in chronic fatigue and nutritional anemia.

A notable positive shift is the “Livestock Revolution”. Aided by government schemes like YSR Cheyutha, women have transitioned from unpaid family workers to owners of buffaloes and sheep. Partnerships like Amul-Andhra Pradesh facilitate direct payments to women’s accounts, enhancing their financial autonomy. Consequently, decision-making power has improved regarding livestock and household income, though men retain control over crop selection and marketing.

Despite these advances, economic parity remains distant. A stark wage gap persists, with women earning ₹250-₹350 compared to men’s ₹500-₹600 for similar durations. This is driven by the cultural misconception that women’s work is “light,” despite ergonomic evidence to the contrary. Critically, women own less than 14% of operational land. Without land titles (Pattadar Passbooks), they are excluded from institutional crop loans and must rely on limited microfinance options.

To bridge these gaps, the study recommends four key policy interventions: promoting Joint Pattadar Passbooks (joint land titling) to ensure credit access; subsidizing gender-friendly farm mechanization to reduce physical drudgery; strengthening the Loan Eligibility Card (LEC) system for landless women; and forming women-led Farmer Producer Organizations (FPOs) to bypass middlemen and secure better market prices.

Keywords: Feminisation of agriculture, Gender wage gap, Livestock-based livelihoods, Women farmers’ rights, Women in farming

For correspondence: S. Prasanthi <s.prasanthi@angrau.ac.in>

Assessing Women's Empowerment and Social Inclusion for Sustainable Agri-Food Systems in the North-Western Himalayan Region

Anamika Sharma, Kiran Rana, Amardeep Chauhan

Govind Ballabh Pant University of Agriculture and Technology, Pantnagar 263145, Uttarakhand, India

Women's empowerment is a critical determinant of agricultural sustainability, rural livelihoods and inclusive development, particularly in ecologically fragile regions. Despite women's substantial contribution to agriculture in the North-Western Himalayan Region (NWHHR) of India, empirical evidence on their empowerment status remains limited. The present study assessed the level and sustainability dimensions of women's empowerment across selected production systems of the NWHHR. The study adopted a combination of exploratory and descriptive research designs to capture both quantitative and qualitative dimensions of empowerment. A multistage sampling technique was employed, wherein Jammu and Kashmir and Uttarakhand were purposively selected followed by the selection of divisions, districts, blocks and villages based on cropping system predominance and cultivated area. A total of 347 households were selected through proportionate random sampling. Primary data were collected using a pretested interview schedule supplemented by focus group discussions. The analysis was carried out using the Tool for Agroecological Performance Evaluation (TAPE) and the Women's Empowerment in Agriculture Index (WEAI).

The findings revealed a moderate level of women's empowerment characterized by high work participation but limited economic autonomy and decision-making authority. Although literacy levels were high (97%), only 44% of women had completed high school and just 9% attained university education which indicating constrained educational advancement. Women experienced a substantial time burden with 98% engaged in domestic work and 85% involved in agricultural activities; 82% worked for more than 10.5 hours per day reflecting the dual burden of productive and reproductive labour. Participation in non-agricultural gainful activities remained limited (22%). Decision-making power was largely joint or male-dominated, particularly in crop production, income utilization and ownership of major household assets, while relatively greater autonomy was observed in livestock management and minor household expenditures. Access to formal credit remained limited with over half of the women reporting no access and a greater dependence on informal sources. Leadership and collective participation were modest indicating restricted institutional engagement. The empowerment index showed that 64% of women were moderately empowered, 28% had low empowerment and only 8% achieved high empowerment. Sustainability-based assessment revealed mixed regional performance with Uttarakhand exhibiting moderate sustainability and Jammu and Kashmir reflecting lower empowerment outcomes. Overall, the NWHHR demonstrated moderate social inclusiveness which underscoring the need for targeted policy interventions to strengthen women's access to education, financial resources and decision-making platforms.

Keywords: Agri-food systems, North-western himalayan region, Social inclusion, Sustainable rural development, Women's empowerment in agriculture

For correspondence: Anamika Sharma <anamikasharma2786@gmail.com>

Participatory Gender-Inclusive Interventions for Sustainable Community Mango Orchard Management

Ankita Sahu, C.S. Mhatre

ICAR-Central Institute for Women in Agriculture, Bhubaneswar 751003, Odisha, India

Community mango orchards serve as a vital source of livelihood for farm families, with nearly 75% of orchard management operations undertaken by farm women. Gender-inclusive technological interventions emphasize the identification of context-specific solutions through gender-based constraint analysis, followed by their implementation with equitable access and participation of all community members. This approach aims to enhance orchard productivity and sustainability while promoting gender equity. The major constraints identified included low profitability during the juvenile phase of orchards (43%), technological gaps in scientific crop management (20%), marketing constraints and distress sales (13%), high post-harvest losses (12%), and limited access to quality planting material (12%). A purposive sample of tribal farm families dependent on community mango orchards, comprising 60 households managing a consolidated 60-acre orchard patch, was selected for baseline assessment and need analysis. Based on identified constraints, participatory action research was conducted through on-farm trials and capacity-building program. Application of naphthaleneacetic acid (NAA @ 40 ppm) reduced fruit drop by approximately 40%. Branch thinning (25%) combined with growth retardant application significantly increased off-year yields by about 45%. Balanced fertilization integrated with Arka Mango Special micronutrient formulation enhanced Grade 'A' fruit yield by nearly 40%. Among intercropping systems, pineapple recorded the highest Sustainable Livelihood Index (4.71) in bearing orchards, followed by cole crops in newly established orchards (3.07). Adoption of improved post-harvest practices, including hot water treatment, pre-cooling, sorting and grading, de-sapping, calcium carbonate treatment, and ethylene-based ripening, reduced post-harvest losses by approximately 45%.

Keywords: Community mango orchards, Gender inclusion, Participatory action research, Post-harvest management, Sustainable livelihood index

For correspondence: Ankita Sahu <ankitaicar18@gmail.com>

Gender Desegregated Physical Participation Supervision and in Decision-Making for Production Activities

S.R. Jakkawad, Neeta Gaikwad, Sadiya Yasmeen

Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani 431402, Maharashtra, India

It is concluded that Women's physical participation is highest in less mechanized tasks like weeding, while men dominate technical and input-based activities like seed selection, irrigation, and fertilizer application. Regarding Supervision women leading labour-intensive or family-focused tasks like weeding, while men primarily manage financial and higher-risk activities such as obtaining and repaying loans. This distribution suggests traditional gender roles remain influential, with women more involved in hands-on agricultural supervision and men handling financial oversight. With regards to decision making for production activities women and families primarily lead decisions in labour-intensive whereas men dominate in financial and technical decisions, such as obtaining loans and selecting seeds. This distribution underscores the influence of traditional roles, where women contribute significantly to practical and family-centered decisions, while men often handle financial and strategic aspects.

Keywords: Decision-making in farming, Farm supervision, Gender division of work, Gender roles in agriculture, Labour participation

For correspondence: S.R. Jakkawad <sunilduttjakkawad@gmail.com>

Mainstreaming Gender Equality and Social Inclusion in Climate-Resilient Agri-food Systems: Evidence from Asia and Africa

Premangini Basumatary, Arun Jyoti Nath, Aditi Nath

Assam University, Silchar 788011, Assam, India

Gender inequality and climate change together pose significant challenges to the sustainability and resilience of global agri-food systems. Climate change impacts are never gender neutral, they are exacerbated by existing social, economic and institutional inequalities that disproportionately affect women and socially marginalised groups, particularly those dependent on agriculture and natural resource based livelihoods. Across Asia and Africa, women play a central role in food production, processing and household food security, yet persistent constraints in access to land, finance, technology, education and decision-making continue to limit their adaptive capacity to climate induced stresses such as droughts, floods and rising temperatures and increased crop-failures due to climate change.

This review aims to bring forward existing literature on gender-differentiated climate vulnerabilities within agri-food systems, with a focus on agriculture, rural livelihoods and social inclusion. It examined how unpaid care responsibilities, financial exclusion, insecure land tenure and harmful social practices such as child marriage and gender-based violence, intensifies women's exposure to climate risks and reduce their resilience capacity across food systems. Adopting an intersectional framework, the review demonstrated that vulnerability is not determined by gender alone, but emerges from the interaction of gender with class, age, marital status, household structure and social identity, shaping unequal access to resources, knowledge and adaptation opportunities.

Drawing on selected case studies from Asia and Africa, the review assessed the effectiveness of gender-responsive and socially inclusive climate and agricultural interventions. The findings highlight that women-led savings groups, collective networks, indigenous knowledge systems and diversified livelihood strategies significantly strengthen adaptive capacity, stabilise incomes and enhance food security under climate stress. These locally led initiatives illustrate women's agency as active contributors to climate adaptation within agri-food systems. However, policy analysis revealed that while women's roles in agriculture are increasingly acknowledged, gender equality and social inclusion remain insufficiently mainstreamed within climate and agri-food policies, often resulting in fragmented or symbolic integration.

The review argued that mainstreaming gender equality and social inclusion within climate action is essential for building resilient and sustainable agri-food systems. Key policy priorities include improving women's access to productive assets and climate finance, reducing unpaid care burdens, supporting inclusive climate-smart agricultural practices and ensuring the meaningful participation of women and marginalised groups in climate and agricultural governance. Integrating gender equality and social inclusion into climate adaptation is therefore not only a matter of equity, but a strategic necessity for strengthening agri-food system resilience and achieving sustainable development.

Keywords: Climate adaptation policies, Climate-resilient agri-food systems, Climate vulnerability, Gender equality and social inclusion, Women in agriculture

For correspondence: Premangini Basumatary <premabasumatary123@gmail.com>

Gender Analysis in Agriculture and Rural development

Anita Kumari, Aditya Sinha, Pappu Yadav, Madhumita, Meera Kumari

Bihar Agricultural University, Sabour, Bhagalpur, 813210 Bihar, India

Women worldwide are indispensable to agricultural development. They constitute 43% of the agricultural labour force in developing countries on average, yet their access to land remains limited, with only about 20% of land worldwide owned by women. In India, rural women face stark challenges, as only 12.69% have operational land ownership. Legal and cultural barriers have historically restricted women in the developing world from inheriting or owning property. Despite their significant contributions performing 66% of global agricultural work and producing half of the world's food women receive only 10% of the income and own merely 1% of property. Notably, in rural India, the percentage of women who depend on agriculture for their livelihood is 80%, out of which 33% constitute agricultural labour force and 48% are self-employed farmers. Despite their essential roles, the lack of disaggregated data on women's activities has often led to their contributions being overlooked. Gender analysis frameworks, provide structured methodologies for assessing disparities in social, economic, and cultural contexts. These frameworks highlight differing needs, preferences, access to resources, and participation in income-generating activities between men and women.

Gender analysis is critical for development programs as it identifies gender-specific opportunities and constraints, facilitating targeted efforts toward gender equality and enhancing agricultural productivity. Collaboration across diverse backgrounds is essential to create an environment that prioritizes gender parity and maximizes developmental outcomes. Thus, to conclude, integrating gender analysis into agriculture and rural development initiatives is essential to effectively address women's challenges from a gender perspective, promoting sustainability and inclusive growth.

Keywords: Gender analysis, Gender inequality, Inclusive agricultural growth, Land ownership, Rural development

For correspondence: Anita Kuamri <anitakvk@gmail.com>

Mainstreaming Gender Equality and Social Inclusion

Abhijeet Kuderiya, Chetna Pathak, Prashant Shrivastava

Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur, 482004 Madhya Pradesh, India

Mainstreaming Gender Equality and Social Inclusion (GESI) is a transformative approach aimed at embedding equitable and inclusive practices across all sectors of policy, planning, and implementation. It seeks to ensure that women, men, and marginalized groups—such as persons with disabilities, ethnic minorities, and economically disadvantaged communities—have equal access to opportunities, resources, and decision-making processes. Rather than treating gender and social inclusion as isolated issues, GESI integrates them into the core structures, systems, and culture of institutions and development programs. This approach emphasizes dismantling systemic barriers, addressing power imbalances, and promoting equitable participation at all levels. A key component of GESI mainstreaming is the recognition that inequality is both structural and intersectional. Policies and interventions must therefore be designed through participatory processes that reflect the diverse needs and experiences of different social groups. Tools such as gender and social inclusion analysis, disaggregated data collection, and inclusive monitoring frameworks are used to identify disparities and measure progress. Effective mainstreaming also relies on institutional accountability, capacity building, and leadership commitment to inclusivity. Moreover, mainstreaming GESI contributes to achieving sustainable development goals (SDGs) by promoting social justice, enhancing governance, and improving development outcomes. Inclusive policies not only empower marginalized populations but also strengthen community resilience and economic productivity. Ultimately, GESI mainstreaming moves beyond token representation toward systemic transformation—ensuring that equality and inclusion are not add-ons but integral to all aspects of development planning and execution. This paradigm shift fosters societies that value diversity, protect rights, and enable all individuals to contribute to and benefit from social and economic progress.

Keywords: Capacity building, Economic progress, Gender equality, Sustainable development goals

For correspondence: Abhijeet Kuderiya <kuderiyaabhijeet@gmail.com>

The Pivotal Role of Rural Women in Ensuring Food Security

Vishakha Singh, Ajeet Kumar Singh, D.V. Singh, Anjani Kumar

Krishi Vigyan Kendra, Ranchi 834008, Jharkhand, India

Nearly a billion people across the world experience the effects of food insecurity especially in developing countries like India. India has a serious level of hunger as it ranks 111 out of the 125 countries thus ensuring food security are of great importance. Rural women play a pivotal and multifaceted role in food security (Global Hunger Index, 2023). Their contributions span the entire agri food system ranging from primary agricultural production to off-farm segments like post harvest processing, management, and household nutrition thereby directly influencing all dimensions of food security: availability, access, utilization, and stability. In rain-fed farming systems, the work of women is especially critical, as families depend on diversified livelihood approaches that integrate crop farming and livestock rearing. Women predominantly manage livestock, which enhances household food supply through dairy products, while generating vital income. Furthermore rural women are also custodians of wisdom including indigenous agriculture like seed selection, seed preservation, crop diversity, and adaptive farming practices suitable for harsh climatic conditions. Their knowledge of drought-resistant crops, wild foods, and traditional varieties supports household resilience against crop failure and seasonal food shortages. With respect to food utilization, women employ a range of traditional food processing and preservation techniques to ensure year-round food availability, especially during off-season. Their participation in self-help groups and other schemes contributes to household income and improves economic access to food. In terms of food system stability, women adopt coping strategies during periods of climatic stress, such as droughts or crop failures, through rationing, food substitution, migration support, and reliance on common property resources. Their involvement in water conservation practices, recycling farm waste into organic fertilizers, kitchen gardening, and sustainable use of natural resources further strengthens household food security in environmentally fragile regions.

Although women play an essential role in the fight against hunger, their contributions often remain unrecognized. A significant gender gap persists in access to resources like land, technology, credit, pesticides, and fertilizers. According to the FAO, providing women with the same access to productive resources as men could increase yields by 20-30%. Therefore, a fundamental requirement in the fight against food insecurity is the active promotion and empowerment of rural women.

Keywords: Food security, Indigenous agricultural knowledge, Livelihood diversification, Sustainable farming systems, Rural women in agriculture

For correspondence: Vishakha Singh <visbunutri92@gmail.com>

Mainstreaming Gender Equality and Social Inclusion in Agri-Food Systems: Pathways, Evidence and Policy Imperatives

Jakkawad Sunildutt, Hiwarale A.S.

Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani 431402, Maharashtra, India

Findings suggest that mainstreaming gender equality within agri-food systems leads to improved household food security, enhanced farm productivity, and more equitable livelihood outcomes. However, fragmented institutional efforts, limited gender-disaggregated data, and inadequate capacity building remain major constraints. The paper underscores the need for coordinated multi-stakeholder approaches, stronger monitoring frameworks, and context-specific strategies for effective inclusion.

This abstract lays the foundation for a future comprehensive review paper that will systematically map global evidence, compare regional experiences, and propose a conceptual framework for embedding gender equality and social inclusion across agri-food policies and institutions.

Keywords: Agri-food systems, Inclusive agricultural policies, Gender equality in agriculture, Social inclusion, Sustainable rural development

For correspondence: Jakkawad Sunildutt <sunilduttjakkawad@gmail.com>

Millet-Centric Nutrition Strategies for Strengthening Women's Role in Sustainable Agri-Food Systems

Maharshi Deepa, M. Yugandhar Kumar

Krishi Vigyan Kendra, Lam, Guntur 522034, Andhra Pradesh, India

Malnutrition and anemia among children, adolescent girls, and pregnant women continue to pose persistent challenges in rural agri-food systems. Women play a pivotal role in household nutrition and dietary decision-making; therefore, nutrition-sensitive approaches embedded within local food systems are critical for improving nutritional outcomes. Millets, being nutrient-dense, climate-resilient, and locally available, offer a viable pathway to address nutrition gaps while strengthening women's engagement in sustainable agri-food systems.

The present study aimed to identify nutrition gaps among vulnerable population groups and document the implementation of millet-centric nutrition interventions with a focus on women, children, and adolescent girls. A long-term, field-based descriptive study was conducted over a ten-year period in adopted villages of Krishi Vigyan Kendra (KVK). Gender-responsive nutrition interventions included nutrition education, millet-based diet diversification, and recipe demonstrations targeting children, adolescent girls, and pregnant women. Nutritional concerns were identified through routine field observations and community-level assessments.

The assessment revealed the presence of mild to moderate malnutrition among 3-4 children per village, anemia among 5-6 adolescent girls in groups of 30, and 1-2 anemic pregnant women per village. The interventions were associated with improved nutrition awareness, increased acceptance of millet-based foods, and positive dietary behavior changes, particularly among women and adolescent girls, who emerged as key agents of change at the household level.

Keywords: Dietary diversification, Malnutrition, Nutrition intervention, Nutrition sensitive agriculture, Women in agri food systems

For correspondence: Maharshi Deepa <deepanarayanam@gmail.com>

Time Use and Work Participation Patterns of Rural Farm Women across Agricultural and Allied Sectors

Surekha K. Sankangoudar, Geeta Channal, K. J. Sannapamma, Vinutha Mukthamath, Rajeshwari Desai, Y. Ravi, Mridula Devi, Priya Hegde

All India Coordinated Research Project on Women in Agriculture, University of Agricultural Sciences, Krishinagar, Dharwad 580005, Karnataka, India

Women's contributions to agriculture are vast and indispensable, particularly in rural and developing regions where agriculture is the primary source of livelihood. Recognizing women's economic and social roles requires a clear understanding of their time-use and work participation patterns, which shape productivity, household welfare and rural development outcomes. Nationally, nearly 74.0% of rural women are engaged in agriculture and allied activities; however, their daily work burden frequently exceeds that of men due to their simultaneous engagement in productive, domestic and care giving roles. Present study examined the time-use pattern and work participation of rural farm women engaged in agriculture and allied sectors across different agro-ecological regions of Northern Karnataka. Data was collected from 1,200 respondents representing crop, livestock, forestry and fishery sectors through a structured interview schedule and focus group discussions. Descriptive statistics and percentage analysis were used to assess gender-based participation and time allocation across major household, farm and social activities. Results revealed that women predominantly contribute to domestic chores, caregiving, livestock rearing and farm operations, while men dominate decision-oriented and physically intensive activities. Average time allocation showed that women spend around 13.0% of their day on household work, 6.0% in child care, 10.58% on farming and 5.58% on animal care, besides contributing 16.45% of time to income-earning activities outside home. Despite their substantial contribution, women's work remains largely unpaid and undervalued. The findings emphasize the need for gender-sensitive extension interventions, labour-saving technologies and recognition of women's unpaid labour in agricultural statistics and policy frameworks.

Keywords: Agriculture, Farm women, Livestock, Time use, Work participation

For correspondence: Surekha K. Sankangoudar <surekbaks@uasd.in>

Gender Dynamics in Decision-Making among Farm Households in Northern Karnataka

Surekha K. Sankangoudar, Geeta Channal, K.J. Sannapamma, Vinutha Mukthamath, Rajeshwari Desai, Y. Ravi, Mridula Devi, Priya Hegde

All India Coordinated Research Project on Women in Agriculture, University of Agricultural Sciences, Krishinagar, Dharwad 580005, Karnataka, India

Decision-making is widely recognized as a critical indicator of empowerment, reflecting an individual's capacity to influence household and community-level outcomes. In rural India and particularly in Karnataka, women contribute substantially to agriculture and allied activities. However, their participation in decision-making often remains constrained by traditional gender norms. Men are commonly perceived as the primary decision-makers regarding productive resources, while women's extensive involvement in farming operations, livestock care, household management and marketing frequently goes unacknowledged within formal decision-making structures. The study explores gender dynamics in household and farm-level decision-making among rural families across four agro-ecological regions of Karnataka, representing the crop, livestock, forestry and fishery sectors. A total of 1,200 farm women were randomly selected (300 from each sector) and data were collected through structured interviews, Participatory Rural Appraisal (PRA) and Focus Group Discussions (FGDs). Decision-making domains such as agriculture, finance, livestock, education and social matters were analyzed using descriptive statistics. The findings revealed that decision-making in rural households remains largely male-dominated, particularly in economic and farm-related activities. However, joint decision-making was more prevalent in areas such as children's education, health and household expenditure, indicating a gradual shift toward shared responsibilities. Women exhibited higher autonomy in decisions related to food preparation, livestock care and social participation. The study emphasizes that strengthening women's agency in decision-making is essential for achieving equitable and efficient agricultural development. Accordingly, policy interventions promoting gender-responsive extension, access to credit and recognition of women's economic roles are recommended.

Keywords: Agriculture, Decision-making, Farm women, Gender, Livestock

For correspondence: Surekha K. Sankangoudar <surekhaks@uasd.in>

India's Double Burden of Malnutrition: Spatial Inequalities and Socio-Demographic Drivers

Jaya Jumrani, Kanishk Dutta

ICAR-National Institute of Agricultural Economics and Policy Research, DPS Marg, Pusa, New Delhi 110012, India

The coexistence of undernutrition (stunting, wasting and underweight) and overnutrition (overweight or obese) is a growing public health concern in India. This double burden of malnutrition (DBM) manifests at the individual, household and population levels, with serious implications for health, productivity and economic growth. Most research in India has focused on malnutrition at the population and regional levels, with intra-household DBM typically involving an undernourished child residing with an overnourished mother.

Using unit-level data from the National Family Health Surveys (NFHS-4 (2015-16) and NFHS-5 (2019-21)), this study examined the prevalence of intra-household DBM, regional differences, and the demographic and socioeconomic factors that contribute to its occurrence. The analysis focuses on mother-child pairs with overweight or obese mothers (BMI: 25 kg/m^2) and at least one under-five undernourished child (*i.e.*, z-scores below -2 SDs from the WHO standards). The findings reflect a steady increase in intra-household DBM incidence across typologies. The incidence of comprehensive DBM measure (*i.e.*, either of the three forms of child undernutrition paired with an overweight or obese mother) shows a notable increase, from 5.96% in 2015-16 to 7.57% in 2019-21. Urban and rural incidence rates rose by 1.36 percentage points (pp) and 1.81 pp, respectively, reflecting diffusion of nutrition transition into rural India. Spatially, the intra-household DBM in 2019-21 was concentrated in southern and northern states such as Kerala, Tamil Nadu, Karnataka, and Delhi, while Jharkhand, Rajasthan, and Chhattisgarh consistently exhibited lower prevalence.

We further examined the factors associated with the comprehensive intra-household DBM measure among the 3,63,759 mother-child pairs using a multivariate logistic regression model for 2019-21. Breastfeeding plays a protective role, while C-section births carry 58% higher DBM odds. Male and older children are relatively more prone to anthropometric failure. A strong wealth gradient emerges, with odds being more than twice among rich households relative to the poorest. Maternal primary and secondary schooling raise the likelihood of DBM by 12-20%, while paternal education has no effect. Regional disparities remain pronounced, with southern India having 28% higher DBM odds, while eastern, north-eastern and western regions show lower odds relative to northern states.

The findings show that undernutrition and overnutrition are interconnected outcomes of shifting food systems, caregiving practices and entrenched inequalities. Tackling DBM requires dual-purpose interventions addressing both the forms together. Policies must move beyond caloric sufficiency to focus on dietary quality, maternal health, child feeding practices and equitable intra-household distribution.

Keywords: DBM, Mother-child pairs, Nutritional inequality, Public health nutrition, Socio-demographic determinants

For correspondence: Jaya Jumrani <jaya.jumrani@icar.org.in>

Popular Indigenous Technical Knowledge (ITK) Practices in the Kumaon Region of Uttarakhand: Implications for Sustainable and Women-Led Agri-Food Systems

Chandni¹, Arun Kishor¹, M.K. Verma²

¹ICAR-Central Institute of Temperate Horticulture (CITH), Regional Station, Mukteshwar, Nainital 263138, Uttarakhand, India; ²ICAR-CITH, Srinagar 191132, Jammu and Kashmir, India

Indigenous Technical Knowledge (ITK) constitutes a valuable, location-specific knowledge system developed through generations of farmers' experience and experimentation. In the hill ecosystems of the Kumaon region of Uttarakhand, ITKs continue to play a crucial role in managing crops, pests, diseases, and soil fertility under resource-constrained conditions. These practices are largely based on empirical observations, community consensus, economic viability, and positive field outcomes, and are primarily transmitted orally across generations, with women playing a key role in their preservation and application. The present abstract documented selected popular ITK practices prevalent among farming communities in Kumaon. These include leaf-tip cutting in transplanted rice to enhance vegetative growth, provide fodder, and reduce stem borer incidence; tying of garlic leaves to regulate excessive vegetative growth, improve bulb development, and induce timely maturity; and the use of plant-based formulations for pest and disease management. Soaking *Urtica dioica* (bicchu booti) in cow urine is widely practiced as an organic fungicide against major vegetable diseases, while crushed leaves of *Corallocarpus epigeos* (mirchiya) are used to control insect pests in vegetable crops. White grub infestation is managed using extracts of *Melia azedarach*, *Verbascum* species, and *Sapindus emarginatus*. These ITKs are low-cost, eco-friendly, and well adapted to the fragile hill environment, contributing to sustainable production, reduced chemical dependency, and household food security. Recognizing, documenting, and scientifically validating such practices can support gender-responsive, climate-resilient agri-food systems and strengthen the role of indigenous knowledge holders particularly rural women in sustainable agricultural development.

Keywords: Indigenous knowledge systems, Gender inclusion, Hill ecosystems, Sustainable farming, Uttarakhand

For correspondence: Chandni <chandnipandey00@gmail.com>

Assessing Women's Empowerment in Livestock Systems in Cyclone-Prone Coastal India: Evidence from Odisha and Andhra Pradesh Using the WELI Framework

Arun Kumar Panda¹, Arpita Mohapatra¹, Braja Bandhu Swain²

¹ICAR-Central Institute for Women in Agriculture, Bhubaneswar 751003, Odisha, India; ²International Livestock Research Institute, New Delhi 110012, India

Women play a central role in livestock-based livelihoods in coastal India, yet their contributions remain inadequately recognized and constrained by limited access to resources, decision-making power, and institutional support. These challenges are further intensified in cyclone-prone regions where recurrent climate shocks disproportionately affect women's livelihoods and wellbeing. This study assessed the level of women's empowerment in the livestock sector in two highly vulnerable coastal states of India Odisha and Andhra Pradesh using the Women's Empowerment in Livestock Index (WELI). The analysis provided empirical evidence on women's agency and gender dynamics in the agrifood system under conditions of climatic risk. The study draws on primary household-level data collected from livestock-rearing households across selected coastal districts of Odisha and Andhra Pradesh. The WELI framework was employed to capture women's empowerment across three core domains intrinsic agency, instrumental agency, and collective agency collectively represented through the three Domains of Empowerment (3DE) score, along with the Gender Parity Index (GPI) to examine intra-household gender equality. The findings reveal a relatively higher overall WELI score for Odisha (0.74) compared to Andhra Pradesh (0.70), indicating moderate to high levels of women's empowerment in livestock systems in both states, with notable inter-state variation. The 3DE score mirrors this pattern, registering 0.74 in Odisha and 0.68 in Andhra Pradesh, suggesting higher achievements in agency and decision-making among women livestock keepers in Odisha. The Gender Parity Index further highlights differences in intra-household equity, with Odisha recording a GPI of 0.94, reflecting near gender parity, while Andhra Pradesh records a comparatively lower GPI of 0.89, indicating persisting gender gaps in access to and control over livestock-related resources and benefits. Despite these gains, domain-level analysis points to persistent disempowerment related to workload burden, limited access to climate-resilient services, and constrained collective action, particularly in cyclone-affected communities. The study revealed that empowerment outcomes are closely linked to women's access to institutions, extension services, and social capital, which vary across contexts.

Keywords: Climate vulnerability, Coastal livelihood systems, Gender parity in agriculture, Livestock-based livelihoods, Women's empowerment in Livestock Index

For correspondence: Arun Kumar Panda <akpanda59@gmail.com>

Gender-Sensitive Integrated Farming Systems: Strengthening Women's Participation and Household Food Security

Arun Kumar Panda, Praveen Jakhar, Ankita Sahu

ICAR-Central Institute for Women in Agriculture, Bhubaneswar 751003, Odisha, India

A gender-sensitive Integrated Farming System (IFS) offers a sustainable and inclusive pathway for strengthening the livelihoods of small and marginal farmers, particularly those operating on resource-constrained and marginal lands. By integrating crops, livestock, fisheries, horticulture, and allied enterprises, a gender-sensitive IFS aims to build a resilient production system that ensures year-round availability of food, steady income, and reduced vulnerability to climatic and market shocks. Central to this approach is the recognition that men and women play distinct yet complementary roles in agriculture, and that addressing gender-based constraints is essential for maximizing system efficiency and sustainability. A gender-sensitive IFS framework focuses on five interrelated dimensions: gender division of labour, resource efficiency, climate resilience, continuous income generation, and family nutrition. Gender analysis helps to identify unequal labour burdens and enables the promotion of more balanced labour allocation through sensitization programs, skill development, and equitable access to inputs, technologies, and extension services. Such measures not only reduce women's drudgery but also foster improved gender relations and shared decision-making within farming households. Equitable resource management is strengthened by actively engaging both men and women in resource assessment, planning, and investment decisions, ensuring optimal and fair utilization of land, water, livestock, and biomass. Climate resilience is strengthened through gender-inclusive strategies that promote diversified cropping systems, sustainable land and water management, adaptive livestock practices, and the adoption of climate-resilient technologies, ensuring the active and equitable participation of both women and men. A well-designed IFS also supports continuous income flows through enterprise diversification and cooperative planning, enabling households to meet regular consumption needs and manage risks. Furthermore, a gender-responsive nutri-farming model embedded within IFS promotes household dietary diversity by prioritizing nutrition-rich crops, livestock products, and women's leadership in food and nutrition decisions. Overall, a gender-sensitive IFS empowers farm women as key agents of change, contributing to economic stability, improved family nutrition, and sustainable agricultural development.

Keywords: Climate-resilient farming systems, Gender-sensitive agriculture, Household food security, Integrated farming systems, Women's participation in farming

For correspondence: Arun Kumar Panda <akpanda59@gmail.com>

Assessment of Nutrition-Based Intervention through Nutritional Gardening in Malnourished Village Sarwarpur of Arwal District

Kavita Dalmia¹, Anita Kumari¹, D.V. Singh², Binod Kumar Singh¹, Shubhangi Shekhar³

¹Krishi Vigyan Kendra, Lodipur, Kaler, Arwal 804428, Bihar, India; ²ICAR-Agricultural Technology Application Research Institute, Patna 800014, Bihar, India; ³Bihar Agricultural University, Sabour, Bhagalpur 813210, Bihar, India

A malnourished village Sarwarpur in Kaler block of Arwal district, Bihar, was identified as target village for malnutrition eradication efforts by KVK Arwal. Malnutrition and over all poor health status especially in inhabitants Sarwarpur village is a common problem. Nutritional garden plays an important role in the supply of essential nutrients at the household level in rural areas. The stunting, wasting and underweight in children were reduced instantly with access to better nourishment through nutrients made available by establishment of nutritional garden for beneficiaries of Sarwarpur village. Nutritional garden provides a sustainable reservoir of fresh fruits and vegetables, nutrient-rich produce, contributing to enhanced dietary diversity and improved nutritional wellbeing, especially micronutrients available to the entire household with minimum effort. Vegetables and fruits are the most affordable and sustainable dietary sources of essential vitamins and minerals. Improved production and consumption of fresh nutrient rich fruits and vegetables are thus the most direct, low-cost method to increase vitamins, minerals and nutrients in the diet. KVK Arwal imparted on/off campus training on various aspects like Nutritional Gardening, value addition in fruits and vegetables, Household food and nutritional security, mushroom production, balanced diet for various ages, child and mother care, etc. Farm women were also encouraged for adoption of other income generating activities besides agriculture.

The studies were conducted during the year 2023-24 to 2024-25. Each year, 10 families were selected for establishment of nutritional garden. The selected families were imparted training and demonstration regarding the importance and benefits of nutritional garden. By intervention, the average yield of vegetables and fruits increased from 220 kg/unit in farmers practice to 290 kg/unit under demonstration. The result revealed that average yield of vegetables and fruits increased by 31.8% after intervention. Before establishment of Nutritional Garden, average per capita availability and consumption of vegetables (including green leafy vegetables) was 39.1% of Recommended Dietary Allowances which increased up to 45.14% after demonstration.

The health status as Anthropometric measurements (BMI) of 25 children were also recorded in which 8 children were found below normal, 14 were normal and rest 3 were above the normal range before intervention, whereas 4 children were found below normal, 20 were normal and 1 child was significantly above the normal range after interventions. Haemoglobin Status (g/dl) of 25 children before intervention was: Normal-11, Low-6, Mild-8 however, after interventions: Normal-18, Low-2, Mild-5 was recorded.

Keywords: BMI, Daily diet, Malnutrition, Nutritional garden, Nutritional security

For correspondence: Kavita Dalmia <arwalkvk@gmail.com>

Participation of Women through Milk Co-operatives among dairy Farms - A Gender Perspective

Tankit Kumar¹, Krishna Kant¹, Sanjay Kumar², Sanjay Kumar², Pankaj Kumar Meghwal²

¹Agriculture Department, Government of Uttar Pradesh, Uttar Pradesh, India; ²Krishi Vigyan Kendra, Badaun-II, Sardar Vallabhbhai Patel University of Agriculture and Technology, Samrer, Badaun 243630, Uttar Pradesh, India

This study evaluated the participation of woman's in milk production and marketing through Milk Co-operatives in the study area. Primary data were collected using a technique simple random approach from 10 sample milk cooperative society on the basis of majority of dairy farms. From each of the selected society Thus, a total of 100 female members were finally identified for the purpose of further investigation. Cattle herd size of the respondents of female were (80%) in medium category and majority of female respondents of overall material possession were in medium category (56%). Majority of female respondents of overall extension contact with information source had (70%) medium category. Further, found that majority of respondents of overall entrepreneurial behaviour were 64%. Overall participation in dairy farm activities of majority found in medium category female (76%). Majority of female respondents in milk production were found 54% in medium category. In milk marketing, majority of respondents were found (58%) in medium category and 76% were in medium category of their annual income through dairy husbandry. The 86% female were in medium category of employment throw dairy husbandry. The five variables *i.e.*, extension contact, entrepreneurial behaviour, milk production, milk consumption and milk marketed were found highly significantly ($p < 0.01$) and positively correlated with the income through dairy cooperative. Further, four variables *i.e.* Social Participation, participation in health care, milk production and milk consumption were found significantly ($p < 0.05$) and positively correlated with the employment through dairy cooperative. The both dependent variables income generation through dairy cooperative and employment generation through dairy cooperative are positively and significantly ($p < 0.05$) correlated with each other. The female cooperative members were significantly ($p < 0.01$) higher in term of extension contact with information sources. Female members were significantly ($p < 0.01$) might in terms of participation in livestock breeding management activities. In contrast to, female cooperative members were significantly ($p < 0.01$) higher in term of feeding management of dairy animals. The study concludes with a policy framework advocated for timely training facility, innovative financial and localized institutional support to accelerate participates of woman in milk co-operatives.

Keywords: Dairy-based livelihoods, Milk production and marketing, Rural women empowerment, Women's participation, Women in dairy cooperatives

For correspondence: Tankit Kumar <tankitjaat4801@gmail.com>

Role of KVKs in Promoting Gender Equality and Social Inclusion in Indian Agriculture: Special Reference to KVK Sivasagar, Assam, India

Arundhati Bordoloi, Priyanka Dutta, Subhashree Dihingia, Banashree Medhi

Krishi Vigyan Kendra, Sivasagar, Assam Agricultural University, Rohdoi Pukhuri, Sivasagar 785687, Assam, India

Krishi Vigyan Kendra (KVKs) are district level Farm Science Centre established by India Council of Agricultural Research (ICAR). KVK is an integral part of the National Agricultural Research System (NARS) aims at assessment of location specific technology modules in agriculture and allied enterprises, through technology assessment, refinement and demonstrations. Primary goal of the KVKs is to serve as a bridge between agricultural research and farming community, applying new research findings of agricultural science in local farming condition.

Krishi Vigyan Kendras (KVKs) play a crucial role in promoting gender equality and social inclusion in Indian agriculture by providing targeted training, technology, and support services to women and marginalized communities, thereby enhancing their livelihoods and decision-making power. KVKs address gender disparities in agriculture through Customized Training for value addition, household food security and animal husbandry; Skill Development and Entrepreneurship development by poultry farming, mushroom cultivation, beekeeping; popularize and demonstrate location-specific; drudgery-reducing technologies and tools to save women's time and energy and improve their work efficiency; Gender Mainstreaming by fostering the formation of Self-Help Groups (SHGs) and improving their access to information, technology, and financial resources; Representation of farm women as members of their Scientific Advisory Committees (SAC) ensuring their perspectives are considered in planning and reviewing activities. Fostering Social inclusion by it's mandated activities and flagship program, KVKs contributing a great share in rural India by uplifting all farming communities, including rural youth and school dropouts, socially disadvantaged and tribal farmers, by ensuring agricultural research and entrepreneurship. During 2024-25, 5,358 women specific trainings were organised by the KVKs with the participation of 1.23 lakh women farmers. Besides, 5.50 lakh women farmers also participated in other 57,757 training program along with male farmers

KVK Sivasagar of Assam is one of the KVKs in India intensively working for the upliftment of farm women and rural youth by providing diverse technical knowledge and skills from the time of inception. From 2020-21 to 2024-25, all total 4,357 women and 1,700 rural youth were trained about various technologies, 35 On Farm Trials and 41 Front Line Demonstrations were carried out with women farmers and entrepreneurs, which shows 74.42% women participation. With the diverse activities, 731 Krishi Vigyan Kendra (KVK)s of entire India are working as largest institution effectively incorporating gender equality and social inclusion into Indian agricultural.

Keywords: Agricultural extension services, Gender equality in agriculture, Rural women empowerment, Social inclusion, Women in agriculture

For correspondence: Arundhati Bordoloi <arundhatibordoloi@gmail.com>

Relationship between Role Performance and Personal Characteristics of the Women Member of Grampanchayat

Amita Madhavrao Kshatriya¹, Jyoti V. Deshmukh²

¹Krishi Vigyan Kendra, Pokharni, Nanded 431602, Maharashtra, India; ²College of Agriculture, Latur, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani 431402, Maharashtra, India

The present study was conducted in randomly selected Majalgaon, Parali and wadwani tehsils of Beed district of the Marathwada region in Maharashtra state. Twelve villages from each tehsils and 3 women member from each Grampanchayat were selected randomly. In this way, total 36 villages from three tehsils were selected to comprise total sample of 108 respondents. The information was collected with the help of structured interview schedule by interviewing personally to the respondents.

Findings of the present study indicated that majority of women member were from young category, educated up to primary school level, living in small size family, low cosmopolitaness, low mass media exposure. Most of the respondents were belonged to high socio-economic status, while medium social participation, medium work experience and having medium levels of role performance. It was inferred that the relationship between independent variables namely education, cosmopolitaness, mass media exposure, socio-economic status and work experience of the respondents had positively and highly significant role performance. However, the relationship between age, size of family and social participation were negative and significant with role performance.

Correlation coefficient showed that independent variables namely Education (0.8894), Cosmopolitaness (0.7879), Mass media exposure (0.8941), Socio-economic status (0.8259) and Work experience (0.7724) were highly significant and positively correlated with the role performance of women member of Grampanchayat. Whereas age (-0.1345), size of family (-0.0900) and social participation (-0.1128) were non-significant and negatively correlated with the role performance of women member of Grampanchayat. Multiple regression analysis showed 91.20% variation in role performance, was explained by eight independent variables. The unexplained variation of 8.80% may be due to the factors not covered under present study. It was also observed that out of eight independent variables namely 'socio-economic status had significant effect on role performance of women member of Grampanchayat while, age, size of family, cosmopolitaness, work-experience had non-significant and education, mass media exposure, social participation had highly significant effect on role performance of women member of Grampanchayat. Thus it could be concluded that majority of the women members were having medium role performance. Therefore, State Government should organize training program to realize their actual role and position in Grampanchayat.

Keywords: Grampanchayat, Personal characteristics, Relationship between role performance and women member, Role performance, Women member

For correspondence: Amita Madhavrao Kshatriya <amitak081@gmail.com>

Women's Participation Yields Benefits for Water Management: Insights from Village Dams in India

Vishwambhar Dadasaheb Duche¹, Thomas Falk², Ivo Steimanis³, Lara Bartels⁴, Bjorn Vollan³

¹International Crops Research Institute for the Semi-Arid Tropics, Patancheru, Hyderabad 502032, Telangana, India;

²International Food Policy Research Institute, Washington DC, United States of America; ³University of Marburg, Marburg, Germany; ⁴Leibniz Centre for European Economic Research, Mannheim, Germany

Economic games have emerged as promising tools for fostering sustainable resource management, however, their gender dynamics remain underexplored. This study examined how women's participation influences the effectiveness of game-based learning across 56 Indian communities facing water management challenges. These structured experiential learning environments allow participants to develop system understanding, problem-solving capacities, and collective action through active engagement. Our results suggest that greater female involvement is associated with improved water management outcomes 2 years after the intervention. Notably, the presence of female leaders correlated with broader participation among women, which in turn was linked to the development of more effective management rules. These findings indicate that gender-balanced participation may enhance the success of such interventions. Incorporating women in game-based learning has the potential to support long-term improvements in resource management, highlighting the importance of inclusive approaches.

Keywords: Collective action, Community water governance, Game-based learning, Water resource management, Women's participation

For correspondence: Vishwambhar Dadasaheb Duche <vishwambhar.duche@icrisat.org>

Women in Field-Level Everyday Leadership: Gender Mainstreaming and Producer Empowerment in Cotton Farming Communities

Yrene Coli Rivera, Dveika Menon

Better Cotton Initiative, Saket, New Delhi 110017, India

This study examined how field-level leadership pathways and everyday organisational practices can advance women's empowerment and institutionalise gender mainstreaming within sustainable cotton programmes in India. Anchored in Better Cotton's social impact objectives and 2030 gender equality commitments, the research aimed to generate applied learning on what provisions and conditions enable greater participation of women in field-facing leadership roles. Specifically, it explored how women are recruited, retained, and supported in these roles, and how their presence contributes to more gender-responsive programme design and delivery, with potential for impact at scale.

The research was conducted with two Better Cotton Program Partners WWF in Telangana and CottonConnect in Maharashtra using a qualitative, learning-oriented methodology. Data collection included in-depth semi-structured interviews, focus group discussions, and detailed case studies with women Field Facilitators, Producer Unit Managers, Gender Leads, Gender Committee members, and programme management staff. This approach enabled an in-depth examination of organisational systems such as recruitment practices, mentoring arrangements, performance expectations, and role design alongside the lived experiences of women leaders operating within complex social and institutional contexts.

The findings highlight how women in field-facing leadership roles serve as critical entry points for gender mainstreaming within cotton programmes, and what it takes for organisations to enable this in practice. The study underscores the importance of intentional programming where gender outcomes are actively designed for rather than left to emerge organically. Women's leadership was associated with increased participation of women farmers in training and decision-making spaces, more inclusive facilitation practices, improved identification of gender-specific constraints, and greater responsiveness of programme activities to women's needs. At the same time, persistent structural and socio-cultural barriers affecting women's retention and progression were identified, including unequal access to mobility, technology, and decision-making authority.

The study resulted in a comprehensive learning document synthesising best practices for recruiting and retaining women leaders, alongside four in-depth case studies illustrating how women leaders and Gender Committees function as drivers of gender mainstreaming at community and organisational levels. The resulting insights offer practical, context-responsive recommendations for sustainability standards, donors, and development organisations seeking to strengthen producer empowerment and embed gender mainstreaming through intentional leadership pathways, while avoiding the reproduction of gender inequalities during scale-up.

Keywords: Cotton farming communities, Gender mainstreaming, Producer empowerment, Sustainable cotton systems, Women's leadership in agriculture

For correspondence: Better Cotton Initiative <nini.mehrotra@bettercotton.org>

Role and Extent of Participation of Women in Dairy Enterprise in Fatehgarh Sahib District, Punjab

Manisha Bhatia, Guranshpreet Singh Sethi, Ajay Godara

Krishi Vigyan Kendra, Punjab Agricultural University, Shamsheer Nagar, Fatehgarh Sahib 140406, Punjab, India

Dairy farming plays prominent role in strengthening India's rural economy. Although both farmers and farm women are involved in dairy farming but the role of farm women is significant and crucial. The present study aimed to understand the participation of farm women in dairy farming with special focus on their participation in decision making and access to training and extension activities in dairy enterprise in district Fatehgarh Sahib, Punjab. For the present study a survey was carried out among 60 dairy women selected from different villages of the district using a structured interview schedule. The participation of farm women was grouped into four activities *viz.*, feeding and watering of animals, management of animals, health care and processing and marketing of milk produce. The participation was measured on 3-point scale. The findings revealed that women exhibited a high level of participation in routine and labour-intensive activities such as feeding of animals, cleaning of sheds and utensils, milking, care of newborn calves, and processing of milk into value-added products. Moderate participation was observed in activities related to care of pregnant animals and taking animals for treatment. However, women's involvement was relatively low in technical and decision-oriented activities such as de-worming, maintaining health and milk production records, and seeking veterinary services. The study concludes that although women are the backbone of day-to-day dairy operations, their participation in scientific and managerial aspects of dairy farming remains limited. Capacity building through targeted training, extension support, and gender-sensitive dairy development programmes is essential to enhance women's role in improving productivity and profitability of dairy enterprises.

Keywords: Dairy enterprise participation, Dairy extension services, Gender roles in livestock, Rural women empowerment, Women in dairy farming

For correspondence: Manisha Bhatia <bhatiamanisha@pau.edu>

Youth Perspectives on Labour and Livelihoods in Multifunctional Landscapes in Rural India

Meghajit Sharma Shijagurumayum¹, Shweta Gupta²

¹Alliance of Bioversity International and CIAT, Yelahanka, Bengaluru 560064, Karnataka, India; ²International Food Policy Research Institute, New Delhi 110012, India

Multifunctional landscapes are increasingly promoted as a means to reconcile ecological sustainability with livelihood diversification in rural areas. However, empirical evidence on how such landscape approaches integrate gender and social inclusion, particularly for rural youth, remains limited. This gap is especially evident for young women, whose engagement in agriculture is shaped by gendered divisions of labour and time constraints. This study examines how rural youth in Mandla district, Madhya Pradesh, India, perceive and navigate multifunctional landscapes. It identifies the conditions under which these landscapes become viable livelihood pathways for young women.

The analysis draws on qualitative data from a youth-focused study conducted in Mandla under the CGIAR Multifunctional Landscapes Science Program. Using in-depth interviews and photovoice, the study explored how young women and men engaged in agriculture and allied activities imagine livelihood futures and assess diversified, agroecological, and nature-based practices within their local landscapes. Rather than evaluating discrete interventions, the analysis centred on youth perspectives to examine how labour, time use, and seasonal sequencing shape the viability of livelihoods.

Findings indicate that rural youth in Mandla rarely aspire to single-activity livelihoods. Instead, they pursue portfolio strategies combining crop production, livestock rearing, value addition, wage work, and care responsibilities to manage risk and seasonal income. These aspirations align conceptually with the logic of multifunctional landscapes. For young women, diversified systems are seen as accessible entry points that require limited land and capital and can be combined with care responsibilities.

However, multifunctional landscapes do not automatically translate into viable or inclusive livelihood pathways for young women. Labour emerges as the key mediating factor. Diversified and agroecological practices tend to add tasks rather than replace existing ones, increasing demands for weeding, composting, pest management, and water-related work. While young men often frame these challenges in economic or technical terms, young women emphasise time scarcity arising from the intersection of productive labour with unpaid domestic and care work. Without mechanisms to reduce or redistribute labour, multifunctionality risks reproducing existing gendered inequalities.

The study identifies several enabling conditions that shape whether multifunctional landscapes work for young women, including secure access to water, locally available inputs, collective labour arrangements, short, practice-oriented training, and reliable market linkages. Overall, the findings suggest that multifunctional landscapes can support youth livelihoods in India, but only when gendered labour and time constraints are treated as central design considerations rather than secondary concerns.

Keywords: Gender and labour dynamics, Multifunctional landscapes, Rural youth livelihoods, Sustainable rural development, Youth in agriculture

For correspondence: Meghajit Sharma Shijagurumayum <m.shijagurumayum@cgiar.org>

Role Performance of Women Member of Grampanchayat and Implication to Improve it

Amita Madhavrao Kshatriya¹, Jyoti V. Deshmukh²

¹Krishi Vigyan Kendra, Pokharni, Nanded 431602, Maharashtra, India; ²College of Agriculture, Latur, Vasantnao Naik Marathwada Krishi Vidyapeeth, Parbhani 431402, Maharashtra, India

The present study was conducted in randomly selected Majalgaon, Parali and wadwani tehsils of Beed district of the Marathwada region in Maharashtra state. Twelve villages from each tehsils and 3 women member from each Grampanchayat were selected randomly. In this way, total 36 villages from three tehsils were selected to comprise total sample of 108 respondents. The information was collected with the help of structured interview schedule by interviewing personally to the respondents. The majority of the women member of Grampanchayat exhibited medium role performance about different functions in village.

Present study clearly concluded that majority of the women member of Grampanchayat had medium level of role performance in respect of most of the areas of functioning such as administrative function, agriculture function, welfare function, educational function and health care's function. Implication to improve the role performance and active involvement, Self-help groups of women should organize the program for empowerment of women at village level through different activities like dairy, small scale industries, home-made food products.

It is therefore highly essential to undertake suitable and appropriate measures like workshop, periodical discussion, exposing members to various development in Panchayat Raj system, efforts should made from Government and NGO's for improving their personal level of women Grampanchayat members, provide better facilities to run the activities so as to make them fully aware about the roles and functions they have performed.

Keywords: Function of grampanchyat, Grampanchyat, Implication, Role performance, Women member

For correspondence: Amita Madhavrao Kshatriya <amitak081@gmail.com>

Empowering Women through Nutrition-Sensitive Agricultural Interventions for Improved Health and Food Security

B.E. Ramitha¹, M.R. Bhavya¹, Ragini Patil¹, Mauneshwari Kammar², Vinuta Muktamath²

¹Krishi Vigyan Kendra, University of Agricultural Sciences, Badami Road, Bagalkot 587101, Karnataka, India; ²University of Agricultural Sciences, Dharwad 580005, Karnataka, India

Women play a crucial role in agriculture and household nutrition, yet they often face challenges related to poor dietary diversity, micronutrient deficiencies and limited access to nutrition-focused agricultural interventions. Strengthening women's health and nutrition through gender-responsive agricultural extension is essential for building inclusive and resilient agri-food systems. The present study documented the outcomes of nutrition-sensitive agricultural interventions implemented among 90 rural women from five villages through Krishi Vigyan Kendra extension programmes. The interventions included establishment of nutri-gardens to ensure year-round availability of fresh vegetables and promotion of nutrient-rich pearl millet varieties (VPMV-9 and VPMH-14) for daily consumption. Capacity-building program were conducted on women's health, balanced diets, anemia prevention and healthy food preparation practices. As per ICMR-NIN guidelines, standardized intake of 60 g per person per day of millet-based foods was followed for a period of 90 days. Baseline and end line assessments were carried out to evaluate changes in food intake, hemoglobin levels, body mass index (BMI), frequency of sickness and acceptability of millet-based products. Results showed a marked improvement in vegetable and millet consumption, leading to enhanced dietary diversity among participating women. Nutri-gardens contributed to improved hemoglobin levels and reduction in household expenditure on vegetable purchase. Consumption of nutrient-rich pearl millet varieties resulted in significant improvement in hemoglobin and BMI, with nearly 48% of women shifting to the normal hemoglobin category, along with reduced fatigue and minor illnesses. Sensory evaluation indicated high acceptability of millet-based products, suggesting strong adoption potential. The intervention demonstrates how public agricultural extension systems can mainstream gender equality by prioritizing women's nutritional needs, enhancing their access to agri-food resources and strengthening their role in household-level decision-making. Overall, the study highlights that integrating agriculture, nutrition and women-centric extension approaches can effectively improve women's health, nutritional security and social inclusion within agri-food systems. The intervention offers a scalable model for promoting gender equality and inclusive agricultural development.

Keywords: Anemia reduction, Gender equality and social inclusion, Household food security, Nutrition-sensitive agriculture, Women in agriculture

For correspondence: B.E. Ramitha <ramithabandi@gmail.com>

Invisible Yet Indispensable: Livelihood Vulnerability among Medicinal NTFPs Dependent Tribal Women in Manipur

Cenmichon Khodang¹, Chitra Parayil¹, A Prema¹, Anil Kuruvila², Binoo P. Bonny³, P. Sujana Pal⁴

Kerala Agricultural University, Vellanikkara, Thrissur 680656, Kerala, India; Kerala Agricultural University, Thiruvananthapuram 695522, Kerala, India; ³Directorate of Extension, Communication Centre, Kerala Agricultural University, Mannuthy, Thrissur 680651, Kerala, India; Kerala Forest Research Institute, Thrissur 680653, Kerala, India

The study assessed the livelihood vulnerability of tribal communities dependent on medicinal Non-Timber Forest Products (NTFPs) in the State of Manipur, India. Livelihood Vulnerability Index (LVI) was used to evaluate vulnerability across the state. Survey of 160 randomly selected tribal households dependent on medicinal NTFPs was undertaken from two tribal districts namely Kamjong and Senapati district and LVI was constructed using seven indicators categorized under exposure, sensitivity and adaptive capacity between the Male Headed Households (MHHs) and Female Headed Households (FHHs). The contributing factors of computed LVI-IPCC assessment indicated that FHHs were substantially more vulnerable than MHHs. Despite relatively lower exposure to climatic risks and better adaptive capacity, the heightened sensitivity of FHHs arising from socio-economic constraints made them disproportionately vulnerable to climate variability and livelihood shocks. Conversely, the lower sensitivity of MHHs offset their higher exposure and weaker adaptive capacity, resulting in reduced overall vulnerability. The study highlighted the complex interplay between socio-economic factors and medicinal NTFP reliance, offering insights for targeted interventions to reduce vulnerability in forest-dependent communities.

Keywords: Climate vulnerability, Livelihood vulnerability, Medicinal plants, Non-timber forest products, Tribal women

For correspondence: Cenmichon Khodang <cenmichon2015@gmail.com>

Are Rural Women Farmers Eating Healthy? Insights from Haryana, India

M. Misha Madhavan, Satyapriya, Sukanya Barua

ICAR-Indian Agricultural Research Institute, New Delhi, 110012, India

Women of reproductive age are often nutritionally vulnerable because of the physiological demands of pregnancy and lactation. The requirements for most nutrients are higher for pregnant and lactating women than for adult men. Rural women are central to ensuring food and nutrition security in farm households, yet an important question remains, are they themselves eating healthy? This study examines the dietary diversity and factors influencing the healthy eating behaviour among rural women farmers in Haryana, India. A cross-sectional survey was conducted among 200 women farmers engaged in farming and allied activities in Sonapat and Mahendragarh Districts of Haryana. Healthy eating behaviour was assessed using a scale and the results revealed very poor healthy eating behaviour among majority of the respondents. The Minimum Dietary Diversity for Women (MDD-W) indicator was used and found that majority of the respondents (85%) were not having the required dietary diversity. Healthy eating of rural women was perceived to be influenced by factors at the individual, social, lived, and food environment levels. The factors like nutrition literacy, sociocultural acceptability, beliefs and attitudes, food availability, affordability, time and convenience were identified as the barriers to healthy eating of rural women. Despite active involvement in agriculture, farming did not consistently translate into healthier diets for women. The study highlights the disconnect between agricultural livelihoods and nutritional outcomes and underscores the need for gender-sensitive nutrition education, dietary diversification strategies, and integrated agriculture-nutrition interventions. The results have important implications for policies and programs aimed at improving women's nutrition, health, and overall well-being in rural agrarian settings.

Keywords: Agriculture-nutrition linkages, Dietary diversity among, Women, Healthy eating behaviour, Nutrition literacy, Rural women farmers

For correspondence: M. Misha Madhavan <mishamadhavanmsy4@gmail.com>

Identification of Problems and Need-Based Gender-Friendly Technologies for Farm Women in Nagaland

Nabaneeta Gogoi, Mandeep Digra, Moloya Gogoi, Mayuri Bora, Tulika Borah, Pubali Saikia, Pallavi Talukdar

All India Coordinated Research Project on Women in Agriculture, Assam Agricultural University, Borbhetta, Jorhat, 785013 Assam, India

The present study was conducted in the agro-ecological regions of Nagaland to identify major problems faced by farm women and to assess their perceived need for gender-friendly technologies. The study was undertaken under AICRP-WIA, Assam Agricultural University, Jorhat, using a multistage sampling technique. A total of 480 farm women respondents were selected, and data were collected using a pre-tested structured interview schedule and analyzed using descriptive statistical tools. The findings indicated that farm women in Nagaland face serious socio-economic and technological constraints. A large majority of respondents reported lack of awareness, skills, and technical competency (95.41%), poor status of women in farm and non-farm sectors (97.91%), and high drudgery in agricultural operations (94.16%). Limited access to government schemes and extension services was reported by 88.12% of respondents. Economic challenges were severe, with 98.75% indicating low market demand and poor returns from rice cultivation, and 98.95% reporting reduced productivity due to the lack of quality seeds, suitable varieties, and standard packages of practices. Nutritional insecurity and low family income were reported by 88.12% of respondents. In terms of perceived needs, priority was given to rainwater harvesting technologies (59.37%) and organic and integrated farming practices for soil health improvement (54.58%). Value addition to crop biomass and farm waste emerged as an important intervention, with demand for mechanization in crop residue management (73.12%) and development of consumer utility products from agro-waste (61.45%). Fruit and vegetable processing (55.83%) and processing of cereals, millets, and pulses (41.04%) were identified as potential income-generating activities. Life skill enhancement (48.33%) was also considered essential. The study highlights the urgent need for region-specific, gender-friendly technologies and capacity-building interventions to reduce drudgery and improve the livelihoods of farm women in Nagaland.

Keywords: Agricultural drudgery reduction, Farm women, Gender-friendly technologies, Nagalan, Need-based interventions

For correspondence: Mandeep Digra <manudigra30@gmail.com>

Empowering Women in Agri-Food Systems: Strategies for Gender Equity

Veena Vidyadharan

Oxfam International, 3rd Floor, The Point Community Mall, Phnom Penh, Cambodia

Gender mainstreaming means systematically integrating gender perspectives at every stage of agri-food policies, programmes, investments, and institutions, leading to equitable, inclusive and sustainable development. It is about reshaping agri-food systems in its design, governance, finance, and evaluation.

Mainstreaming gender in agri-food systems requires systemic change across policies, institutions, markets, technologies and social norms. Addressing structural barriers in society is critical to enabling women to access productive resources (land, credit, inputs), as well as technology. Interventions targeting structural issues should include both men and women in transforming food systems toward equity, sustainability, and resilience.

The policies should have clear targets, a budget, and indicators for gender-responsive planning. Women's position in agri-value chains is mainly at the lower end, which is labourious and low-skilled. Promoting gender-friendly tools and implements, and designing gender-sensitive advisory and extension services are prerequisites for upgrading their position in a value chain. Furthermore, gender-disaggregated data across the entire value chain of a product needs to be analysed to understand their real needs and inform design strategies.

Investing in Education, Training, and Capacity Development; Leadership Training and Mentoring through tailored programs; strengthening collective action and leadership through cooperatives and self-help groups; and participatory learning approaches and forums are a few strategies that can enhance the agency.

Increased climate stress and climate-induced migration are deepening gender gaps across South Asia. With a larger share of the workforce in the informal sector, integrating gender into climate-smart agriculture, adaptation finance, and disaster risk reduction would ensure equity and agency and strengthen their economic resilience.

Keywords: Agri-food systems governance, Climate-smart agriculture, Gender equity in value chains, Gender mainstreaming in agriculture, Women's empowerment

For correspondence: Veena Vidyadharan <veena.vidyadharan@oxfam.org>

Framework for Incorporating Gender Equality and Social Inclusion (GESI) Elements in Nutrition Sensitive Agriculture in India

Pragati Shukla¹, Veenita Kumari¹, S.P. Lal²

¹National Institute of Agricultural Extension Management, Rajendranagar, Hyderabad 500030, Telangana, India; ²Dr. Rajendra Prasad Central Agricultural University, Pusa 848125, Bihar, India

Women constitute nearly one-third of India's agricultural labour force and are pivotal to agri-food systems, yet they remain marginalized in access to land, credit, technology, and decision-making. Their role in nutrition operates at two interconnected levels: farm-level production and household-level consumption. At the farm level, women influence crop choices, biodiversity, and food availability, often prioritizing nutrient-rich crops such as pulses, vegetables, and millets. At the household level, they are central to food preparation, child feeding practices, and dietary diversity, directly shaping nutrition outcomes. Nutrition Sensitive Agriculture (NSA) offers a critical pathway to address malnutrition and food insecurity, but without embedding Gender Equality and Social Inclusion (GESI), interventions risk perpetuating structural inequities.

This paper proposes a comprehensive framework grounded in seven governance pillars representation, participation, capacity and skills, accessibility, financial equity, knowledge systems, and innovation to integrate GESI into NSA programs. Drawing on global best practices, national policies such as Poshan Abhiyaan and the National Food Security Act, and grassroots experiences from self-help groups (SHGs) and farmer producer organizations (FPOs), the framework outlines actionable strategies: mandating gender-responsive budgeting, securing joint land titles, elevating women's leadership in SHGs and village nutrition committees, and expanding access to climate-smart technologies and digital markets.

By explicitly recognizing women's dual role in nutrition as cultivators of diverse, nutrient-rich food systems and as household nutrition managers the NSA approach strengthens the link between agricultural growth and equitable nutrition outcomes. It further emphasizes participatory monitoring with gender-disaggregated data and the integration of indigenous food knowledge with scientific research. Centering women and marginalized communities in agri-food governance advances both food security and social justice, aligning with Sustainable Development Goals (SDGs) 2 (Zero Hunger) and 5 (Gender Equality). Scaling up innovative, women-led models across diverse agro-ecological zones can position India as a global leader in building equitable, nutrition-sensitive food systems.

Keywords: Food and nutrition security, Gender equality and social inclusion, Gender-responsive policies, Nutrition-sensitive agriculture, Women in agri-food systems

For correspondence: Pragati Shukla <pragati.manage@gmail.com>

Vulnerability to Resilience: Women-led Climate Smart Dairy Farming in Haryana

Sanchita Garai, Anil Kumar Reddy, Siri Lakshmi, Veera Anusha, Sanjit Maiti, Gopal Sankhala

ICAR-National Dairy Research Institute, Karnal 132001, Haryana, India

Women form the backbone of the dairy farming in India, contributing extensively to animal care, milk production, processing, and marketing. Despite their central role, women dairy farmers remain disproportionately vulnerable to climate change due to limited access to resources, technologies, and institutional support. Recognizing women as key agents of climate adaptation, this study examined how women-led climate smart dairy farming can transform vulnerability into resilience in impending climate change. Against this backdrop, the present study was undertaken in Hisar, Jind, and Rohtak districts of Haryana to assess the effectiveness of women-led climate smart dairy farming interventions in enhancing adaptive capacity and resilience. A quasi-experimental Difference-in-Difference (DiD) research design was employed. A total of 360 women dairy farmers were selected as respondents, and 60 key stakeholders were engaged to assess the coping capacity of climate resilient dairy farming practices. Based on stakeholder analysis, six practices with the highest coping capacity were selected *viz.* supplementation of vitamin E-selenium; deworming followed by mineral mixture supplementation; supplementation of buffers, ration and feed management during climate stress; advisory services based on Temperature Humidity Index; and preparation of value-added milk products. Adaptive capacity was conceptualized as composite of five livelihood capitals *viz.* human, physical, natural, financial, and social, capturing the multidimensional nature of resilience. Results indicated significant improvement in women farmers' knowledge and attitudes toward climate smart dairy practices following the intervention. Adoption of these practices led to a significant increase in animal productivity, with an average rise of 1.23 liters in daily milk yield. Substantial improvements were observed in human, financial, and natural capital, contributing to an overall enhancement of adaptive capacity by 8.80% among participating women dairy farmers. In contrast, the counterfactual (control) group exhibited a declining trend in adaptive capacity over time, underscoring the critical role of climate-resilient dairy practices in sustaining livelihoods under changing climatic conditions. The study further identified key barriers to adoption of climate-resilient dairy farming practices, with lack of knowledge emerging as the most significant constraint, followed by limited financial independence and decision-making power among women, high costs associated with the practices, and prevailing socio-cultural norms. The findings demonstrate that empowering women through targeted, gender-responsive climate smart dairy interventions can significantly strengthen household-level resilience and enhance the sustainability of dairy enterprises. Positioning women dairy farmers at the center of climate adaptation planning is essential for facilitating a transition from vulnerability to resilience in climate stressed rural livelihoods.

Keywords: Climate resilience, Climate-smart dairy farming, Livelihood adaptive capacity, Gender-responsive agriculture, Women dairy farmers

For correspondence: Sanchita Garai <sanchita.bckv@gmail.com>

Learning and Doing Gender: Evolving Strategies of Inclusion in Transdisciplinary Agricultural Research in South Asia

Sucharita Sen¹, Tamara Jackson²

¹Jawaharlal Nehru University, New Delhi 110067, India; ²University of Adelaide, Adelaide, South Australia 5005, Australia

Despite nearly three decades of scholarship and policy engagement on gender mainstreaming and the integration of sex, gender, and diversity analysis in research, significant gaps remain in understanding how gender strategies are enacted and transformed within transdisciplinary, multi-country development projects. Existing literature has largely focused on institutional policies, funding mandates, proposal-stage compliance, or sector-specific applications, predominantly in the Global North. It offers limited empirical insight into the practical, process-based evolution of gender strategies during project implementation, particularly in agrarian and Global South contexts. Gender is frequently articulated as a normative objective or evaluative criterion, but rarely examined as a dynamic, negotiated practice shaped by learning, contextual adaptation, and trade-offs across disciplines, countries, and social hierarchies.

This paper addresses this gap by tracing the evolution of a gender and inclusion strategy within a cross-country, transdisciplinary agricultural diversification project implemented in India, Nepal, and Bangladesh. Drawing on the project's longitudinal experience, the paper documents how gender was approached both as a standalone objective and as a cross-cutting lens embedded across all project components, moving beyond checklist-based inclusion toward addressing structural inequalities shaping access to resources, participation, and benefits from diversification. By framing the gender strategy as learning and doing gender, we moved beyond static or compliance-oriented approaches to foreground gender as a relational, evolving practice shaped by context, power, and reflexive engagement.

The paper reflects on key activities underpinning the strategy, including iterative strategy discussions, context-specific gender training, cross-country review meetings, ongoing engagement with field teams, and systematic documentation of gender-relevant data. These processes enabled continuous reflection on inclusion trade-offs, particularly where project efficiency and gender equity came into tension. The analysis highlights key learnings around power and participation, the differentiated impacts of diversification pathways across social identities, the limits of visible but non-transformative participation, and the risks of success selection that may inadvertently exclude the most marginalised. The paper also identifies unrealised opportunities for deepening inclusion such as non-plot livelihood pathways, nutrition-linked interventions, and richer use of intra-household data, while demonstrating the necessity of embedding gender considerations across productivity, profitability, nutrition, and climate resilience objectives. By documenting learning processes rather than outcomes alone, the paper contributes a reflexive, practice-based account of how gender strategies evolve in real time. In doing so, it bridges the gap between funding-level gender frameworks and the everyday practices of transdisciplinary research, offering insights for future project design and gender-transformative strategies in the Global South.

Keywords: Agricultural diversification, Gender mainstreaming, Gender-transformative approaches, Social inclusion, Transdisciplinary agricultural Research

For correspondence: Sucharita Sen <ssen.jnu@gmail.com>

Transforming Women's Roles in Agri-Food Systems through Gender-Responsive Technologies: Evidence, Agency, and Policy Pathways

Kumar Shipra¹, Sangeeta Deo¹, Aditya Kumar²

¹Dr. Rajendra Prasad Central Agriculture University, Aditi Eye hospital, Ward no 34, Kashipur, Samastipur 848101, Bihar, India;

²Indian Institute of Information technology, Surat, Gujarat, India

This paper argues that emerging agricultural technologies can play a transformative role in empowering women in agri-food systems only when technology access is deliberately linked with agency, decision-making, and control over outcomes. Across South Asia, Sub-Saharan Africa, and Latin America, digital tools, ergonomic farm technologies, and innovative service models have expanded women's reach and productivity, but structural barriers continue to limit their ability to benefit fully from these innovations. In India and other developing contexts, gender disparities in technology access and usage persist despite significant progress in digital inclusion programs designed to improve information flow, market connections, and financial access for rural women farmers. Evidence shows that women often lack control over digital devices, internet connectivity, and the income generated from technologies, which undermines the potential for sustained empowerment.

Using empowerment frameworks such as the Reach-Benefit-Empower approach and the Women's Empowerment in Agriculture Index, this review synthesizes peer-reviewed studies, program evaluations, and policy analyses from 2015-2025 to demonstrate that gender-responsive technologies that improve access and benefits without enhancing agency can reproduce inequality. For transformative impact, technologies must be embedded in social and institutional innovations that address norms, digital literacy gaps, and intra-household power relations.

The analysis highlights examples such as mobile advisory and voice-based systems that overcome literacy barriers, and community video models like Digital Green that strengthen women's confidence and practice adoption. It also reflects India's efforts to expand women's participation through custom hiring centres and digital strategies aimed at bridging the gender digital divide. Crucially, the paper shows that when women are positioned as technology users and leaders of technology-enabled services and enterprises, their economic and social influence increases. The findings underscore that technology alone cannot drive gender equity; instead, integrated approaches combining technology with gender-sensitive extension, capacity building, collective action, and supportive policy frameworks are essential for building resilient and inclusive agri-food systems as we move toward the International Year of Women Farmers in 2026.

Keywords: Agency and decision-making, Agricultural technologies, Agri-food systems, Gender digital divide, Women's empowerment

For correspondence: Kumar Shipra <shipra.kumari@rpsc.au.ac>

Multi-Dimensional Empowerment of Rural Women through Nutrition Assessment, Food Processing Technologies and Enterprise Models in Malda

Pavuluri Yasaswini¹, Dushyant Kumar Raghav¹, P. Anbazhagan¹, T. Damodaran², Pradip Dey³

¹ICAR-Central Institute for Subtropical Horticulture (CISH), Madhab nagar, Malda 732103, West Bengal, India; ²ICAR-Central Institute for Subtropical Horticulture (CISH), Lucknow, Uttar Pradesh, India; ³ICAR-Agricultural Technology Application Research Institute(ATARI), Zone V, Kolkata, West Bengal, India

Rural women play a crucial role in household nutrition and food processing yet face multiple constraints due to limited knowledge and awareness of processing technologies, income opportunities, low dietary diversity and reduced decision-making power, as reflected in a structured baseline survey conducted across three blocks in Malda using a gender-nutrition assessment tool. The survey revealed that most women consumed low dietary diversity, carbohydrate-heavy diets, low access to nutrition-rich foods, often sacrificed food for their families and inadequate awareness of balanced dietary requirements. Body measurements (height, weight, BMI) and dietary diversity scores further indicated a need for targeted nutritional intervention. To address these interconnected challenges, ICAR-CISH, KVK, Malda implemented multi-dimensional empowerment models integrating nutrition education, food processing technologies and livelihood enhancement. In the mango-dominant region, women were trained to utilise the fallen mangoes by reducing post-harvest losses through value-added processing of both raw and ripened mangoes, including amchur powder, aam panna, raw mango papad, mango squash, ripe mango papad, jam and cake. Low-cost dehydration techniques for jujube, tomato, potato and methi enabled seasonal preservation and reduced household dependency on high-priced off-season vegetables, with tomato powder emerging as a key strategy for reducing household expenditure during price fluctuations. Nutrition empowerment was strengthened through awareness sessions on ICMR-NIN My Plate for the Day, encouraging balanced diets and improved food choices. In Habibpur block's chilli-growing cluster, women-led enterprise models were supported through installation of five shade nets, each accommodating 300 portraits (104 seedlings per tray), enabling production of pest-free, healthy seedlings, replacing traditional soil-based nursery practices and generating sustainable income. Additional skill-based initiatives such as including bamboo handicrafts and tailoring, were introduced for economic diversification. This integrated approach demonstrates that technology access, nutrition literacy and enterprise opportunities can collectively create gender-transformative progress. The CISH-KVK, Malda model offers a replicable framework for enhancing women's autonomy, improving household nutrition and strengthening rural livelihoods within agri-food systems.

Keywords: Bamboo crafts, Food processing, Gender-transformative, Livelihood, Nutrition assessment, Rural women empowerment, Tailoring, Value addition, Vegetable seedlings

For correspondence: Pavuluri Yasaswini<yasaswini.pavuluri789@gmail.com>

Ergonomic Analysis of Drudgery Prone Activities among Women Involved in Harvesting the Jasmine Floral Crop

Swetha Kodali, R. Neela Rani, W. Jessie Suneetha, Lakshmi Challa, G. Swarupa Rani

All India Coordinated Research Project on Women in Agriculture, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad 500030, Telangana, India

Harvesting activity is mostly performed by women farmers or female labour, which is tedious. Harvesting crop manually is very lengthy and time consuming; especially the jasmine floral crop, as picking of these flowers should be done carefully without losing its shape. Despite its economic importance, the manual nature of the work often leads to significant physical drudgery and health-related issues. This study evaluated the work patterns and health status of farm women in terms of postures adopted, drudgery prone problems and explored the associated occupational health hazards while harvesting the crop using standard scales, as it aids in bringing out the mitigating strategies for reducing the drudgery of women involved in harvesting the jasmine flowers. Demographic data revealed that most of the women involved in harvesting jasmine flowers were aged 21-40 years of age group. The health impact studied had revealed that 100% of the respondents reported persistent leg pain, while others frequently experienced pain in the feet (73.3%), neck (80%), and shoulders (50%). Frequent back pain and finger cramps were reported by 53.3% of the sample. Other problems included were whole-body fatigue, sweating, giddiness, and numbness in the hands (53.3%). Long-term standing led to leg swelling in 66% and cramps in 33% of the workers. The study found a total lack of protective measures among the workforce. Ergonomic assessments had indicated a significant reduction in finger pinch and grip strength in jasmine floral harvesting activity, indicating localized fatigue and discomfort. Workers adopted strenuous and repetitive postures, including standing, bending, and squatting, which were described as exhausting to very exhausting by the participants. The Jasmine harvesting was found to be a highly demanding activity that leads to significant musculoskeletal disorders and occupational health problems. Hence, there is a need to bring out the mitigating strategies to reduce physical drudgery of women involved in harvesting the jasmine flowers through ergonomically designed women-friendly tools to enhance the well-being of female farm labourers and create awareness regarding Personal Protective Equipment (PPE).

Keywords: Drudgery, Ergonomics, Harvesting, Health hazards, Jasmine floral, Musculoskeletal disorders, Posture

For correspondence: Swetha Kodali<swethakodali0788@gmail.com>

Designing of A-line Khadi Kurties Using CAD with Different Constructional Features

Gayatri¹, Alka Goel²

¹Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar, India; ²Govind Ballabh Pant University of Agriculture and Technology (GBPUA&T), Pantnagar, Uttarakhand, India

In India, most of females of young generation prefer to wear kurties with a variety of lower garments that include jeans, skirt, palazzo, lehnga and salwar etc. because kurties are easy to wear, comfortable and create a traditional and fashionable look. A large variety of kurties with different colours, sizes, designs and styles are available in the market by different brands. However, Shri Gandhi Aashram also offers kurties. But these kurties have very limited designs. Whereas, consumers demanding for variety in these kurties. So, this study was planned with the objective *i.e.* designing of A-line khadi kurties using CAD. In the present study, a survey method was used for data collection related to the preference of consumers for readymade khadi kurties with constructional features. The study was conducted in the premises of Govind Ballabh Pant University of Agriculture and Technology (GBPUA&T), Pantnagar located in the U. S. Nagar district of Uttarakhand state, India. A total of one hundred females between 21-31 years of age were selected as the sample for the present study. Based on the results of the survey, by using CAD (Jindex Software) with different constructional features, total sixteen A-line khadi kurties designs were developed and all designs were evaluated by consumers. Collected data were analyzed by using frequency, percentage and Weighted Mean Score. It can be concluded from the study that all prepared designs for A-line khadi kurties using CAD (Jindex Software) with constructional features were accepted by all the consumers.

Keywords: A-line khadi kurties, Constructional features in kurties, CAD, Khadi kurties

For correspondence: Gayatri <gayatri@rpcau.ac.in>

Effect of Different Extraction Techniques on Nutritional and Techno-Functional Characterization of Amaranth Leaf Protein

Anusha Cherukuri¹, Renuka Aggarwal¹, Harpreet Kaur¹, Kiran Bains², Meena Krishania³

Punjab Agricultural University (PAU), Ludhiana 141004, Punjab, India; ²College of Community Science, PAU, Ludhiana, India; ³Biotechnology Research and Innovation Council (BRIC), National Agri-Food and Biomanufacturing Institute, Mohali, Punjab, India

Rapid population growth, urbanisation, and shifts toward protein-rich diets have increased global demand for sustainable protein sources. Leaf proteins offer a promising alternative due to their renewability, nutritional quality, and low environmental footprint. Amaranthus leaves, widely recognised for their high nutrient density and affordability, are traditionally regarded as a superfood and a poor man's vegetable. The present study aimed to evaluate the efficiency of ultrasonic-assisted extraction for producing Amaranthus leaf protein concentrate (LPC).

Fresh Amaranthus leaves were procured from the School of Organic Farming, Punjab Agricultural University. LPCs were extracted using ultrasonic-assisted alkaline extraction and compared with classical heat coagulation and industrial alkaline-assisted methods. The extracted proteins were assessed for extraction yield, protein content, functional properties (solubility, foaming, emulsifying capacity, oil and water binding), *in vitro* protein digestibility, amino acid composition, and structural and morphological characteristics.

Ultrasonic-assisted extraction yielded significantly higher protein recovery (17.83%) and protein content (47.3%) compared to conventional methods. Ultrasonically extracted LPCs exhibited superior solubility, foaming capacity, oil and water binding properties, and enhanced *in vitro* digestibility, though slightly lower emulsifying stability was observed. Amino acid profiling revealed that proteins obtained from extraction techniques met FAO/WHO adult essential amino acid requirements. SEM analysis demonstrated that ultrasonic treatment produced fragmented, porous, and uniform protein structures, attributed to cavitation-induced cell disruption, reduced particle size, and increased surface area, thereby improving functional performance.

Ultrasonic-assisted extraction significantly enhances the yield, functional quality, and structural attributes of Amaranthus LPC, highlighting its potential application in sustainable food systems, nutraceuticals, and dietary supplement formulations.

Keywords: Amaranthus, Functional properties, Leaf valorisation, Plant-based proteins

For correspondence: Anusha Cherukuri <anushacherukuri1805@gmail.com>

Performance Assessment of Women-Friendly Weeders in Cauliflower Cultivation in Northern Bihar of India

Nidhi Kumari¹, Dibyanshu Shekhar¹, Prabhat Kumar Singh², Pooja Kumari¹, Pradeep Kumar Vishwakarma¹, Chandan Kumar¹

¹Krishi Vigyan Kendra Jale, Darbhanga, Dr. Rajendra Prasad Central Agricultural University (RPCAU), Pusa 848125, Bihar, India; ²Narayan Institute of Agricultural Sciences, Gopal Narayan Singh University, Jamuhar, Rohtas 821305, Bihar, India

Bihar ranks as the third largest producer of cauliflower in India, contributing approximately 10.86% of the nation's total production. The state cultivates cauliflower on 65.71 thousand hectares, yielding about 935.56 thousand tonnes annually, with an average productivity of 15.28 tonnes per hectare. Cauliflower is highly sensitive to various stresses, particularly weed infestation, and therefore requires more intensive management than most other vegetables. Since, weeding represents a time-consuming and labour-intensive intercultural practice in agriculture, accounting for approximately 25% (900-1200 man-hours per hectare) of the total labour requirement. Therefore, an On Farm Trial (OFT) was conducted to evaluate the field performance of four weeders: Khurpi (T_1), Improved Grabar (T_2), push type twin wheel hoe weeder (T_3), and power weeder (T_4) in cauliflower fields managed by seven farm women at Krishi Vigyan Kendra, Turki, Muzaffarpur during 2021-22 and 2022-23. Parameters assessed included weeding efficiency, field capacity, plant damage, performance index, and the economics of weeding operations. Results showed that T_4 required the most power (3 hp), and had the highest effective field capacity (0.05 ha/hr) and plant damage (2.24%). T_1 achieved the highest weeding efficiency (98%), while T_4 had the lowest (81%). The highest performance index was recorded for T_2 (1781.46), followed by T_3 (1546.74). Compared to T_1 , operational costs were reduced by 50% for T_2 , 40% for T_3 , and 86.25% for T_4 . Although T_4 produced a lower yield than other treatments, its lower cultivation cost resulted in the highest net return, making the power weeder the most economically viable and acceptable option for farm women.

Key words: Field capacity, Performance index, Weeder, Weeding efficiency

For correspondence: Nidhi Kumari <nidhi.kumari@rpcau.ac.in>

Climate Smart Agriculture: Improving Productivity, Promoting Gender Equity

Varsha Kumari¹, Prabhakar Mahapatra¹, Muneshwar Prasad¹, Dinesh Mahto¹, Nirala Kumar²

¹Krishi Vigyan Kendra (KVK), Jehanabad, Bihar, Jahanabad 804432, Bihar, India; ²Indian Council of Agricultural Research (ICAR), New Delhi, India

Climate Smart Agriculture (CSA) includes a variety of technologies which aim to improve agricultural productivity while adapting to climate change. In most developing countries like India agriculture is highly labour-intensive, particularly for small and marginal farmers. Female contributions to farm labour in crop production activities such as transplanting, weeding, harvesting, threshing, and processing is estimated around 60-80%. Climate-smart agricultural technologies significantly reduce the drudgery faced by women in agriculture by enhancing productivity, minimizing physical labor and helping women farmers manage their workloads more effectively. Considering the cropping system, agroclimate, and women's participation in different agricultural activities this study has been carried out in Jehanabad district of Bihar in all three cropping seasons to identify potential labour-saving CSA technologies for women farmers in areas with high climate variability. Direct-Seeded Rice (DSR), zero tillage, micro irrigation, improved crop varieties, early planting, crop and soil health management measures offered promising avenues in reducing women's labour enhancing their resilience. DSR eliminates the need for transplanting performed by women labour. Laser Land Leveling technology ensured even surface for uniform water distribution reducing the time and workload for women. The ergonomical tools like manual seed drills and improved sickles, significantly reduce physical strain and enhance productivity for women farmers. CSA technologies help alleviate the "triple burden" of household labour, farm work, and caregiving for women in agriculture. Focusing on gender-responsive approaches by providing necessary support and training, we can empower women farmers and promote gender equality in agricultural practices.

Keywords: Climate smart agriculture, Drudgery, Gender equality, Productivity

For correspondence: Varsha Kumari<varshakvk22@gmail.com>

Gender-Sensitive Mechanization in Maize Sowing Tools for Reducing Drudgery of Women Farmers

Kumari Namrata¹, Anil Kumar Singh¹, Kavita Verma¹, Ranju Kumari²

¹Krishi Vigyan Kendra Vaishali, Dr. Rajendra Prasad Central Agricultural University (RPCAU), Pusa, hariharpur, Hajipur, Rajauli, Vaishali 844102, Bihar, India ²Bihar Agricultural University (BAU), Sabour, Bihar, India

Women constitute a major workforce in maize cultivation, particularly in sowing operations, which are traditionally carried out through hand dibbling by Khurpi. This method demand continuous bending and repetitive movements, leading to high drudgery, increased physiological workload, and musculoskeletal discomfort among women farm workers. To mitigate these issues, women-friendly sowing tools have been developed and evaluated for maize cultivation. Commonly used tools include manual vertical maize planters, rotary dibbler.

Studies have shown that the use of improved sowing tools can reduce time required for sowing by 30-60% and overall drudgery by 40-70% compared to traditional methods. Physiological parameters such as heart rate, energy expenditure, and perceived exertion were found to be significantly lower while using vertical manual planter and rotary dibbler. For instance, rotary maize dibbler reduced energy expenditure by about 35-45% and minimized bending posture, resulting in reduced back and shoulder pain. In addition to drudgery reduction, these tools ensure uniform seed placement, proper spacing, and optimum plant population, contributing to yield increases of 10-20%.

From an economic perspective, Vertical and rotary dibbler lowered the cost of sowing by 25-40% due to reduced labor requirement. Uniform seed placement and proper spacing resulted in better crop establishment and yield increases of 11-15%, thereby enhancing net returns. Benefit-cost ratios were reported to be higher (2.2-2.5) for improved sowing tools compared to traditional practice Khrpri..

The adoption of women-friendly maize sowing tools not only improves work efficiency and profitability but also enhances occupational health and empowerment of women farmers. Promoting these tools through extension programs, skill training, and access to affordable equipment can contribute significantly to sustainable maize production and gender-inclusive agricultural mechanization.

Keywords: Drudgery reduction, Ergonomic tools, Gender-friendly mechanization, Maize, Sowing equipment, Women farm workers

For correspondence: Kumari Namrata<k.namrata1014@rpcau.ac.in>

Gender-Responsive, Climate Resilient Homestead Aquaculture for Nutrition and Livelihood Security: Empirical Insights from Rural Households

S. Tanuja

ICAR-Central Institute for Women in Agriculture, Plot No 50-51, Mouza Jokalandi, Baramunda Post, Bhubaneswar 751003, Odisha, India

Improving rural women's access to productive resources, appropriate technologies, and essential services enhances their role in rural development, even as their close dependence on natural resources makes them particularly vulnerable to climate change. This connection also positions rural women as key contributors to adaptive and sustainable resource management. Gender-focused interventions for climate adaptation and livelihood diversification remain underexplored globally. In this context, the present study assessed the impacts of gender-responsive and climate-resilient homestead aquaculture and horticulture interventions on household food availability, income generation, and women's empowerment among 58 rural households across five villages in the flood-prone districts of Puri and Bhadrak, India. The interventions were implemented through community mobilization, capacity building, and participatory action research, with the objective of empowering women to effectively utilize available homestead and community resources and to collectively adopt strategies that mitigate climate-related shocks. Homestead ponds, averaging 0.11 ha, served as the key productive resource, where women actively engaged in fish farming integrated with vegetable cultivation (averaging 97 m²) to enhance household income and nutrition. As a result, fish productivity from homestead ponds increased by nearly 95%, reaching 3.22 t ha⁻¹ yr⁻¹ and generating a net income of ₹1.57 lakh ha⁻¹ yr⁻¹. Multiple stocking and harvesting practices increased per-household fish availability from 15.2 kg to 45 kg per year. Vegetable production from plots ranging between 50-150 m² yielded approximately 675 kg annually, supplying about 230 g of vegetables per person per day and generating an average income of ₹12,000 per household from surplus sales. Paddy straw mushroom cultivation emerged as a viable alternative livelihood option, enabling women farmers to earn approximately ₹460 per day while fostering confidence and entrepreneurial motivation. Women's participation in aquaculture and horticulture activities increased substantially, ranging from 5.2% to 83.0%. The adoption of the interventions resulted in 39% increase in participation of women in decision making regarding quantity of produce to be sold and retained for home consumption and a 45% increase in access to critical inputs for farming. Overall, the active involvement of women in adopting climate-resilient, gender-responsive practices at both household and community levels resulted in improved household incomes, enhanced nutritional outcomes, and strengthened women's capabilities, participation, and decision-making in farm, family, and community spheres.

Keywords: Adaptation, Aquaculture, Climate, Empowerment, Gender, Horticulture, Livelihoods, Nutrition

For correspondence: S. Tanuja <tanujasomarajan@gmail.com>

Low-cost Bamboo Storage Structure for Potato Seed Tuber: A Gender-Transformation Post-Harvest Innovation for Women Farmers

T. Esther Longkumer, Hannah K. Asangla, K.S. Manjunath, K.R. Harini, Sanjeev Kumar Singh, S. Girish Patil

ICAR-Krishi Vigyan Kendra, ICAR-National Research Centre on Mithun, Porba, P.O. Pfutsero, Phek 797107, Nagaland, India

Potato (*Solanum tuberosum* L.) is an important vegetable crop widely cultivated in the hill regions of Nagaland. In Phek District, potato production is the highest in the state, with 7,917 MT cultivated over 755 hectares (Statistical Handbook of Nagaland, 2025). However, post-harvest losses due to inadequate storage facilities remain a major constraint for smallholder farmers, resulting in significant economic losses. This study investigates the effectiveness of a low-cost bamboo storage structure as a sustainable and affordable solution for potato seed tuber storage. The structure, constructed using locally available bamboo, was designed to ensure adequate ventilation, thereby reducing moisture accumulation, sprouting, and tuber rotting. Field evaluation revealed that the bamboo storage structure successfully preserved tuber quality for an extended period, minimized post-harvest losses, and maintained a high germination rate of 90-95%. The technology proved to be economically viable and environmentally sustainable compared to conventional storage systems. The findings highlight the potential of bamboo-based storage structures in promoting sustainable agriculture, enhancing food security, and strengthening climate-resilient hill farming practices in rural Nagaland.

Keywords: Bamboo, Food security, Germination, Post-harvest, Potato, Storage, Sustainability

For correspondence: T. Esther Longkumer <estherimtyl@gmail.com>

Effect of Mulching on Weed Biomass, Productivity and Profitability of Tomato (*Lycopersicon esculentum* L.) in Semi-Arid Region of Bihar

Sushma Tamta, Jitendra Chandra Chandola, Vijay Kumar, Sanjay Kumar Rai

Krishi Vigyan Kendra, Saran, Dr. Rajendra Prasad Central Agricultural University, Pusa 841313, Bihar, India

A two-year (2019-21) field experiment was established at semi-arid region of Bihar to evaluate the effect of mulching *viz.* Black plastic mulch: BPM, Rice straw mulch: RSM and unmulched: (UM) on weed biomass, productivity and profitability of tomato. Results revealed that black plastic mulch and straw mulch significantly reduced the weed population at first and second interval to the tune of 0-0 and 38.5-62.6 kg/ha, respectively as compared to unmulched (UM) *i.e.* 122.5-205.4 kg/ha. The productivity of tomato was significantly the highest (293.6.5 q/ha) under black plastic mulching (BPM) followed by RSM and UM. The seasonal income in terms of net benefit cost (net B: C ratio) ratio was the highest with the application of black plastic mulch which was followed by rice straw mulch.

Keywords: Mulching, Productivity and profitability, Tomato, Weed biomass

For correspondence: Sushma Tamta<sushmatamta91@gmail.com>

Non-Destructive Identification of Internal Quality Defects in Indian Pomegranate Using Imaging Techniques

Ritu Kukde, Thongam Sunita, Shaghaf Kaukab, Navnath Indore, Priyabrata Kapri

ICAR-Central Institute of Post-Harvest Engineering and Technology (CIPHET), Ludhiana 141004, Punjab, India

Pomegranate is an economically important fruit crop in India, valued for its nutritional quality and export potential. However, the occurrence of internal physiological disorders such as aril browning (blackheart disease) significantly affects fruit quality and market acceptance. Since this defect develops internally without visible external symptoms, reliable non-destructive methods for early detection are essential to reduce postharvest losses and export rejections. This study investigated a multimodal non-destructive approach for the detection of aril browning in selected Indian pomegranate varieties using RGB imaging, thermal imaging, and soft X-ray imaging, along with physicochemical quality evaluation. Soft X-ray imaging was utilized to visualize internal structural and density variations associated with browning of arils, enabling effective identification of internal defects. RGB imaging was employed to extract external color features, while thermal imaging captured surface temperature variations related to internal physiological and metabolic changes. Classification models developed using individual and fused feature sets demonstrated that soft X-ray imaging provided the highest sensitivity for detecting internal aril browning, while the integration of RGB and thermal features improved overall classification performance. The results confirm the effectiveness of a combined imaging-based framework for non-destructive assessment of internal quality in pomegranate. The proposed approach offers strong potential for automated grading, quality screening, and improved quality assurance, thereby enhancing the competitiveness of Indian pomegranates in domestic and international markets.

Keywords: Aril browning, Internal quality, Non-destructive detection, Pomegranate, RGB and thermal imaging, Soft X-ray imaging

For correspondence: Ritu Kukde<ritukukde1996@gmail.com>

The Role of Digital Literacy in Enhancing Livelihood Sustainability and Overall Women Empowerment: A Meta Analytical Study

Prachi Bisht, Aditi sewak

Punjab Agricultural Universit (PAU), Ferozpur Road, Ludhiana 141004, Punjab, India

The rapid expansion of digital technologies in India has emerged as a critical enabler of livelihood sustainability and women's empowerment, particularly in rural contexts. This meta-analytical review synthesizes findings from major Indian studies published over the last decade to examine the role of digital literacy in enhancing livelihood security and overall empowerment of rural women. Evidence drawn from national surveys, government programmes, and empirical research indicates that rural women remain digitally disadvantaged, with studies reporting that women constitute nearly 33-35% of India's total internet users, and the rural gender digital divide exceeding 20% in several states. Despite these gaps, interventions such as PMGDISHA, Self Help Group (SHG) digitization, digital financial inclusion initiatives, and ICT-based agricultural extension programmes have demonstrated significant positive outcomes. Meta-analytic findings reveal that digital literacy adoption among rural women is associated with 20-40% improvement in income-generating activities, increased access to digital banking and government entitlements, and enhanced participation in market linkages and e-commerce platforms. Further, studies consistently report improvements in decision-making autonomy, social participation, self-confidence, and institutional engagement, with empowerment indices showing gains ranging from 0.25 to 0.45 standard deviation units following digital literacy interventions. However, persistent barriers including limited device ownership, low functional literacy, inadequate infrastructure, and socio-cultural norms continue to constrain equitable digital uptake. The review highlights a shortage of longitudinal and standardized impact assessments, particularly linking digital literacy to long-term livelihood sustainability. The study concludes that gender-responsive digital literacy programs, integrated with livelihood, financial, and social empowerment initiatives, are essential to harness the full transformative potential of digital technologies for rural women in India.

Keywords: Autonomy, Digitalization, Empowerment, Livelihoods, Inclusion, Sustainability

For correspondence: Prachi Bisht <bishtprachi@pau.edu>

Land Fragmentation and Migration of Men Farmers Creating Opportunity for Sustainable Women-Led Homestead Farming System - Baseline Overview from Assam, Odisha and Rajasthan

Sukanta Kumar Sarangi

ICAR-Central Institute for Women in Agriculture, Bhubaneswar, Odisha, Bhubaneswar 751003, Odisha, India

Agriculture Census and Surveys data shows land holding size in India declined from 2.28 ha in 1970-71 to less than 1 ha recently. Latest field surveys show intensified fragmentation at the grassroots level. Fragmentation is visible in the rising importance of the smallest farms (Marginal + Small (<2 ha): ~86.2% of total holdings, Semi-medium (2-4 ha): ~9.5%, Medium (4-10 ha): ~3.8% and Large (>10 ha): ~0.57%). Operational holdings increased from ~70.5 million (1971) to ~146 million (2015-16), while total agricultural area has changed little or even slightly declined recently (~159 million ha range). The major drivers of fragmentation are inheritance laws, high rural population growth, limited off-farm employment, distress sales due to debts, emergencies (further subdivision).

In the context of increasing land fragmentation and the declining economic viability of small and marginal holdings, male out-migration from rural areas to urban centres in search of alternative livelihoods has become a widespread phenomenon. Women are increasingly assuming primary responsibility for agricultural operations. Small and fragmented landholdings managed by women farmers create a favourable context for the adoption and strengthening of homestead farming systems. Given the limited size of operational holdings and women's proximity to the homestead, farming activities are often reorganised around the home, enabling efficient use of small plots, backyards, and common spaces. Women tend to integrate multiple components such as vegetables, fruits and perennial trees, small livestock, poultry, fisheries, composting, and recycling of household waste, thereby enhancing resource-use efficiency and reducing dependence on external inputs. In situations of land fragmentation and male out-migration, women-managed small holdings provide a significant opportunity for diversified, nutrition-sensitive, and sustainable homestead farming systems.

Studies at ICAR-CIWA revealed that majority of rural households (>80%) in Assam and Odisha practice HFS, compared to Rajasthan (60%). The area under such farming is small in Odisha (mean 900 m²) and Rajasthan (mean 409 m²) compared to Assam (mean 3334 m²). Women-managed homestead farming systems on small fragmented holdings have great potential to produce high aggregate outputs (vegetables, poultry, tubers, eggs) and increase household income substantially, often raising earnings by 20-50% through diversified produce sales and savings on food purchases. The interventions are targeted to support cultivation of multiple crop varieties, enhancing crop diversity, nutrition, and resilience. This evidence underscores that homestead farming managed by women not only compensates for land fragmentation constraints but also strengthens livelihoods, food security, and dietary diversity at the household level.

Keywords: Agriculture diversification, Food security, Fragmentation, Homestead, Livelihoods, Nutrition, Women

For correspondence: Sukanta Kumar Sarangi <sksarangicanning@gmail.com>

Gender Responsive Green Fodder Production from Rice Bean Crop

Debendra Nath Sarangi, Sukanta Kumar Sarangi

ICAR-Central Institute for Women in Agriculture, Baramunda, Bhubaneswar 751003, Odisha, India

Women's participation in rice bean cultivation is greater than that of men. It is generally cultivated in the hilly and tribal regions of India, where women's involvement in agriculture is higher. In India, there is a green and dry fodder deficit for animal feeding. Rice bean, a legume crop having good potential to grow in minimal condition cultivated for the purpose of fodder. It is a good source for green as well as dry fodder. To estimate the fodder production potential through minimal input an experiment was conducted in a randomized block design taking two varieties Bidhan-1 and Bidhan-2 with four treatments *i.e.* fertilizer N:P:K (20:40:20), FYM (5 tonnes/ha), Vermicompost (5 tonnes/ha), and Mo Khata (5 tonnes/ha) and with control plots without any input in three replications. Mo Khata is a 100% organic compost/manure generated by the composting process from household and market wet waste, a concept of waste to wealth. In the present study, green fodder of Rice bean was harvested at the 50% flowering stage to assess the potential fodder yield under the above treatments. In different treatments of FYM, Vermicompost, Mo Khata, and N:P:K, the fodder yield recorded in Bidhan-1 was 246.06, 263.10, 264.86 and 269.86, q/ha and fodder yield recorded in Bidhan-2 was 270.60, 291.60, 303.66, and 265.53 q/ha, respectively. In all the treatments Mo Khata treatment provides better fodder yield (284.27 q/ha). The overall performance of Bidhan -2 (282.85 q/ha) was better than Bidhan-1 (260.97 q/ha).

Keywords: Dry fodder, Fodder, Green fodder, Organic, Productivity, Ricebean, Vermicompost, Women

For correspondence: Debendra Nath Sarangi <dnsdrwa@gmail.com>

Emerging and Disruptive Technologies for Gender-Transformative Change in Agriculture: Opportunities, Challenges and Future Directions

Jakkawad Sunildutt, A.S. Hiwarale

Vasantrao Naik Marathwada Krishi Vidyapeeth (VNMKV), Parbhani 431402, Maharashtra, India

Technological innovations are reshaping agri-food systems worldwide, yet their benefits are not equitably distributed among men and women. Emerging and disruptive technologies such as digital agriculture, artificial intelligence (AI), Internet of Things (IoT), climate-smart tools, and women-friendly mechanization hold significant potential to reduce drudgery, enhance productivity, and promote gender-transformative change. This paper explores the scope and implications of integrating gender-sensitive technologies into agri-food systems with a focus on women farmers and agripreneurs.

Using a narrative review approach, this study synthesizes evidence from research articles, development reports, and international case studies to assess how technological interventions address gender-based constraints. Particular attention is given to digital inclusion, access to information and advisory services, labor-saving technologies, and climate-resilient innovations tailored to women's needs. The paper also examines socio-economic, cultural, and infrastructural barriers that hinder women's adoption of new technologies.

The analysis reveals that when designed and implemented through a gender-responsive lens, agricultural technologies can significantly enhance women's agency, income, and participation in value chains. However, issues such as digital literacy gaps, affordability, limited extension support, and gender norms continue to restrict impact. The paper argues that technology alone is insufficient without supportive policies, institutional backing, and inclusive innovation ecosystems.

This abstract is intended as a precursor to a future in-depth review paper that will systematically evaluate technological pathways for gender-transformative agriculture, identify best practices, and propose policy and research directions for inclusive and sustainable agri-food systems.

Keywords: Agriculture, Digital, Gender, Inclusion, Innovation, Mechanization, Technology, Women

For correspondence: Jakkawad Sunildutt <sunilduttjakkawad@gmail.com>

Development and Quality Evaluation of Karindi- A Traditional Pickled Dish

Vinutha Muktamath¹, Surekha Sankangoudar¹, S. Shubha¹, K.J. Sannapamma¹, Rajeshwari Desai¹, Y. Ravi¹, S. Hemalatha¹, Mridula Devi², Pallavai Badami¹

¹University of Agricultural Sciences, Dharwad, Krishinagar 580005, Karnataka, India; ²ICAR-Central Institute for Women in Agriculture, Bhubaneswar, Odisha, India

Pickled Chutney is a flavourful and pungent accompaniment in Indian cuisine and is widely consumed for its taste and health benefits. It is a nutrient-dense, low-calorie side dish rich in antioxidants, known to boost immunity and aid digestion. A study was undertaken under the All India Coordinated Research Project on Women in Agriculture (AICRP-WIA), University of Agricultural Sciences (UAS), Dharwad, to develop and evaluate karindi, a traditional pickled chutney. Two types of karindi, namely red and green, were prepared using red and green chilli as the primary ingredient, along with flaxseeds, fenugreek powder, garlic and mustard oil. Sensory evaluation of both red and green karindi revealed high acceptability for appearance, flavour, texture and overall acceptability, even after six months of storage. Nutritional analysis showed that red karindi contained 59.53% moisture, 6.40% protein, 7.88% fat, 8.41% crude fibre, 10.21% total ash, and 38.22 mg of vitamin C per 100 g. In comparison, green karindi contained 70.63% moisture, 4.37% protein, 5.83% fat, 5.66% crude fibre, 10.33% total ash and 35.10 mg of vitamin C per 100 g. Microbial analysis of both karindi samples after ten months of storage indicated the complete absence of coliforms, yeast, moulds and *Escherichia coli*. A gradual decrease in pH during storage further confirmed the product's good keeping quality and microbial safety. Also, the microbial studies indicated development of beneficial probiotic microbiota as the product aged indicating its health benefits. The study concludes that karindi has good nutritional value, shelf stability and consumer acceptability. Large-scale production of karindi can be promoted as an entrepreneurial venture for farm women, with scope for commercialization and export tie-ups with the local food processing industry.

Keywords: Commercialisation, Health benefits, Nutri-dense, Pickled chutney, Probiotic

For correspondence: Vinutha Muktamath <vinumuktamath@gmail.com>

Climate Change Impacts on Crop Production: Farmer Responses and Policy Priorities

Rajeshwari Desai¹, Surekha Sankangoudar¹, K.J. Sannapamma¹, Y. Ravi¹, Mridula Devi²

¹University of Agricultural Sciences, Dharward 580005, Karnataka, India; ²ICAR-Central Institute for Women in Agriculture, Bhubaneswar, Odisha, India

Climate change is increasingly disrupting traditional crop production systems, posing serious challenges to agricultural sustainability and rural livelihoods. Variations in temperature and rainfall patterns have altered cropping calendars, increased pest and disease incidence, and reduced crop yields, compelling farmers to adopt adaptive strategies to cope with these stresses. This study examines farmers' perceptions of climate change, its impacts on crop production, and the adaptive responses undertaken, with a particular focus on identifying constraints that limit effective adaptation and drawing policy-relevant implications.

The study is based on a descriptive research design and primary data collected from 120 farmers across four districts of Andhra Pradesh Anantapur, Kadapa, Visakhapatnam, and Vizianagaram using a pre-tested structured questionnaire and random purposive sampling. Information was gathered on socio-economic characteristics, perceived climatic changes, adaptation practices, and barriers to adaptation. The data were analyzed using frequency, percentage, and rank correlation methods.

Findings indicate that farmers widely perceive significant climatic variability, particularly irregular rainfall patterns and delayed monsoons, which have contributed to reduced crop yields, increased pest infestations, and delayed crop maturity. To cope with these impacts, farmers have adopted a mix of traditional and modern adaptation measures. Farm mechanization (70%), crop rotation (65%), and intercropping (60%) emerged as the most commonly practiced strategies, reflecting efforts to improve productivity and reduce climate-related risks. However, the adoption of improved and climate-resilient practices remains constrained by structural and institutional barriers. High input costs (60%), limited market access (66.60%), and inadequate availability of quality seeds (60%) were identified as major challenges.

The study underscores the urgent need for policy interventions that strengthen seed distribution systems, improve market infrastructure, and enhance access to affordable agricultural inputs through targeted subsidies. Strengthening extension services and promoting climate-resilient technologies can further support farmers' adaptive capacity. Such policy measures are essential to enable smallholder farmers to sustainably adapt to climate change and safeguard agricultural productivity in vulnerable regions.

Keywords: Climate change, Climate-resilient technologies, Crop production, Farm mechanization, Impact

For correspondence: Rajeshwari Desai <rajeshwarimd@uasd.in>

Broom Grass (*Thysanolaena maxima*) Serves Significant Economic Boon - A Sustainable Livelihoods, Income Generation and Women Empowerment in Mizoram, India

Mainak Ghosh¹, Rebecca Lalmuanpuii¹, A.K. Mohanty², A.K. Singha², Vanlalhrauia Hnamte¹, P.K. Pathak², T. Amrutha², Divya Parisa²

¹Krishi Vigyan Kendra, Mamit District, Lengpui, Mizoram, India; ²ICAR-Agricultural Technology Application Research Institute (ATARI), Zone VII, Umiam, Shillong 793103, Meghalaya, India

High rainfall, steep slopes, and acidic soils are the key challenges for sustainable agriculture in Mizoram which is situated in the extreme northeastern part of India. Mizoram is experiencing 1,800-2,500 mm of annual rainfall, primarily from May to September. Govt. of Mizoram with other state level initiatives have focused on Broom grass (*Thysanolaena maxima*) cultivation and providing the necessary infrastructure, tools, and market linkages to the women-led enterprises. The Broom cultivation has become a significant economic boon for women in Mizoram and surrounding North Eastern states, offering sustainable livelihoods, income generation, and empowerment through Self-Help Groups (SHGs). Govt. supported Van Dhan Yojana, enables rural women to turn raw grass into profitable household items (phool jharus) and allow them to generate substantial profits from making and selling, which is up to ₹60 in profit per kilogram of broom grass. Brooms are widely used for cleaning floors, the foliage for fodder purpose and stems for thatching materials. The women of the villages used to collect the inflorescences of broom randomly from the forest during December to March every year either for sell or their own utilization. Krishi Vigyan Kendra, Mamit in Mizoram has made in scientific way of broom grass cultivating in the farmer's field aiming to increase the farmer's income. The villages in Mamit District of Mizoram *i.e.* Phuldungsei, Rawpuichhip and Marpara were selected for field experiment on scientific cultivation of broom grass during 2021 to 2025. It was observed that around 19 q/ha yield of dry broom grass was found with a net return of ₹ 1,50,500/ha and B:C ratio of 3.6 (Averaged over 5 years). This broom cultivation made significant impact in the household of small holders where the women made an outstanding enhancement in their income. The scientific package and practices were developed by Krishi Vigyan Kendra, Mamit which ensured three times more economic output over the traditional farmers' practice. Growing of Broom grass systematically is indeed a boon to subsidiary income for women empowerment in the villages of North Eastern hill region of India.

Keywords: Broom grass, Scientific cultivation, Small holding farmers, Subsidiary income, Village dwellers

For correspondence: Mainak Ghosh <mainakghosh999@gmail.com>

Women-Led Agri-Entrepreneurship Under ARYA: Evidence from North-East India

Prasanta Kumar Pathak, A.K. Mohanty, A.K. Singha, Divya Parisa, Mainak Ghosh, T. Amrutha

ICAR-Agricultural Technology Application Research Institute (ATARI), Zone-VII, Umroi Road, Umiam, Shillong 793103, Meghalaya, India

Women's participation in agriculture is critical for sustainable rural development; however, limited education, low income, and inadequate technical exposure often constrain their entrepreneurial potential. The Attracting and Retaining Youth in Agriculture (ARYA) project of ICAR, implemented through six Krishi Vigyan Kendras (KVKs) since 2016-17, provides a structured institutional platform to address these constraints. This paper presents empirical evidence from women beneficiaries supported by six KVKs under ICAR-ATARI, Zone-VII, Umiam, covering Manipur, Nagaland, Mizoram, Meghalaya, and Tripura.

The beneficiaries were women aged 20-38 years, belonging predominantly to small and marginal farming families and economically vulnerable households. Their educational levels ranged from primary schooling and Class X to higher secondary and graduate (B.Tech). Prior to ARYA intervention, most beneficiaries were engaged in subsistence farming, unpaid family labour, petty trade, or remained unemployed, with annual incomes ranging between ₹15,000 and ₹40,000.

Through skill development training, input support, low-cost infrastructure, and continuous technical mentoring, the women adopted mushroom cultivation as a climate-resilient and space-efficient enterprise. Oyster mushroom (*Pleurotus* spp.) was the primary enterprise adopted by most beneficiaries, while a few progressive entrepreneurs also experimented with shiitake mushroom (*Lentinula edodes*) on a pilot scale. Production levels increased from 30-60 kg/year to 840-1,710 kg/year, while net annual income rose to ₹1.7-4.5 lakh, with Benefit-Cost ratios ranging from 2.4 to 3.75. The enterprises generated 110-330 man-days of employment annually and facilitated peer-to-peer diffusion, motivating 5-10 rural youth and women per entrepreneur to adopt similar enterprises.

The findings demonstrate that targeted institutional support under the ARYA project effectively transforms rural women irrespective of educational or economic disadvantage into successful agri-entrepreneurs, thereby enhancing income security, leadership, and community-level empowerment in the North-Eastern Region of India.

Keywords: Arya project, Entrepreneurship, Livelihood enhancement, Mushroom cultivation, North-East India, Rural women

For correspondence: Prasanta Kumar Pathak <drpkp19@gmail.com>

Gender Responsive Strategies for Drudgery Reduction among Tribal Women in Paddy Farming System of Odisha

Gayatri Moharana, Chaitrali S. Mhatre

ICAR-Central Institute for Women in Agriculture, Opposite of Kalinga Studio, Baramunda, Bhubaneswar 751003, Odisha, India

Women play a pivotal role in agriculture and are helping to 'feed the world'. They perform back breaking tasks in traditional method leads to drudgery and occupational health hazard due to lack of awareness and knowledge about women friendly farm tools. Keeping this in view, a study has been undertaken in a tribal district Koraput and Mayurbhanj of Odisha to address the needs and issues of tribal women in paddy farming system through suitable interventions with collaborative gender transformative approach. Paddy is the major crop cultivated in both the selected districts, where tribal women play a significant role in sowing, transplanting, weeding, harvesting, and post-harvest management activities. Information pertaining to drudgery and occupational health hazards in paddy were collected from 180 women farmers from Lamtaput block of Koraput and Jashipur block of Mayurbhanj districts. The study revealed that tribal women were very much conventional and followed traditional practices in farming and both the tribal men and women used traditional tools for different activities in paddy and depended upon the implements which were mostly operated by animals and human as source of power. The data pertaining to incidences of occupational health hazards revealed that more than 65% of the respondents had pain in body parts such as pain in neck, back, hand and shoulder. Considering the agricultural practices of the two districts, 14 types of farm implements were identified, procured, and distributed to 44 Custom Hiring Centres (CHCs) established across different villages. The data after intervention programs revealed that the output/ productivity of the tools and implements were more than 90% in case of all the 14 tools distributed in CHCs. Majority of the respondent expressed their positive feedback towards improved tools and equipment. This gender transformative approach for reducing drudgery and occupational health hazards brought a positive change in the life of tribal women and men by saving their time, energy and enhance income. It also changed their knowledge, skill and attitude for breaking the barriers by using improved tools at their field.

Keywords: Drudgery, Occupational health hazards, Tribal women, Women friendly tools

For correspondence: Gayatri Moharana <gayatri.bibhuti@gmail.com>

Nutri-Garden: A Cost-Effective Approach to Dietary Diversity and Micronutrient Security

Tejaswini Kapil, Pragma Bhadauria, Jyoti Sinha, Md. Monobrullah , D.V. Singh, Amrendra Kumar, Anjani Kumar

ICAR-Agricultural Technology Application Research Institute (ATARI), Zone IV, Garbhuchak, Jagdeo Path, Patna 800014, Bihar, India

Hidden hunger and malnutrition continue to pose serious public health challenges in rural India, particularly among small and marginal farm households where diets remain cereal-based and deficient in essential micronutrients. Nutrition-sensitive agriculture has gained recognition as a viable approach to linking agricultural production with improved nutritional outcomes. In this context, the present study highlights the concept and impact of Nutri-gardens as a cost-effective, sustainable, and household-focused intervention for enhancing dietary diversity and micronutrient security. Nutri-gardens promote the cultivation of diverse, safe, and nutrient-rich vegetables and fruits using small landholdings, locally available inputs, and recycled organic waste, thereby ensuring year-round availability of fresh produce in alignment with ICMR-NIN dietary recommendations. This intervention also addresses the major nutritional deficiencies such as protein-energy malnutrition, iron deficiency anemia, vitamin A deficiency, and other micronutrient disorders. Multiple Nutri-garden models including household, community, institutional, vertical, terrace, raised-bed, and integrated systems combining poultry, mushroom, vermicompost, and apiary units were promoted through Krishi Vigyan Kendras in Bihar and Jharkhand. These models improved household access to fresh foods, enhanced nutrition awareness, strengthened women's participation in food and nutrition-related decision-making, encouraged healthier dietary behaviour, and generated supplementary income through surplus production and value addition. During 2019-2024, a total of 4,099 Nutri-gardens were established under Zone IV, directly benefiting 19,834 farm women and farmers, with sustained adoption observed over the study period. Nutri-gardens enabled access to 20-25 varieties of vegetables and fruits annually, leading to improved intake of iron, vitamin A, vitamin C, calcium, and dietary fibre, particularly among women and pre-school children. Participating households reported a 30-50% reduction in annual expenditure on vegetables, demonstrating the economic efficiency of the model. Complementary interventions further strengthened outcomes, including demonstrations on bio-fortified crop varieties, large-scale capacity-building program, and nutrition literacy activities. Overall, Nutri-gardens emerged as a scalable, climate-resilient, and nutrition-sensitive strategy that supports efficient land use, agrobiodiversity conservation, and the achievement of Sustainable Development Goals, particularly Zero Hunger (SDG-2) and Good Health and Well-being (SDG-3).

Keywords: Biodiversity, Empowerment, Food security, Malnutrition, Micronutrients, Nutri-gardens, Resilience, Sustainability

For correspondence: Tejaswini Kapil <ptejaswini2002@gmail.com>

Empowering Women Farmers through Hands-on Training in the Aroma Sector: Best Practices, Ground Realities, and Pathways for Fair Market Access

Rashmi¹, Varnika Tyagi¹, Nisha Verma²

¹Sardar Vallabh Bhai Patel University of Agriculture and Technology, Modipuram, Meerut 250110, Uttar Pradesh, India; ²ICAR-Indian Institute of Farming Systems Research (ICAR-IIFSR) Modipuram, Meerut 250110, Uttar Pradesh, India

Women farmers play a vital role in the cultivation and primary processing of aromatic crops, yet they remain marginalized within high-value aroma value chains due to limited access to technology, organized markets, and gender-responsive policy support. This paper examined the role of Women Technology Parks (WTPs) as institutional platforms for delivering hands-on training and enabling women's effective participation in the aroma sector. Through practice-oriented training in aromatic crop cultivation, essential oil extraction, quality assurance, packaging, branding, and entrepreneurship, WTPs facilitate skill enhancement and technology adoption among women farmers. The study highlights best practices emerging from WTP-led interventions, including shared processing infrastructure, collective enterprises, market linkages through SHGs/FPOs, and mentorship for women-led micro-enterprises. It also captured ground realities such as constrained land ownership, limited access to finance, price volatility, and lack of formal recognition of women as farmers. The paper proposes actionable strategies to strengthen WTPs as engines of gender-transformative change, including convergence with extension services, tailored technologies for women, digital market access, and supportive policy frameworks. Positioning WTPs at the centre of aroma-based value chains can ensure fair market access, sustainable livelihoods, and inclusive rural development for women farmers.

Keywords: Aroma crops, Empowerment, Entrepreneurship, Market linkages, Livelihoods, Value chains, Women farmers, Women technology parks

For correspondence: Rashmi<sebrawat82@gmail.com>

Elda Project: An Integrated Approach to Elderly Nutrition and Women's Livelihoods

Neelofar Illiaskutty, Manojkumar T.S.

Krishi Vigyan Kendra, ICAR-Central Plantation Crops Research Institute (CPCRI), Kasaragod, Kerala, India

India's elderly population, estimated at 103.8 million in the 2011 Census, faces increasing challenges due to age-related physiological changes, shifting socio-economic conditions, and the WHO-recognized double burden of malnutrition. Responding to this need, ICAR-KVK, CPCRI, Kasaragod developed elderly-friendly food technologies that are nutritious, affordable, and convenient, tailored to the reduced energy and specific nutritional requirements of older adults. The Elda Project operationalized these technologies through two pre-cooked, easy-to-digest products Concentrated Elda Powder and the traditional Elda Kanjikkoottu formulated using locally available millets, cereals, pulses, oilseeds, dried vegetables, fruits, and digestive herbs. Implementation is anchored by the Kudumbashree Mission, Kasaragod, which serves as the central engine of the project by establishing and overseeing five dedicated women-run production units across various CDSs, transforming local workers into skilled producers and strengthening women's economic autonomy. The technologies were transferred through structured training and demonstrations, and the products were packaged and distributed free of cost to senior citizens. This closed-loop model integrates scientific expertise, strong local governance, and women-led grassroots production, ensuring improved nutritional security for the elderly while providing stable, risk-free livelihoods for women, and offers a scalable and sustainable model for nutrition-sensitive social enterprises.

Keywords: Elderly, Empowerment, Food technology, Gerontology, Livelihoods, Malnutrition, Nutrition security, Sustainability

For correspondence: Neelofar Illiaskutty <neeloik@gmail.com>

Awareness and Adoption of Drudgery-Reducing Tools among Farm Women of Baramulla

Anjali Gairola¹, W.H. Raja¹, Preeti Mamgain²

¹Krishi Vigyan Kendra, ICAR-Central Institute of Temperate Horticulture (CITH), Baramulla, Kunzer 193404, Jammu and Kashmir, India; ²ICAR-Agricultural Technology Application Research Institute (ATARI) Zone I, Jammu and Kashmir, India

In India, women play a major role in agriculture and related fields. Rural women typically carry the “triple burden” of employment, which includes social, reproductive, and productive obligations. However, the type and degree of their involvement differ from state to state. Physical exhaustion, psychological strain, and associated health problems are frequently caused by this excessive workload. In agriculture, women are typically employed in tasks that require a lot of manual labour and are either not mechanized at all or just barely mechanized. The persistence of conventional labour-intensive methods, a lack of knowledge about drudgery-reducing technology, the incompatibility of current technologies, and psychological obstacles like unwillingness to change are all significant contributing factors. To determine the degree of awareness and use of specific drudgery-reduction tools among farm women, the current study was carried out in the Baramulla district of Jammu and Kashmir. A total of 150 respondents, representing ten distinct district blocks, were chosen at random from ten villages. A systematic questionnaire was used for collecting data through in-person interviews. The findings revealed that the majority of respondents had no or least awareness of drudgery-reducing tools, with many encountering the terminology for the first time during the survey. The improved sickle and handheld maize sheller were among the few instruments that just a small minority of farm women reported using. The study highlights the need for targeted intervention programs, particularly through Krishi Vigyan Kendras, to enhance awareness and promote the adoption of drudgery-reduction technologies among farm women for improving their work efficiency and overall well-being.

Keywords: Awareness, Baramulla, Drudgery, Farm women, Kashmir

For correspondence: Anjali Gairola <anjali.gairola@icar.org.in>

Drudgery Reducing Technologies - Efficient and Women Friendly Tools

Y. Uma Jyothi¹, S. Dhrua¹, A. Appal Swamy¹, B. Mukunda Rao¹, G. Sivannarayana¹, S.N. Meera²

¹Krishi Vigyan Kendra, Acharya N. G. Ranga Agricultural University (ANGRAU), Rastakuntubai, Kurupam, Parvatipuram 535523, Andhra Pradesh, India; ²ICAR-Agricultural Technology Application Research Institute (ATARI), Zone- X, Hyderabad 500035, Telangana, India

Weeding is removal of unwanted plants from the fields. It is one of the most important cultural activities in the crop production system and it is carried out by women by using hand hoe. They are still performing these activities in traditional methods using conventional tools. Although this method of weeding proves to be beneficial as it controls 98% of weed, it requires more labour and it involves more drudgery especially to the women farmers. During hand weeding, they adopt the bending and sitting posture of the body, which increases their physical workload and, in addition, they suffer from a variety of muscle-skeletal problems, resulting in a greater capacity reduction in women stressing demand to provide farm women friendly labour-saving, cost-effective and simple farming tools. Majority of women performs weeding activity in squatting posture for long time in very uncomfortable posture leading to lower back pain, musculo-skeletal disorders and drudgery of farm women. Non availability of labour during peak season is added burden to the farmers. Women increase their workload, causing significant physical, mental fatigue and other health problems. Hence, the study was conducted with an objective to assess the performance different weeders for drudgery reduction in vegetable production carried in fields of Kurupam, and Gummalaxmipuram mandals of Parvathipuram Manyam district by the Krishi Vigyan Kendra, Rastakuntubai with the sample size of 30 farm women. The results revealed that work efficiency with the use of CRIJAF weeder was good and taken less time for performing weeding activity 6hrs/acre and saved the labour cost of ₹ 900/- as compared to other two weeders CRIDA (₹ 1800/-) and manual weeding (₹ 2700/-). Reduction of drudgery and postural discomfort was observed and use of these weeders helps in saving of time and energy among farm women in vegetable production system and were highly appreciated and accepted by small farming community.

Keywords: Drudgery, Efficient and operation, Vegetable production

For correspondence: Y. Uma Jyothi <umajyothiy@gmail.com>

ICT Application by Farm Women in Climate Change Adaptation Interventions

R. Neela Rani, W. Jessie Suneetha, Lakshmi Challa, G. Swarupa Rani, Swetha Kodali

All India Coordinated Research Project on Women in Agriculture (AICRP), Professor Jayashankar Telangana Agricultural University, Rajendranagar, Hyderabad 500030, Telangana, India

The aim to impart knowledge to people and to empower themselves through introduction of Information Technology in areas relating to health, education, labour and employment, commerce, etc. and prepare the farming community to face the challenges of climate change by adopting climate smart practices is the need of the hour. The role of extension system is to groom farmer into the most intelligent and aware decision maker. The innovative extension approach should be on ICT+capacity building. The farmer friendly technology dissemination process needs to be handled with careful planning for inclusion of appropriate ICT modules. The use of ICTs can enhance opportunities of the reaching the unreach farming community to live in close proximity of the scientific input. Strong linkages needs to be established between direct ICT interventions and it should be part of the different programmes on directed specially women development.

Based on purposively selected data of farm women, a group comprising of 10 farm women from each village was formed to empower their knowledge on climate-smart agriculture. Farm women with smartphones were formed into village-wise Whatsapp groups along with the local leaders for proper connectivity. Text messages, audio messages, and videos were sent. These text messages were directed to farm women on a specific topic of CSA enlisted on day to day basis and it was administered in different forms of voice, text, and video through mobiles. Pre-test data reveals that 60% of farm women were aware of climate change onpercentage level of awareness on indicators of climate change, level of knowledge about causes of climate change, climate variable influencing production, adaptation practices for climate change. Post-test intervention data reveals that 80% of farm women were aware of climate change onpercentage level of awareness on indicators of climate change, level of knowledge about causes of climate change, climate variable influencing production, adaptation practices for climate change.

Keywords: Adaptation practices, Climate change, Farm women, ICT, Smartphones

For correspondence: R. Neela Rani<neelar47@gmail.com>

Digital Interventions, Nutrition Practices, and Intra-Household Food Decision-Making among Rural Women: A Descriptive Survey-Based Study from Punjab

Sukhdeep Kaur, Manpreet Kaur, Maninder Singh Bons

Krishi Vigyan Kendra, Punjab Agricultural University (PAU), Bahawal, Hoshiarpur 146105, Punjab, India

Nutrition behaviours among rural women are shaped by access to food, knowledge, and household decision-making, while growing use of digital tools offers new opportunities for nutrition information; however, descriptive evidence linking digital exposure with nutrition practices and women's participation in household food decisions remains limited. A cross-sectional descriptive survey was conducted among 200 rural women from Hoshiarpur and Amritsar districts of Punjab, India using a structured questionnaire, to assess digital access, exposure to nutrition-related digital content, nutrition behaviours, and women's involvement in intra-household food-related decision-making. Data were analyzed using frequencies and percentages to identify patterns and trends. According to the results, the majority of respondents were aged 23-42 years (60%), married (85%), and were not engaged in paid employment (70%), while about 30% reported involvement in self-employment or wage work. About 68% had access to mobile phones, while 44% reported regular exposure to nutrition-related digital content. Messaging applications (62%) and social media platforms (53%) were the most commonly used sources of information. Among women exposed to digital nutrition messages, 72% reported improved awareness of balanced diets and 64% reported better understanding of micronutrient-rich foods. Adoption of diversified diets was reported by 53% of digitally exposed women, compared to 28% among women with limited digital exposure. Increased consumption of seasonal fruits and vegetables was reported by 29% and 66%, respectively. Improved food preparation and preservation practices were reported by 48% of respondents with digital exposure. In addition to dietary practices, digital exposure was associated with greater involvement in household food-related decision-making. Over half (67%) of digitally connected women reported increased participation in meal planning, food selection, and dietary modifications at the household level. Many respondents indicated that access to digital nutrition information improved their confidence to suggest healthier food choices within the family. Despite these positive patterns, 56% of women reported challenges such as limited digital literacy, shared ownership of devices, and restricted autonomy over technology use. The descriptive evidence indicates that digital interventions are associated with improved nutrition awareness, healthier dietary practices, and enhanced participation of rural women in intra-household food decision-making. Strengthening equitable digital access, improving digital literacy, and promoting locally relevant nutrition messaging can further enhance the role of digital platforms in supporting nutrition-sensitive and gender-responsive outcomes in rural agri-food systems.

Keywords: Empowerment, Decision making, Diet diversity, Literacy, Digitalization, Nutrition

For correspondence: Sukhdeep Kaur <sukhdeepkaur@pau.edu>

Underexploited Indigenous Bio-resources of Northeastern India: Designing Year-Round Nutri-Gardens for Enhanced Household Nutrition and Livelihood Security

Divya Parisa, T. Amrutha, Mainak Ghosh, Arun Kumar Singha, P.K. Pathak, A.K. Mohanty

ICAR-Agricultural Technology Application Research Institute (ATARI) Zone VII, Umaim, Barapani, Shillong, 793103 Meghalaya, India

Northeastern India, is a recognized agro-biodiversity hotspot, yet paradoxically faces significant nutritional insecurity. Strategic promotion of integrated backyard nutri-gardens is a sustainable solution, leveraging the region's wealth of underexploited indigenous crops and livestock. Traditional tuber and vegetable species such as *Alocasia*, *Xanthosoma* (Tannia), Arrowroot, Cassava, Coleus, Coclocasia, Elephant Foot Yam, Greater Yam, Lesser Yam, Potato Yam, Sweet Potato, White Yam, Winged Bean, and Yam Bean are nutritionally dense, climate-resilient, and historically adapted to local conditions but remain marginalized in mainstream agriculture. These crops offer vital carbohydrates, dietary fibre, vitamins (A, C), and essential minerals like calcium, potassium, and iron. Their integration with underexploited fruit crops [e.g. Sohiong (*Prunus nepalensis*), Japong (*Citrus* spp.), Star Apple, and wild berries] and high-value spice crops can dramatically enhance dietary diversity and micronutrient intake. Furthermore, synergizing horticulture with low-input backyard poultry and piggery systems provides complete protein, accelerates nutrient cycling, and boosts household income.

A well-designed, 500-600 sqm nutri-garden model, incorporating sequential cropping and perennial layers, can supply a household of five with an estimated 150-200 kg of fresh vegetables, 800 kg of starchy tubers, 60-80 kg of fruits, and significant quantities of spices annually. This output can meet a substantial proportion of the Recommended Dietary Allowance (RDA) for energy, protein, and key micronutrients throughout the year. Critical to success is a meticulously planned crop calendar to bridge the "off-season" gap, which in NER primarily occurs during the cool, dry winter months (November to February) and the peak monsoon period (June to August), when conventional vegetable production dwindles. This holistic approach ensures continuous harvest, maximizes land use efficiency, and builds climate resilience. By valorizing indigenous agro-biodiversity through scientific nutri-garden models, Northeastern India can effectively combat hidden hunger, improve livelihood security, and conserve its unique genetic heritage, contributing directly to the achievement of Sustainable Development Goals (SDGs) 2 (Zero Hunger) and 3 (Good Health and Well-being).

Keywords: Agrobiodiversity, Climate-resilience, Food security, Micronutrients, Nutraceuticals, Nutri gardening

For correspondence: Divya Parisa<divya3233@gmail.com>

Assessment of Intervention on Drudgery Reduction for Farm Women of Hilly Areas

Rashmi Limbu

Veer Chandra Singh Garhwali Uttarakhand University of Horticulture and Forestry (VCSGUUH&F), Bharsar, Pauri 246123, Uttarakhand, India

In the hilly areas of Uttarakhand women play dominant role in agriculture. They are involved in almost all agricultural operations. These agricultural operations involve bending, squatting, crouching for extended hours which are often repetitive, time consuming resulting in musculoskeletal disorders. Majority female farmers in district Pauri Garhwal perform dairy related and post harvest management activities using traditional conventional tools leading to drudgery.

Therefore, the present study was conducted with an objective of assessing long handle spring brace rake for reducing drudgery of farm women in dairy and post harvest management activities in villages of district Pauri Garhwal. The study was conducted in villages Bhuransi and Dhulet, block Pabou with a sample size of 20 (control group- 10 and experimental group-10). In the experimental group, subjects were asked to perform dairy and post harvest management activities using long handle spring brace rake where as in control group subjects performed these activities using traditional tools like dranti and wooden rake. Likert frequency scale was used *i.e.* Always (score-1), Often (score-2), Occasionally (score-3) to assess physiological stress. The results revealed that long handle spring brace rake resulted in less physiological stress in activities like spreading of green fodder (3.8 ± 0.63), collection of green fodder/ preparing heap (3.3 ± 0.48), spreading of dry fodder (4.4 ± 0.69), collection of dry fodder (3.3 ± 0.48), spreading of grains while drying (3.4 ± 0.51), cleaning of cow shed (3.2 ± 0.92), collection of leaves in kitchen garden (3.8 ± 0.42) as compared to control group. On five point likert scale (highly relevant to irrelevant) long handle spring brace rake was found to be highly relevant for biomechanical, physiological fatigue/physical stress and work out put and relevant for tool factor and field acceptability. It is concluded that the technology resulted in reducing drudgery and is acceptable by farm women thus can be recommended for farm women of hill areas.

Keywords: Agriculture, Drudgery, Ergonomics, Fodder, Hill farming, Mechanization, Tools, Women

For correspondence: Rashmi Limbu <rashmilimbu@gmail.com>

Empowering Women Farmers through Digital Advisory Tools: Lessons From Digital Skill Trainings in Asia and Africa

Kavita Mishra¹, Mahesh Handiganala Munireddappa¹, Poonam Jasrotia², Dilruba Sharmin¹, Malvika Chaudhary¹

¹Centre for Agriculture and Biosciences International (CABI), ICAR-National Agricultural Science Complex, New Delhi, India;

²Indian Council of Agricultural Research (ICAR), New Delhi, India

Digital agricultural advisory tools offer new opportunities to overcome limitations of conventional extension services, such as limited staff, difficult-to-reach terrains, and a lack of tailored information to diverse problems. However, effective use of these tools remains constrained by gaps related to accessibility, affordability and ability among women farmers. To address these gaps, CABI PlantwisePlus has developed a suite of digital tools to strengthen the knowledge and skills of agri-service providers in 27 countries, enabling them to transform their knowledge into adaptive learning for smallholder farmers and facilitating the practice of IPM. These digital advisory tools provide opportunities to access agricultural advice when face-to-face extension services are not available.

To bridge these gaps, a three-tier cascade skills training approach was piloted in Ghana, Uganda, Nepal, Pakistan and Bangladesh in 2025. This approach focused on building the technical and facilitation capacities of master trainers, who in turn trained extension officers to deliver digital advisory services to women and smallholder farmers. A diverse range of stakeholders, including representatives from the Department of Agricultural Extension, agro-input dealers, plant doctors, IPM facilitators, community-level women mobilisers, and the private sector, were trained to ensure the sustainability of the initiative.

Outcomes of the program are significant, directly reaching 6,440 women farmers in three months of the pilot. Among all trained participants, 80% were women farmers. The initiative strengthened women's decision-making and advisory roles while leveraging digital advisory tools to bridge the gender divide. Participants also reported increased confidence in decision-making and greater adoption of climate-smart agricultural practices using digital advisory tools. This enabled the delivery of timely, relevant, and climate-smart plant health practices, contributing to more sustainable and gender inclusive farming systems. Notably, women IPM facilitators demonstrated increased confidence and proficiency in using smartphones and digital advisory applications, reflecting meaningful gains in empowerment and digital capability.

Keywords: Climate-smart agriculture, Digital advisory, Empowerment, Extension services, Integrated pest management, Women farmers

For correspondence: Kavita Mishra <k.mishra@cabi.org>

Gender Dimensions of Millet Cultivation and Value Chains in Rain-Fed Agriculture: A Case Study of Nandurbar, India

A.H. Deshmukh, V.R. Gurve

Krishi Vigyan Kendra, Kolda, Nandurbar 425412, Maharashtra, India

Millets are climate-resilient cereals that play a critical role in sustaining livelihoods and nutritional security in rain-fed and tribal regions of India. Nandurbar district of Maharashtra, characterized by marginal landholdings (<2 ha for over 70% of farm households), low-input agriculture, and high rainfall variability, continues to cultivate millets such as pearl millet, finger millet, and small millets. This study analyzes millet-based agri-food systems in Nandurbar with a focus on women's participation and associated socio-economic and nutritional outcomes. The research employed a mixed-methods design involving a primary survey of 120 farm households, 8 focus group discussions with women farmers and Self-Help Groups (SHGs), and 15 key informant interviews with extension officials and local institutions. Secondary data from district agricultural and nutrition records were used for triangulation. Gender-disaggregated analysis assessed participation across production, post-harvest processing, value addition, and marketing. Results show that women contribute 65-80% of labour in millet cultivation and nearly 90% of post-harvest processing activities, including cleaning, drying, and milling. Approximately 42% of surveyed households reported engaging in women-led value addition activities such as flour preparation and ready-to-cook products, leading to an average 18-25% increase in household income from millets. Dietary diversity scores were significantly higher in households consuming millets at least three times per week. Key constraints identified include limited access to improved seed (reported by 58% of respondents), institutional credit (61%), and organized markets (67%). The study underscores the importance of gender-responsive interventions, including women-focused extension services, access to quality inputs, and market integration, to strengthen millet-based agri-food systems and enhance resilience and nutrition in climatically vulnerable regions like Nandurbar.

Keywords: Agri food systems, Climate resilience, Dietary diversity, Livelihoods, Millets, Nandurbar, Value addition, Women farmers

For correspondence: A. H. Deshmukh<aratideshmukh1@gmail.com>

Women-Centric KVK Interventions for Nutrition and Livelihoods

Tushar Ramchandra Athare, T. Rajesh, Shakir Ali Q. Syed, S.K. Roy, Anita Deshmukh

ICAR-Agricultural Technology Application Research Institute (ATARI), Zone VIII, Pune, College of Agriculture Campus, Shivajinagar, Pune, 411005, Maharashtra, India

Women play a central role in Indian agriculture, contributing nearly 75% of the agricultural workforce, particularly in labour-intensive operations such as sowing, weeding, harvesting, post-harvest processing, and livestock management; however, they experience higher drudgery, limited access to resources, and poor nutritional outcomes. Nutritional vulnerability among women remains a major concern, with more than 57% of women and 59% of adolescent girls suffering from anemia, along with widespread deficiencies of calcium and other micronutrients, adversely affecting health, work efficiency, and household nutrition security. Studies further indicate that women spend longer hours in agricultural and domestic labour, resulting in time poverty and physical strain, while access to improved tools, technologies, and extension services remains limited. Although women perform over 60% of farm-related operations, their participation in value addition and enterprise development remains constrained.

In this context, women-centric technologies assume critical importance as they directly address women's specific needs by reducing physical workload, improving nutritional status, enhancing income opportunities, and strengthening decision-making power. Krishi Vigyan Kendras (KVKs) play a pivotal role in assessing, refining, and disseminating such technologies to enhance nutrition security and sustainable livelihoods in rural India. The present study synthesizes outcomes of on-farm technology assessments conducted across KVKs in Maharashtra, focusing on drudgery reduction, nutrition management, storage techniques, value addition, and women-led enterprise development. These interventions were evaluated through on-farm trials and demonstrations, comprising a total of 261 trials covering 10 technologies across the state. In addition, skill development trainings under RKVY were conducted for women on enterprises such as beekeeping, mushroom cultivation, and nursery management.

The findings revealed that consumption of drumstick (*Moringa oleifera*) leaf powder resulted in an 11.70% increase in blood calcium levels among women, while solar dryer technology improved the dehydration ratio of dried produce by 4.61%. Nutrition-focused interventions, including drumstick and cauliflower leaf powder supplementation and consumption of biofortified red rice, pearl millet, and sorghum, led to measurable improvements in hemoglobin levels and dietary diversity among women and adolescent girls. Overall, the assessed technologies were technically feasible, economically viable, and socially acceptable, demonstrating strong gender-transformative potential. The study highlights the critical role of KVK-led technology assessment in advancing inclusive, nutrition-sensitive, and drudgery-reducing innovations for sustainable rural development.

Keywords: Drudgery reduction, Krishi Vigyan Kendra, Nutrition security, Rural livelihoods Women empowerment, Women-centric technologies

For correspondence: Tushar Ramchandra Athare <tushariari@gmail.com>

From Crop to Nutrition Security: Building Future Leadership in the Agri-Food Sector

Shivangi Tripathy, Tanya, Ritu Prakash Dubey

Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Naini, Prayagraj, Allahabad 211007, Uttar Pradesh, India

The agri-food sector is rapidly evolving in response to rising food and nutrition insecurity, climate change, population growth, and increasing demand for sustainable and affordable diets. In this changing landscape, future leadership in the agri-food sector must be driven by food and nutrition innovation that bridges agriculture, processing, and public health outcomes. Food and nutrition professionals play a critical leadership role by transforming agricultural raw materials into value-added, nutrient-dense, and inclusive food products that support sustainable food systems.

This paper highlights the importance of building future agri-food leadership through food and nutrition-based research, with specific reference to plant-based product development using peanut milk. Peanuts are a widely available, cost-effective, and protein-rich agricultural commodity, making them a promising raw material for addressing protein-energy malnutrition and micronutrient deficiencies, particularly in low- and middle-income populations. The development of peanut milk demonstrates leadership through innovation by integrating agricultural resources with food processing techniques to produce a nutritionally viable alternative to dairy milk.

The study emphasizes how such food-based innovations contribute to sustainable agri-food systems by promoting plant-based diets, enhancing value addition at the farm level, and improving accessibility for lactose-intolerant, vegetarian, and economically vulnerable populations. Moreover, this approach reflects key leadership competencies such as systems thinking, problem-solving, and sustainability orientation, which are essential for addressing contemporary agri-food challenges. Educational and research institutions play a pivotal role in nurturing such leadership by encouraging interdisciplinary training, research-led innovation, and community-oriented solutions.

In conclusion, food and nutrition research, exemplified by peanut milk development, serves as a powerful pathway for building future leadership in the agri-food sector. Empowering young researchers and professionals to develop nutrition-sensitive, sustainable food innovations will strengthen agri-food resilience and contribute to long-term food and nutrition security.

Keywords: Agri-food leadership, Food and nutrition innovation, Nutrition security, Peanut milk, Plant-based foods, Sustainability

For correspondence: Shivangi Tripathy <shivangitripathy7@gmail.com>

Impact of Bajra Based Product on Adolescent Girls through on Farm Trial in Sahibganj District of Jharkhand

Maya Kumari

Krishi Vigyan Kendra, Maheshpur, Pakaur 816106, Jharkhand, India

Malnutrition is common in adolescent girls. Anemia among adolescents adversely affects growth, resistance to infections, cognitive development and work productivity. Iron deficiency in adolescent girls is due to blood losses with menstruation, lack of knowledge about nutritive value of farm produce, lack of knowledge about preparation technique of iron rich products and lack of knowledge about recommended dietary allowances for the adolescent girls. The farmers of hilly area of Sahibganj districts produce large amount of Bajra. Bajra is a full source of iron and phosphorus. Hence, a bajara based food product was developed by Krishi Vigyan Kendra, Sahibganj and evaluate its impact on adolescent girls of Banjhi Village in the Sahibganj district of Jharkhand to eradicate anemia through on farm trial (OFT). On the basis of present trial, it can be concluded that bajra based food product developed had positive influence on weight, height, arm circumference, chest circumference and head circumference of the girls studied under the trail. Technology option 1 (TO1) resulted in increased weight of girls to 4.50 kg (10.45%), height increased by 2.5 cm (1.55%), arm circumference increased by 0.73 cm (3.61%), chest circumference increased by 8.85 cm (14.45%) and head circumference increased by 1.59 cm (2.79%) at the end of trial as compared to initial values in these parameters. No change in taste and colour of the product developed was observed up to one year which clearly indicates the longer shelf life of the product. As far as bajra based products and market available women food both are highly significant at 5% level of significance. But, in case of cost of production, the cost of 1 kg market available women food is ₹ 500. Whereas, the bajra based products costed only 44.14 per kg. Another thing is that, all the ingredients of bajra based products are locally available. So, farmers can easily accept bajra based products for eradicating anemia in adolescent girls.

Keywords: Anemia, Adolescents, Bajra, Bioavailability, Nutrition, Supplementation

For correspondence: Maya Kumari <mayabau@rediffmail.com>

Awareness, Need and Perception of Farm Women of Bihar Towards Entrepreneurial Development

Gitanjali Chaudhary, Neelam Kumari, Sangeeta Deo

Dr Rajendra Prasad Central Agricultural University, Pusa, Samastipur 848125, Bihar, India

Agriculture is not just a sector in India but it is the backbone of the country's social and economic fabric. This sector supports rural livelihoods through farm entrepreneurship and farm-generated employment thereby alleviating poverty levels in the rural population. It is very important to empower women socially and economically as the livelihood of these farm women depend entirely on farming and related activities. Today, policymakers of India have widely acknowledged the role of rural entrepreneurship as the engine of rural development. Thus, the farm women should be encouraged to take up entrepreneurship as a career because they are the backbone of the society and important resource in agriculture and rural economy of Bihar. The present study has been conducted in four blocks of two districts *i.e.* Muzaffarpur and Sheohar district of Bihar. A household survey data of 1000 families revealed that majority of farm women (56.2%) belong to nuclear family and their illiteracy percentage was highest (66.9%). With regards to their caste categories, 76.2% of farm women belong to OBC category followed by SC (21.6%) and General (1.8%). Agriculture is the primary occupation for 60.5% farm women followed by agricultural labourers and small business. Majority of population is growing wheat and rice as their major crop followed by maize and millets. Land holding capacity is also found less than one hectare among 87.5% of the households. In regard to age majority (47.2%) of farm women are falling under the age of 36-55 years and 64.0% respondent are mostly farm women and cultivator as their main occupation.

As per as social participation is concerned, majority of farm women are the member of SHGs like JEEVIKA. 83.7% farm women are interested in enhancement of entrepreneurial skill and their perception was to be found very positive for entrepreneurial development but they don't have adequate knowledge and skill to start their own enterprise. Most of the farm women are agreed that they don't have sufficient knowledge related to financial, banking and legal procedure for establishment of an enterprise. After all the observation it was found that 96.8% farm women have expectation that they can enhance their income after establishing her own enterprise.

Keywords: Agripreneurship, Entrepreneurship, Farm women, Rural livelihoods, Self-help groups, Women empowerment

For correspondence: Gitanjali Chaudhary <gitanjali@rpcau.ac.in>

Enhancing Child Nutrition through Women-Led Agri-Food System Innovations: Development of a Probiotic Millet Snack Bar

R. Vijayalakshmi¹, R. Arunkumar²

¹Tamil Nadu Agricultural University (TNAU), Madurai 625104, Tamil Nadu, India; ²Agricultural College and Research Institute, TNAU, Chettinad, Tamil Nadu, India

Millets are veritable storehouses of health and nutrition. It is high in fiber, protein, iron and calcium, making it essential for children to consume. The consumption of fast food and snacks increased significantly in recent years. In this study, millets being highly nutritious were used in the development of bars instead of cereals. Standardization of millet bar were carried out with different millets. Fruit bars were inoculated with probiotic cultures such as *Lactobacillus delbrueckii*, *Lactococcus fermentum*, *Streptococcus thermophilus*, *Bifidobacterium bifidum* and *Lactobacillus acidophilus*. They were tested for acid and bile tolerance. The cultures were inoculated in the mango fruit bar and is placed on the millet bar. The bars were packed in MPP covers and stored at room temperature. *S thermophilus* tolerated well at pH 2.0 and exhibited maximum growth 0.241 after four hour of incubation compared to *L. delbrueckii* and *L. acidophilus*. The moisture content of the millet fruit bar was 6.32 which was within the safe level for storage. The protein content of the bar was 14.58 g/100g. The fat content of the bar was less which was found to be 6.72g% which is ideal for those who prefer low fat snack. The calcium and iron content of the millet fruit bars were 1.73 and 35.15mg%. All the parameters like colour and appearance, texture, flavour, taste and overall acceptability were above 8.50 during initial day of storage indicating the product was highly acceptable. The probiotic microbes did not influence the organoleptic properties of the bars. The increase in microbial population was minimum during the storage.

Keywords: Cereal bars, Fruit bars, Millets, Nutrient content, Probiotic

For correspondence: R. Vijayalakshmi<vijimurugan_15@yahoo.co.in>

Empowering Women in Agri-Food Systems through Value Addition: Development of Ready-to-Serve Fruit Juices Enriched with Rice Bran Extracts

R. Vijayalakshmi¹, R. Arunkumar²

¹Tamil Nadu Agricultural University (TNAU), Madurai 625104, Tamil Nadu, India; ²Agricultural Collage and Research Institut, TNAU, Chattinad, Tamil Nadu, India

Rice is one of the most economically important foods in the world today. While several rice byproducts have applications in agriculture, rice bran has probably received the most attention for its functional properties among the byproducts of rice. Fruit juices have an important role to play as part of a healthy diet and help to replenish the body cells. The rice bran from ADT 47 was stabilized and rice bran extracts were obtained and incorporated at 10, 15 and 20 percentage in pineapple, papaya and orange RTS beverages. The rice bran has been stabilized by pan roasting method at 80°C for 20 min in order to prevent the fatty odour in extract. To the stabilized rice bran of 100g, 400 mL of deionised water has been added and mixed well and stirred it using magnetic stirrer for 20 min. The filtrate has been collected. To get the clear extract without any floating particles it has been centrifuge at 2700 rpm for 20 min. RTS has been prepared based on the standard procedure for pineapple, papaya and orange fruits. The rice bran extract were incorporated in the prepared RTS at different levels like T₁ (10%), T₂ (15%) and T₃ (20%). The incorporated RTS has been organoleptically evaluated and its chemical characteristics also been analysed. From the sensory and chemical characteristics. Addition of rice bran extract at different levels (10,15 and 20%) had great influence on the flavor and taste in all the three RTS beverages. T₁(10%) samples had more acceptable sensory characteristics. T₃ (20%) samples has higher antioxidant activity. T₂ (15%) have optimum nutritional and sensory characteristics than T₁ and T₃. Addition of 15% of rice bran extracts increased the antioxidant content to 16% in orange juice, 3% in pineapple juice , 9% in papaya RTS respectively. Cost of production RBE incorporated fruit RTS like pineapple, papaya and orange T₃ (20%) was ₹14.5, 12 and 19.8/250 mL respectively.

Keywords: Antioxidants, Fortification, Nutraceuticals, Rice bran, Sensory evaluation, Value addition

For correspondence: R. Vijayalakshmi<vijimurugan_15@yahoo.co.in>

Women Farmers and Agri-Food System Resilience in Dahod a Climate-Vulnerable District of Gujarat

Suneeta Chandorkar, Surabhi Pareek, Rosemary Mondal

The M. S. University of Baroda, Fatehgunj, Vadodara, 390002, Gujarat, India

Dahod, an aspirational tribal district of Gujarat, is characterised by rain-fed agriculture, fragmented landholdings and limited institutional support, making farming households highly vulnerable to climatic and structural shocks. Women farmers play a central yet under-recognised role in sustaining household food systems through cultivation, livestock care, post-harvest processing, and dietary decisions. Their resilience is critical for nutrition-sensitive and climate-resilient development in fragile agro-ecologies. This study applies FAO's RIMA-II framework to assess household food-system resilience in Dahod, with a specific focus on women farmers' roles, constraints, and adaptive strategies.

A mixed-methods, cross-sectional study was conducted in four villages of Garbada block, covering 24 small and marginal farming households, where women led or dominated daily agricultural operations in 75% of cases. Quantitative data were collected through structured household surveys and complemented by women-focused focus group discussions. Indicators were standardised using Z-scores and composite pillar scores were derived using Principal Component Analysis. A Resilience Index (RI) was computed as the average of Assets, Access to Basic Services (ABS), Adaptive Capacity (AC) and Social Safety Nets (SSN), with households classified into low, medium and high resilience using tertiles. Exploratory and Confirmatory Factor Analyses validated the resilience construct, while ANOVA assessed inter-pillar differences across resilience levels. Qualitative data were thematically analysed.

Despite similar farming experience (~22 years), small farmerstypically male landholdershad larger landholdings, higher incomes and greater livestock and machinery ownership than marginal farmers, while women's labour and decision-making roles remained substantial across both groups, especially in seed selection, livestock care, and post-harvest work. The absence of storage facilities disproportionately increased women's workload and food-loss risks. Institutional engagement was uneven: PM-Kisan had high coverage, but uptake of crop insurance and formal credit was minimal. Food Consumption Score was strongly associated with grain availability ($r = 0.828$, $p < 0.001$), highlighting the role of self-production and PDS in dietary diversity. Assets, Adaptive Capacity, and Social Safety Nets emerged as key resilience drivers, with significant differences in SSN and basic services across resilience levels. Women's adaptive practices were largely necessity-driven, constrained by land and credit gaps, while younger, educated women showed higher adaptive capacity through digital tools.

Women farmers are central to household food-system resilience in Dahod but remain constrained by structural and institutional deficits. Targeted investments in women's assets, services, and financial inclusion are essential to convert resilience into sustained nutritional gains.

Keywords: Adaptive capacity, Climate resilience, Food systems, Social safety nets, Vulnerability, Women farmers

For correspondence: Suneeta Chandorkar <suneetachandorkar@gmail.com>

From Farm to Family Food: Value Addition-Success Story of Rural Woman Entrepreneur

Supriya P. Patil, T.N. Devaraja

Krishi Vigyan Kendra, Davanagere, Kadalivana, Taralabalu, Davangere 577004, Karnataka, India

In this globalized world, economic growth of a country totally depends on the participation of women in the Rural Development. But a society like India is dominated by man, it is very complicated for a women to think about to establish their own startups. In order to encourage the Women Entrepreneurship Government of India has taken up many initiatives one among them is PMFME scheme, which helped many entrepreneurs to build up their lives. One among these entrepreneurs is Smt. Saroja N. Patil, 73 years old rural farm woman from Nittur Village, Harihara Taluk of Davanagere District. Smt. Saroja is an active farm women engaged in cultivation of Paddy, Coconut, Arecanut, Sugarcane and Millets in organic method. Even though her family used to get good income from farming she was not satisfied with the prices that the family is getting from Coconut and Millets. Hence, she taught of value addition of millets which are nutritious and good for human health. At that time she visited ICAR-Taralabalu Krishi Vigyan Kendra for information on value addition of millets. With the help of Krishi Vigyan Kendra scientists she has undergone many trainings on millets at CFTRI, Mysuru. UAS, Dharwad and UAS, Bengaluru. After training she started processing unit by the name TADHVANAM at Nittur. She took loan under PMFME scheme and started preparing many value added products like Seven days seven millets, Malt powders, Millet energy mix, Millet khakhra's, Millet vermicellies, Raw banana powder, Soup powder, Coconut chips, pickles, Virgin coconut oil and many other products. She used to sell her products in Krishi Vigyan Knedra organic bazar on every Saturday and to Sahaja Samruddha. On an average annual turn over is ₹ 15,00,000 and monthly income ₹ 75,000- 80,000. Now she has emerged as a successful Rural Women Entrepreneur and Master Trainer in millet and banana value added products. She has got many awards for her achievements and also recognized as a Role Model for Rural Women Entrepreneurs in this region. Smt. Saroja's efforts led to significant improvements in household income, nutritional security and reduced post harvest losses.

Keywords: Entrepreneurship, Income, Millets, Nutrition, Rural, Value addition, Women

For correspondence: Supriya P. Patil<dvgtkvk@yahoo.com>

Building Future Leadership in the Agri-Food Sector

Pushpam Patel, Reeta Singh

Krishi Vigyan Kendra, Bihar Agricultural University, Sabour, Bhagalpur, Agwanpur, Barh 803214, Bihar, India

Women play a pivotal yet often underrecognized role in global agri-food systems, contributing extensively as farmers, farm laborers, agri-entrepreneurs, researchers, extension professionals, processors, marketers and primary custodians of household nutrition and food security. Across developing and developed economies alike, women are deeply embedded in every stage of the agri-food value chain, from production and post-harvest handling to food preparation and consumption. Despite their substantial contributions, women continue to face persistent and systemic constraints, including limited access to land ownership, financial services, modern technologies, quality inputs, education, extension support and leadership opportunities. These structural inequalities significantly restrict women's productivity, income potential, and decision-making power, ultimately undermining the efficiency, equity and sustainability of agri-food systems. This paper underscores women's empowerment as a transformative and strategic approach to strengthening agri-food systems and enhancing food and nutritional security. Empowering women not only improves individual livelihoods but also generates positive spillover effects at household, community and national levels by improving agricultural productivity, income distribution, dietary diversity and intergenerational well-being. It explores multiple pathways for women's empowerment, including capacity building through targeted training and education, digital inclusion via access to information and communication technologies, promotion of women-led entrepreneurship, adoption of climate-smart agricultural practices and leadership development to enhance women's participation in governance and policy processes. Particular attention is given to the role of institutional and policy frameworks in enabling equitable access to productive resources, strengthening legal rights, promoting women-friendly financial instruments and recognizing women's contributions to agri-food governance and rural development. Evidence from diverse contexts demonstrates that empowering women leads to higher agricultural yields, improved farm management, better nutritional outcomes, enhanced household food security and more resilient rural livelihoods. Moreover, women's empowerment accelerates progress toward global development commitments, particularly the Sustainable Development Goals, including SDG 2 (Zero Hunger), SDG 5 (Gender Equality) and related goals on poverty reduction, climate action and inclusive economic growth. By fostering inclusive leadership, supporting innovation and addressing deeply rooted structural inequalities, women's empowerment emerges as a critical driver of transformation in agri-food systems. Strengthening women's agency, visibility and voice across the agri-food value chain is therefore not only a matter of social equity but a strategic imperative for achieving global food security and sustainable development.

Keywords: Gender equality, Inclusive leadership, Sustainable agriculture, Women empowerment, Women in agri-food systems

For correspondence: Pushpam Patel <pushpam.bpsac@yahoo.co.in>

Empowering Women through Processing of Underutilised Indigenous Hill Fruit Crops: A Success Story

Y. Prabhavati Devi¹, Y. Jamuna Devi², Arati Ningombam³, A. Ameeta Devi⁴

¹Krishi Vigyan Kendra, Imphal East, Central Agricultural University (CAU), Imphal, Manipur, India; ²Standard College, Imphal, Manipur, India; ³ICAR-Research Complex for North Eastern Hill Region, Manipur Centre, Imphal, Manipur, India; ⁴Krishi Vigyan Kendra, Chandel, Manipur, India

Chandel, a hilly terrain is bestowed with the most congenial climatic condition for the growth of various underutilized indigenous fruits and vegetables. Most of these underutilized fruits and vegetables are very rich in vitamins, minerals and antioxidants which remain wastage throughout the year. With greater pitch of productivity and value addition, these underutilized crops have greater potential for future commercialization, income generation of farm women which can also empower many women by establishing small foodpreneurship. Most of the villagers of Chandel district are economically and agriculturally backward as they are not exposed to any improve farm technologies. With the intervention of KVK, Chandel, Mrs. ST. Wanhriing from Lambung village, Chandel started producing more than 20 items from underutilized indigenous fruits and vegetables in the form of squash, ready-to-serve beverages, candy, pickle, snacks, bread spread, jam, jelly, candy chew, herbal tea, dehydrated vegetables, chocolate, fruit wine, tutti frutti, etc. The products are highly popular in the local market and now available in most of the departmental stores in Imphal. Besides, she is also selling her products to Meghalaya, Assam, Nagaland, Punjab and metro cities like Delhi, Mumbai, Bengaluru and Chennai. On an average the unit is earning a net profit of ₹ 10 lakhs annually which was earlier ₹ 32000 to ₹ 45000 per year. Moreover, the unit is generating self-employment of 4500 man-days in a year for 10 workers. Mrs. ST. Wanhriing become a successful entrepreneur, a trainer and also a role model which inspires the local women folks to work hard and make them economically self-reliant and improve their families' economic status. After seeing her enthusiasm, hard work and interest in production of fermented fruit juice from underutilised seasonal fruits, other villagers from Chandel district were also motivated, gave huge encouragement and confidence to take up such venture in Chandel district. After entrepreneurship development, she becomes more self-reliant, increases social participation, improves status of the family, increase influence and acceptability among fellow members. Her livelihood status also increases by purchasing new furniture, TV, vehicle and also improve the nutritional intake of the family. She can afford to send her children in good school. After seeing the success, many women from other villages comes up for starting such type of enterprise. Their social prestige has also been improved among the fellow villagers and society. After entrepreneurship development, she become more confident and self-sustainable.

Keywords: Empowerment, Indigenous, Underutilized, Value addition

For correspondence: Y. Prabhavati Devi <prabhayumnam@rediffmail.com>

An Assessment of Digital Literacy Constructs Pertinent to Future Leadership in Students Enrolled in Agricultural Higher Education

Lalita Vatta, Namita Yadav

Banaras Hindu Univeristy (BHU), Varanasi 221005, Uttar Pradesh, India

The ongoing wave of digital transformation is rapidly reconfiguring agri-food systems, changing production techniques, reinventing modalities of market integration, altering governance structures, and modifying leadership dynamics. Particularly for college students, digital literacy has emerged as a critical competency for producing future leaders. With the growing integration of digital extension systems, artificial intelligence-based advisory services, precision farming systems, and data-driven decision-making systems into the sphere of agriculture, access, interpretation, and application of digital information is no longer optional but essential for students and professionals working in the field. The lack of institutionalization of leadership-oriented, learning ecosystems and structural disparities in access to advanced digital proficiencies limit their ability to take on leadership roles, even though they are positioned as the next generation of agricultural professionals. Strengthening digital literacy in agricultural higher education is a step that will empower the future agricultural personnel to bridge the knowledge gap, provide context specific and inclusive advisory services, promote sustainable and climate smart agricultural practices and support innovation, entrepreneurship and the larger vision of Atmanirbhar Bharat. The present study adopted an evaluation-based approach to assess digital literacy among students enrolled in undergraduate agriculture programmes, using primary data collected through a self-structured assessment tool administered to students enrolled in agriculture programmes at Banaras Hindu University (BHU). According to the findings, the students were found to have an moderate level of digital literacy, reflecting a basic level of familiarity with digital resources. The study examined students' proficiency across key digital literacy constructs as delineated by basic digital access and safety, digital information handling, digital communication and collaboration, and digital content creation. Proficiency appeared to be comparatively consistent across different institutional factors, and no statistically significant differences were observed in overall digital literacy. Although the difference across course years appeared marginally higher when the mean scores of senior students were considered, the difference was not statistically significant. The findings emphasized the critical importance of purposeful instructional design and framed experiential learning to strengthen digital literacy among agriculture students, consequently enhancing their readiness to navigate effectively amid technology-driven agricultural environments.

Keywords: Agricultural higher education, Digital literacy, Future leadership, Students

For correspondence: Lalita Vatta<lalitavatta@bhu.ac.in>

Agri-Food Entrepreneurship as a Pathway to Women's Empowerment: A Case Study of Swabhlambi Women Self-Help Group in Tehri Garhwal, Uttarakhand

Kirti Kumari, Aalok Gulabrao Yewale

Krishi Vigyan Kendra, Tehri Garhwal, VCSG Uttarakhand University of Horticulture and Forestry, Ranichauri Campus, Tehri 249199, Uttarakhand, India

Women's Self-Help Groups (SHGs) are effective platforms for integrating agriculture-based livelihoods with nutrition security and women's empowerment. This case study documents the success of Swabhlambi Swayam Sahayata Samooh, led by Savita Rawat in Dikholgaon village, Chamba block, Tehri Garhwal district, Uttarakhand, highlighting its transition into a sustainable agri-food enterprise addressing both income generation and community nutrition. A descriptive case study approach was used to document interventions undertaken by an eight-member women's SHG during 2025-2026 with technical support from Krishi Vigyan Kendra (KVK), Tehri Garhwal. Major interventions included nursery production of 8,000-10,000 planting materials (Malta, Baanj, and Guriyal) under MNREGA, value-added food processing (Malta squash, hill lemon squash, rhododendron syrup, indigenous vegetable pickles), and adoption of oyster mushroom cultivation for income diversification. A key innovation was a community-based anemia control initiative through production and distribution of iron laddus and aonla candy, benefiting approximately 7,300 women (2025-26) and 256 adolescent girls (2021-22). Market linkage was strengthened through branding and sale of products under the Hilansbrand via the Government of Uttarakhand-supported 3K (Kisan, Krishak Kalyan) outlet. The SHG achieved an annual turnover of ₹15 lakh in year 2025 with a net profit of ₹5.3 lakh. Iron laddu production emerged as the major revenue source (₹8.9 lakh), demonstrating the economic viability of nutrition-sensitive agri-food entrepreneurship. The integration of nutrition intervention with entrepreneurship represents a unique model where therapeutic food production (iron laddus for anemic women) became both a public health solution and a sustainable livelihood option. The case highlights a scalable and replicable women-led model for hill regions, integrating indigenous resources, nutrition interventions, and market-oriented agriculture to enhance livelihoods and nutrition security.

Keywords: Agri-food enterprise, Community nutrition, Nutrition intervention, Self-help groups, Value addition, Women farmers

For correspondence: Kirti Kumari <kumarikirti95@gmail.com>

Optimizing Rice Cooking Practices to Improve Starch Digestibility and Glycemic Response: Implications for Future Food Systems

Renuka Aggarwal, Prabhjot Kaur

Punjab Agricultural University, Ludhiana 141004, Punjab, India

Rice is a major staple food and plays a critical role in food and nutrition security for future generations. Cooking induces structural changes in starch that can influence starch digestibility, resistant starch (RS), antinutritional factors (ANFs), and glycemic response, thereby affecting the nutritional quality of rice-based diets.

The present study evaluated the effect of common household cooking methods on starch digestibility, RS, ANFs, and predicted glycemic index (pGI) of rice. Three rice varieties PR 126, PR 131 (non-basmati) and PB1121 (basmati) were analyzed in raw and cooked forms. Rice-based preparations including boiled rice, vegetable pulao, and kheer were prepared using boiling, stir-frying, and simmering techniques. All samples were analyzed using standard analytical protocols. Statistical significance was assessed at $p \leq 0.05$.

Cooking significantly ($p \leq 0.05$) enhanced starch digestibility compared to raw rice, primarily due to starch gelatinization and structural modification. A significant reduction ($p \leq 0.05$) in antinutritional factors such as phytic acid, trypsin inhibitor activity, and tannins was observed, which showed negative correlations with starch digestibility. Reduction in resistant starch content following cooking led to a significant increase in pGI, with variations among cooking methods and rice varieties. Hot kheer and boiled rice exhibited the highest starch digestibility (84.94 ± 8.25 and 76.48 ± 6.20 mg/100 g, respectively), followed by stir-fried vegetable pulao (72.83 ± 7.14 mg/100 g) and cold kheer (67.57 ± 3.91 mg/100 g). Despite cooking, basmati variety PB1121 showed comparatively lower pGI, attributed to its higher slowly digestible starch fraction and higher amylose content.

Household cooking methods significantly influence starch digestibility and glycemic response of rice through reductions in resistant starch and antinutritional factors. Appropriate selection of rice variety and cooking practice can help optimize nutritional quality and glycemic outcomes, highlighting the role of young agri-food professionals in promoting evidence-based and nutritionally informed food preparation strategies for sustainable and healthy diets.

Keywords: Antinutritional factors, Cooking methods, Glycemic index, Resistant starch, Rice, Starch digestibility

For correspondence: Renuka Aggarwal <renukaaggarwal@pau.edu>

Impact of Nutri-farms/Nutri-gardens on Food and Nutrition Security among Farm Women in Chamarajanagar, Karnataka State, India

Y. Ravi, Usha Ravindra, Natraj Durgannavar

University of Agricultural Sciences, Dharwad 580005, Karnataka, India

The status of women in the society is the indication of progress which comprises good nutrition, health and socio psychological wellbeing. Among the micronutrients, iron and vitamin 'A' plays very important role in women and children. Iron and vitamin A deficiencies are major health concern in the study area Chamarajanagar district. This can be tackled by nutrition education and establishment of nutri-farms to improve the household consumption of farm produce especially green leafy vegetables and fruits. Diet diversification is the most sustainable and affordable strategy to improve nutrition for the majority of the vulnerable group. The sample size of 300 farm women who were willing to participate in the study taken from study area. The data was collected on socio economic, health and nutrition status. Farm women were divided into three categories for intervention with sub sample (n=90). The study revealed that nutrition education and nutri-farm interventions significantly improved the food and nutrient intake, dietary diversity, and nutritional status of farm women in Chamarajanagar. Group III, which received both nutrition education and nutri-farm support, showed the most notable improvements in vegetable intake. In group III, mean intake of green leafy vegetables, other vegetables and fruits were found to be 42.17 g, 36.47 g and 17.33 g, respectively which was below the RDA. However, after the intervention, the intake of same food groups was increased to 83.50, 69.07 and 27.33 g, respectively. After the intervention there was significant change in the % adequacy of energy, fiber iron and vitamin C was found. Highest change was observed in the intake of vitamin C and iron (83.01 to 109.95) and (57.87 to 94.45%). Income levels and anthropometric indicators also improved slightly post-intervention. These findings highlight the effectiveness of integrating nutri-farms and nutrition education in improving household nutrition security and health outcomes among rural farm women.

Keywords: Diet, Dietary diversity, Health, Intervention, Micronutrients, Nutri-farm, Nutrition, Women

For correspondence: Y. Ravi <raviy@uasd.in>

Digitalization of the Agri-Food System

Priyanka Patel, Chetna Pathak, Abhijeet Kuderiya, Bharat Bansal

Jawaharlal Nehru Krishi Vishwa Vidyalaya, Suhagi, Adhartal, Jabalpur 482004, Madhya Pradesh, India

The study emphasizes digitalization as both an enabler of production efficiency and a radical innovator, transforming business models and agricultural practices. It explores the development of applications and products that links consumers, supply chain actors, and producers, leading to create personalized food products. A healthy, attractive, sustainable, and scalable food system is vital for Green Transition and requires enabling Digital Transformation. Sustainable agri-food systems involve large-scale coordination of farming and value chain operations, resource use, and food chains, and they require extensive digital devices and infrastructure technologies to enable and provide data and digital information chains. Digital transformation refers to a comprehensive change in business strategies, management structures, and operations by incorporating digital technologies (DTs). It encompasses the digitalization of processes and the formation of extended supply chain relationships and the utilization of the internet in various aspects of the business. This transformation will lead to enhance products and services, more efficient operations, cost reductions, and a competitive advantage in the market. DTs are various and complex and often classified into four categories: Efficiency technologies (e.g. Cloud Computing), connectivity technologies (e.g. Internet of Things [IoT]), trust disintermediation technologies (e.g. Blockchain), and automation technologies (e.g. Artificial Intelligence (AI) and Big Data). Digital transformation is a requirement to build a strong circular agri-food system by enabling more effective and sustainable methods in the production, distribution, and consumption of food. Addressing these needs requires an interdisciplinary approach that goes beyond technology itself. It involves understanding human-to-technology interactions, changing mindsets about how digitalization integrates with production systems, and focusing on implementing digital systems from a total system perspective. This comprehensive approach ensures that digital transformation not only enhances efficiency but also supports sustainable and resilient food production systems. There is also a growing interest in developing an interoperability strategy which is an opportunity to overcome the low technological integration of the value chain.

Keywords: Artificial intelligence, Digital transformation, Internet of Things, Sustainable agri-food systems

For correspondence: Priyanka Patel <priyanka0826a@gmail.com>

Strengthening Family Level Food and Nutritional Security via Nutrition-Sensitive Kitchen Gardens

Veena Yadav¹, Anita Yadav², Chandra Bhanu³, Savita Arya⁴, Kirti Mani⁵, Rakesh Tiwari¹

¹Krishi Vigyan Kendra, Hastinapur, Meerut, Uttar Pradesh, India; ²Krishi Vigyan Kendra, Baghpat, Uttar Pradesh, India; ³ICAR-Indian Institute of Farming Systems Research (IIFSR), Meerut, Uttar Pradesh, India; ⁴Krishi Vigyan Kendra, Muzaffarnagar-1, Uttar Pradesh, India; ⁵Krishi Vigyan Kendra, Bulandshahr, Uttar Pradesh, India

Ensuring adequate family-level food and nutritional security remains a major challenge in rural areas of India due to limited dietary diversity, seasonal availability of vegetables, and rising food costs. The present study documents the impact of nutrition-sensitive kitchen gardens on strengthening household food and nutritional security in adopted villages of Meerut district, Uttar Pradesh. The intervention was implemented by Krishi Vigyan Kendra (KVK), Hastinapur during 2020-2025 in the villages of Samaspur and Lukkadhari through 25 frontline demonstrations. The demonstrations focused on establishing diversified kitchen gardens for ensuring round the year availability of vegetables using improved vegetable varieties and sustainable production practices. Key interventions included the distribution of seed minikits of improved vegetable varieties, organic nutrient management kits. Seasonal planning ensured year-round availability of vegetables. During summer and Kharif seasons, crops such as okra etc were grown, while Rabi season crops included fenugreek, coriander etc. The results of the study revealed a substantial improvement in vegetable production and consumption at the household level. The average vegetable yield under demonstration plots was 415 kg per household/year, compared to only 72 kg per household under farmers' practice, registering a remarkable 476% increase in vegetable yield/year. In approximately 150 square meters nutritional garden. The daily per capita availability of vegetables in demonstration households increased to 227 g/person/day, which is close to the recommended dietary intake, whereas check households recorded only 39 g/person/day. This clearly indicates a significant enhancement in nutritional intake and dietary diversity among participating families. The number of vegetables consumed by demonstration households increased by 17, compared to only 8 vegetables consumed earlier under check conditions. Apart from nutritional benefits, the kitchen gardens also contributed to household income, with an average net return of ₹9,850 per family per year and a benefit-cost ratio of 4.8, highlighting the economic viability of the intervention.

Overall, the study demonstrates that nutrition-sensitive kitchen gardens are an effective, low-cost, and sustainable approach to improving family-level food and nutritional security, dietary diversity, and livelihood resilience in rural households. The approach holds significant potential for scaling up in similar agro-ecological regions to address hidden hunger and malnutrition.

Keywords: Dietary diversity, Food security, Kitchen garden, Livelihood, Nutrition, Rural, Sustainability, Vegetables

For correspondence: Veena Yadav <veenayadav1020@gmail.com>

Value Addition to Vetiver Root (*Vetiveria zizanioides*): A Sustainable Livelihood Model for Empowerment of Farm Women

K.J. Sannapamma, Sakeena Naikwadi, Yashwini Sharma, Chaitanya Itagi, Vidya Sangannavar, D. Soudarya

University of Agricultural Sciences, Dharwad 580005, Karnataka, India

Vetiveria zizanioides is an aromatic grass and one of the natural resources that has great application for well being of human. Hence, the present study was designed with objectives; to document the traditional practices of vetiver root in Uttar Kannada district and to characterize and optimize vetiver root extract for textile finishing. The information on farming and traditional practices of vetiver root was collected through self-structured questionnaires. The vetiver root extracts was subjected to by FTIR, GCMS, TPC, DPPH and Bio-assay for textile application. Results revealed that, the average land holding size among the farmers was 7.19 hectares and vetiver cultivation accounted about 4.35 hectares (60.50%) with total production cost of ₹ 1.15 lakh per hectare (83.92%). Majority of respondents stated that the root was mainly used for health purpose (70%) followed by handicrafts making (30%) *viz.*, hats, bags, doormats, dolls and toys, crochet, fancy jewellery and coral sculpture etc. The major compounds present in root extracts were diethyl pathalate 7- Isopropyl dimethyl carboxylic acid (4.05%), 2-Butanone with functional groups of OH, N-O, S-O and possessed greater TPC, antioxidant, antimicrobial properties. The optimized extracts was used for organic cotton fabric finishing which possessed better mechanical and functional properties *viz.*, soft in handle, good drapability, pleasant aroma, excellent UV protection and antimicrobial properties. Therefore, it can be concluded that the vetiver root is multifunctional crop with diversified application which encourages vetiver growers, farmers and artisans for their livelihood security and sustainability. The root extracts is found to be excellent eco auxiliary for textile finishing.

Keywords: Antimicrobial, Antioxidant, Aromatic, Extract, Root, Sustainability, Textile, Vetiver

For correspondence: K. J. Sannapamma<sannapapammakj@uasd.in>

Vaikom Fish Farm and Aqua Tourism: A Women-Led Model of Integrated Aquaculture and Farm Tourism

Hafeef Roshan, G. Jayalekshmi, Elizabeth Joseph, Smitha Revi, Asha V. Pillai, Manuel Alex

Krishi Vigyan Kendra, Kerala Agricultural University, Kumarakom, Kottayam, Kerala, India

Women-led enterprises play a vital role in strengthening sustainable and inclusive agri-food systems through diversification, innovation, and experiential learning. This abstract presents the successful case of Vaikom Fish Farm and Aqua Tourism Pvt. Ltd., a women-led integrated aquaculture and farm tourism enterprise located in Kottayam district, Kerala, India. The enterprise, led by Mrs. Anila Vipin, a nationally recognised aquaculture entrepreneur with over 25 years of experience, demonstrates a holistic and farmer-friendly model integrating scientific aquaculture, ornamental fish culture, cultivation of commonly available medicinal and ornamental plants, and eco-friendly aqua tourism for income enhancement and rural livelihood generation.

The enterprise operates a scientifically managed aquaculture system comprising ornamental fish breeding, pond culture, and cage culture, embedded within a structured farm tourism framework. The ornamental fish unit focuses on quality seed production of high-value species using standardised broodstock management, controlled breeding, and strict biosecurity protocols. These units function as live demonstration and learning centres for tourists, students, women self-help groups, and aspiring entrepreneurs.

Alongside aquaculture, the farm landscape includes cultivation of a wide range of locally available medicinal and ornamental plants, contributing to biodiversity conservation, environmental sustainability, and enhanced aesthetic appeal under the farm tourism programme. The enterprise has achieved notable success in food fish culture, particularly Pearl Spot (*Etroplus suratensis*), Kerala's state fish, through scientific breeding. Diversification into Nile Tilapia and Red Tilapia using pond and cage systems has further improved productivity. Farm-produced food fish are also utilised for preparing and serving fresh, value-added fish dishes to visitors as part of the farm-based lunch experience, strengthening farm-to-plate linkage.

The eco-friendly aqua tourism component includes guided farm tours and boat rides through ponds and culture systems, generating employment for local women in production, maintenance, marketing, hospitality, and tourism services. The model is highly replicable and serves as a benchmark for women-led, integrated aquaculture-based farm tourism enterprises aligned with sustainable and climate-resilient agri-food systems.

Keywords: Aquaculture, Diversification, Entrepreneurship, Livelihoods, Ornamental fish, Sustainability, Tourism, Women

For correspondence: Hafeef Roshan <hafeefroshan@gmail.com>

Iron Rich Supplementary Food (Promix) to Combat Malnutrition among Farm Women: An Intervention Study

K.J. Sannapamma, Y. Ravi, M. Vinutha, Rajeshwari Desai, S. Surekha, Mridula Devi, Geeta Channel, Manjula Patil, Chaitanya Itagi

University of Agricultural Sciences, Dharwad 580005, Karnataka, India

Anaemia is a global public health problem in both developed and developing nations, affecting more than one third of the World's total population. In India, more than 50% of children (58.6%), women of reproductive age (53.2%), and pregnant women (50.4%) are anaemic. To address these challenges by focusing on improving the health and nutrition of farm women through innovative strategies. Under the Nutri Smart Village programme, AICRP-Women in Agriculture, UAS Dharwad developed an iron-rich millet-based supplementary health mix (Promix), aimed to combat iron deficiency anaemia among farm women. The formulation of Promix includes finger millet, green gram, sorghum, moringa leaves and garden cress seeds ingredients selected for their high nutritional value and accessibility in rural Karnataka. The development process involved meticulous preparation of raw materials, soaking, sprouting, drying, roasting and milling to create fine flour. The best accepted combination of pro mix was subjected to further analysis, *i.e.* proximate analysis, mineral estimation, assessment of anti-nutrient content and bio accessibility of iron to ensure quality and efficacy. Further, clinical trials were conducted at five adopted villages and three months intervention programmes were carried out to evaluate the effectiveness of Promix among the farm women. Results observed that the promix possessed the highest amount of energy (367.84 Kcal), crude protein (13.46%), calcium (247.3mg/100g) and iron (6.03mg/100g), the promix is able to meet nearly one third of the requirement of farm women by providing 100 g of promix. Pre-intervention assessments revealed high rates of anaemia among farm women, with significant improvements observed in post-intervention. The haemoglobin status of the farm women was improved, the percentages of the farm women in the acceptable level increased from zero to 16.67% and mild anaemia reduced to 66.6 to 30.0%, whereas severe anaemia reduced to 20.0 to 3.33. Consumption of Promix led to notable increases in haemoglobin levels, particularly among women with moderate to severe anaemia, indicating its efficacy as a dietary supplement. The development of Promix represents a step towards addressing iron deficiency anaemia among rural farm women. Community-based nutritional interventions can be a way forward for ensuring sustained improvements in the health and well-being of farm women.

Keywords: Anaemia, Bioavailability, Intervention, Iron, Millets, Nutrition, Supplementation, Women

For correspondence: K. J. Sannapamma <sannapapammakj@uasd.in>

Mushroom Production and Processing for Household Food and Livelihood Security in Jharkhand

Seema Singh, Rekha Sinha

Krishi Vigyan Kendra, East Singhbhum, Birsa Agricultural University (BAU), Ranchi 832304, Jharkhand, India

Mushroom farming is emerging as promising livelihood diversification option in Jharkhand, particularly among farm women and youth, due to its low land requirement, minimal investment, and year-round income potential. Mushrooms are rich in high-quality protein, vitamins, minerals, and bioactive compounds, and are increasingly recognized for their medicinal and nutritional benefits. This study documents the role of mushroom production and processing in enhancing household food and livelihood security in Jharkhand through Krishi Vigyan Kendra (KVK) interventions.

The study was conducted during 2020-2025 in two blocks of Dhanbad and East Singhbhum district. A participatory approach was adopted to assess interest, capacity building, and income generation. Farm women, rural youth, and extension functionaries expressed strong interest in mushroom cultivation as an additional income-generating activity. Through structured training programmes organized by KVKs, participants were oriented on basic principles of mushroom farming, including life cycle of edible fungi, substrate preparation, hygiene, sterilization, and scientific management practices. Hands-on demonstrations and exposure visits further strengthened practical skills.

A total of 600 farm women and rural youth were trained in mushroom cultivation, post-harvest handling, and value addition. Initially, most beneficiaries started mushroom production at household level using small spaces within their homesteads. With increased confidence and market exposure, many women gradually expanded their activities by constructing separate mushroom sheds and adopting improved production practices.

As an outcome of these interventions, about 40 rural youth progressed to an entrepreneurial level, producing nearly 10 kg of mushrooms per day. Fresh mushrooms were marketed locally at prices ranging from ₹150 to ₹200 per kg. In addition, growers diversified into value-added products such as dried mushrooms, pickles, mushroom powder, cookies etc. which significantly enhanced profitability. On average, beneficiaries reported an additional monthly income of ₹15,000-20,000.

Mushroom farming offers substantial scope for improving food and livelihood security while promoting efficient utilization of agricultural waste, recycling of biomass, and creation of local employment. The enterprise supports sustainability, nutrition security, and climate-resilient agriculture. Mushroom farming as an agripreneurship in Jharkhand has been further strengthened through convergence with line departments such as JSLPS, DAO, DHO, DFO, and NGOs including Tata Steel Foundation, TSRDS, and PRADAN. Future strategies should focus on scaling up mushrooms into ICDS and Mid-Day Meal strengthening market linkages for SHG and FPO-based agri-food products.

Keywords: Agripreneurship, Empowerment, Entrepreneurship, Livelihoods, Mushrooms, Nutrition, Sustainability, Value addition

For correspondence: Seema Singh <seema21jan@gmail.com>

Women Empowerment through Nutrition-Sensitive Agriculture Resources (NARI)- KVK Initiatives in Dhanbad District of Jharkhand

Seema Singh, Rekha Sinha

Krishi Vigyan Kendra, East Singhbhum, Birsa Agricultural University (BAU) Ranchi 832304, Jharkhand, India

Malnutrition, micronutrient deficiencies, and livelihood insecurity continue to pose serious challenges in rural and peri-urban areas of Jharkhand, particularly affecting women and children. Nutrition-sensitive agriculture resources (NARI) program of ICAR has emerged as an effective and sustainable strategy to address these interconnected concerns by linking agricultural production with improved dietary outcomes and women's empowerment. This review paper synthesizes the outcomes of integrated NARI interventions implemented by Krishi Vigyan Kendra (KVK), Dhanbad, during the period 2020-2025.

Key initiatives reviewed include the establishment of Poshan Vatika (nutrition gardens), promotion of millets as nutri-cereals, post-harvest management and value addition, and women-led rural enterprises. Value-added millet products such as madua paustik atta, madua laddu, madua chikki, madua nimki, and other nutritious snacks were promoted through Self-Help Groups (SHGs). Allied livelihood activities including mushroom cultivation, bamboo handicrafts, herbal gulal, and cultivation of medicinal plants further enhanced income opportunities for farm women. Front Line Demonstration (FLD) on the economic evaluation of nutrition gardens was conducted in approximately 200 m² area across 10 villages of Baliapur block, Dhanbad district. 200 women received capacity building through demonstrations and hands-on training. The results revealed multiple benefits: continuous availability of fresh and diverse vegetables significantly improved household dietary diversity; economic returns were observed through savings on vegetable purchases and sale of surplus produce in local markets. Importantly, a reduction in anaemia among adolescent girls (15-19 years) was observed, with prevalence declining from 69.9% (NFHS-4) to 61.7% (NFHS-5), supported by increased consumption of iron- and vitamin C-rich vegetables. Enhanced decision-making power, leadership, and entrepreneurial skills among women indicated substantial empowerment outcomes.

The integrated framework demonstrates effective convergence from village to panchayat, block, and district levels through training, demonstrations, and institutional linkages. Expansion of nutrition gardens, millet clusters, SHG/FPO-based agri-food enterprises can significantly improve nutritional security and economic resilience for women empowerment in Jharkhand and similar agro-ecological regions.

Keywords: Anaemia, Empowerment, Gardens, Livelihoods, Malnutrition, Millets, Nutrition

For correspondence: Seema Singh <seema21jan@gmail.com>

Addressing Malnutrition and Promoting Women Entrepreneurship through Processing

Dipika Agrahar Murugkar, Samlesh Kumari

ICAR-Central Institute for Agricultural Engineering (CIAE), Centre of Excellence on Soybean Processing and Utilization, Nabibagh, Berasia Road, Bhopal, Madhya Pradesh 462038, India

Malnutrition in India remains a persistent challenge, particularly among women and children, despite significant advances in agricultural production. At the same time, limited livelihood opportunities for rural women constrain household nutrition and economic resilience. The present body of work focuses on addressing these dual challenges through value addition and processing of nutritionally rich crops such as millets and soybean, coupled with targeted capacity building for women entrepreneurship. Millets and soybean are climate-resilient, locally available crops with high potential to deliver affordable protein, dietary fibre, micronutrients, and functional bioactives when appropriately processed.

Research efforts were directed towards the development and standardization of processing technologies for soy- and millet-based foods, including fortified staples, functional foods, probiotic and prebiotic products, and ready-to-eat/ready-to-cook formulations. Emphasis was placed on improving nutrient bioavailability, reducing anti-nutritional factors, enhancing shelf life, and ensuring sensory acceptability. Several process technologies were optimized and scaled, leading to the development of nutritionally enhanced products suitable for addressing protein-energy malnutrition and micronutrient deficiencies.

Parallel to technology development, focused extension and entrepreneurship development programmes were implemented to translate laboratory innovations into field-level impact. Women self-help groups, farmers' collectives, and rural youth were trained in small-scale processing, quality control, packaging, and basic business management. These interventions enabled women to establish micro-enterprises based on millet- and soybean-processing, generating income while supplying affordable, nutritious foods to local communities.

The integrated approach of crop-based nutritional innovation, decentralized processing, and women-led entrepreneurship demonstrates a sustainable pathway for improving dietary diversity, strengthening local food systems, and enhancing women's economic empowerment. This work underscores the potential of millet and soybean processing as a scalable strategy for simultaneously addressing malnutrition and promoting inclusive rural development.

Keywords: Bioavailability, Empowerment, Entrepreneurship, Malnutrition, Millets, Nutrition, Processing, Soybean

For correspondence: Dipika Agrahar Murugkar<dipika.agrahar6@gmail.com>

Advancing Women's Leadership in Agrifood Systems in India: A Compilation of Strategies

Meghajit Sharma Shijagurumayum, Miranda Morgan, Marlène Elias, Haley Zaremba

Alliance of Bioversity and CIAT, Yelahanka 560064, Karnataka, India

Women's leadership is increasingly recognised as central to building equitable, resilient, and sustainable food systems, yet remains unevenly conceptualised, supported, and operationalised across policy, programming, and research. In India, organisations across the private sector, development and research institutions are actively implementing initiatives to advance women's leadership in agrifood systems. However, these efforts are rarely examined collectively, limiting insight into how leadership is understood, supported, and sustained across contexts. This contribution draws on *Advancing Women's Leadership in Agrifood Systems in India: A Compilation of Strategies*, which documents organisational approaches to advancing women's leadership across value chains, producer organisations, seed systems, financial services, and local governance institutions.

The compilation includes eight case studies contributed by a range of organisations working with women in agrifood systems. Each case describes a leadership initiative, the strategies used to support women's leadership, the challenges encountered during implementation, and the learning emerging from practice that may be relevant to other actors. The cases provide contextualised accounts of how organisational approaches to women's leadership are shaped by sectoral contexts, institutional arrangements, and social norms, without assessing effectiveness or comparing outcomes.

Across the cases, four interrelated strategies recur. First, women's leadership is understood as a process that combines building confidence and self-efficacy with functional capabilities, including governance literacy, negotiation, financial management, and technical expertise. Second, collective platforms in rural communities, such as self-help group federations, producer organisations, frontline cadres, and women-led enterprises, can provide critical sites where women's leadership is practised, recognised, and legitimised. Third, initiatives that engage enabling environments by working with households, communities, organisations, and institutional actors are better able to address the relational and socially negotiated nature of leadership. Fourth, sustaining institutional accompaniment for emerging women leaders (through ongoing mentoring, peer networking, and an enabling environment) supports the continuity and progression of their leadership.

Lastly, the compilation highlights the range of challenges to supporting women's leadership in agrifood systems, emphasizing the need for strategies to be multifaceted, multiscale and address the deeper power dynamics restricting women's leadership. Overall, the compilation offers a valuable practice-based resource that shows how organisations are navigating these challenges and provides grounded learning for advancing women's leadership beyond isolated interventions or individual-focused approaches.

Keywords: Agrifood, Empowerment, Governance, Inclusion, Institutions, Leadership, Value chains, Women

For correspondence: Meghajit Sharma Shijagurumayum <m.shijagurumayum@cgiar.org>

Development of Corn Silk-Fortified Millet Cookies, A Sustainable Approach to Nutritional and Functional Snacks

Samar Jan, Ishtiyaq Ahmad Khan, Rayees Ul Islam, Umer Bin Farooq, Suheel Ahmad Ganaie, Shabeer Ahmad Ganaie

Krishi Vigyan Kendra, Sher-e-Kashmir University of Agricultural Sciences and Technology (SKUAST), Anantnag 192211, Jammu and Kashmir, India

Corn silk (*Stigma maydis*), which is traditionally regarded as an agricultural by-product, is increasingly recognized for its rich composition of bioactive compounds and associated health benefits. It contains certain valuable and nutritive compounds such as flavonoids, polysaccharides, phytosterols, vitamins, and minerals that contribute to antioxidative, antidiabetic, diuretic, anti-inflammatory, anti-fatigue, and radioprotective activities, thereby preventing protection against various diseases. Despite this reported therapeutic potential, corn silk remains largely underutilized and is often discarded during maize processing. We know that India is moving towards being *Viksit Bharat*, in every sector, and is moving forward with a goal of Take, Make, use and Reuse policy, in other words circular economy hence making an efficient use of every product that is beneficial but goes waste such as the corn silk. Moreover due to the rise in the consciousness in health among people, they prefer foods rich in nutritive value thus millets which are ancient, climate-resilient grains, and valued for their high protein, dietary fiber, micronutrient content, and functional properties, including low glycemic index (GI), antioxidant activity, and suitability for gluten-free diets can be used as both sustainable as well as convenient and health oriented food just by fortifying it with corn silk and developing it into corn silk millet-based cookies which will offer an approach to valorizing agricultural waste while enhancing the antioxidant capacity, dietary fiber, and overall nutritional quality of the product. Such functional cookies represent a promising strategy to bridge traditional health knowledge with modern food innovation thereby addressing consumer demand for natural, health-promoting, and sustainable snack products. Future research should focus on optimizing formulations, preserving bioactive compounds during processing, and evaluating sensory acceptability to support commercial viability.

Keywords: Circular economy, Cookies, Corn silk, Millets

For correspondence: Samar Jan <shabsamar1920@gmail.com>

Empowering Women in Agriculture to Transform Indigenous Agri-Food Systems: Empirical Evidence and Success Stories

Rashmi Chaudhary

Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan 173230, Himachal Pradesh, India

In Himachal Pradesh, agriculture and allied activities are predominantly sustained by marginal and smallholder farmers, with women playing a central yet often under-recognized role. This paper examines women's empowerment in agriculture and its contribution to the transformation of indigenous agri-food systems, based on empirical evidence from the state and supported by women-led agricultural success stories. Women's empowerment was assessed across the production, resources, income, leadership, and time dimensions, each of which aligns closely with the Sustainable Development Goals. Empowerment in production and adoption of improved technologies contributes to SDG 2 (Zero Hunger) by enhancing agricultural productivity and food security. Leadership and collective action correspond to SDG 5 (Gender Equality) and SDG 10 (Reduced Inequalities) by strengthening women's voice and reducing social and economic disparities. Control over income is linked to SDG 8 (Decent Work and Economic Growth) as it expands women's access to economic opportunities and financial autonomy. The findings indicate substantial progress in women's participation in farm decision-making, income-generating activities, collective action and adoption of improved agricultural and value-addition practices. The empirical findings are reinforced by women-led initiatives across Himachal Pradesh, where women farmers have successfully engaged in natural farming, collective marketing and processing of locally available agricultural and forest-based resources into marketable products. These initiatives have contributed to income diversification, reduced post-harvest losses and strengthening of local agri-food value chains. The study highlights that institutional interventions including formation of Self-Help Groups, Farmer Producer Companies, Cooperative Societies and marketing through Him-Ira have been instrumental in strengthening women's skills, improving market access and increasing their active participation in agri-food systems. The study highlights that integrated, gender-responsive strategies that combine capacity building with asset-based policy interventions are essential for fostering inclusive, resilient and sustainable agri-food systems in hill regions.

Keywords: Himachal Pradesh, Indigenous agri-food systems, Institutional support, Sustainable development goals, Value addition, Women in agriculture, Women's empowerment

For correspondence: Rashmi Chaudhary <rashmi.ubf@gmail.com>

Krishi Sakhi-Led Promotion of Natural Farming for Farmers Empowerment in Tripura

Mandira Chakraborti¹, Ganesh Das¹, Nagaraju¹, Shri Debashis Datta¹, Maibam Baby Devi¹, B.U. Choudhury², A.K. Mohanty³, S. Hazarika²

¹Krishi Vigyan Kendra, West Tripura, Belbari, Agartala 799045, Tripura, India; ²ICAR Research Complex for North Eastern Hill Region, Tripura Centre, Debendrachandra Nagar, 799210, Tripura, India; ³Agricultural Technology Application Research Institute (ATARI), Zone VII, Umiam 793103, Meghalaya, India

A study was conducted during 2025-2026 in West Tripura district to assess the role of women-led *Krishi Sakhi* in empowering farmers and farm women through the promotion of natural farming practices. The *Krishi Sakhi* were trained by ICAR-Krishi Vigyan Kendra (KVK), West Tripura through two structured capacity-building programmes conducted during the pre-Kharif and pre-Rabi seasons. The study evaluated changes in knowledge levels of *Krishi Sakhis* and farmers, adoption behaviour, and challenges encountered during field-level implementation. Post-training assessment revealed a significant improvement in the knowledge level of *Krishi Sakhis*, indicating the effectiveness of the training interventions. During the dissemination and implementation phase, farmers' knowledge regarding natural farming practices showed a medium level of improvement, followed by high and low levels among different categories of beneficiaries. Despite initial gender-based stereotypes and hesitation among some male farmers in receiving technical guidance from female *Krishi Sakhis*, a majority of farmers showed positive interest and willingness to adopt natural farming technologies. Availability of bio-inputs and institutional support from the Department of Agriculture and Farmers' Welfare, Government of Tripura, played a crucial role in enhancing farmers' confidence and adoption intent. Continuous post-training follow-up, frontline demonstrations and field-level support by ICAR-KVK, State Departments, and ICAR institutes are being undertaken with the help of *krishi sakhis* to strengthen natural farming practices. The study highlights that *Krishi Sakhi* serve as effective grassroot level change agents, contributing to reduced cost of cultivation, enhanced farm profitability, and promotion of sustainable agricultural growth. More than 1,000 registered farmers were trained, with farm women constituting the majority, underscoring the potential of women-centric extension models in accelerating natural farming adoption in Tripura.

Keywords: Farmer empowerment, Knowledge enhancement, *Krishi Sakhi*, Natural farming, Sustainable agriculture, Tripura, Women-led extension

For correspondence: Mandira Chakraborti <mandira1@rediffmail.com>

A Study on the Production of Fortified Kinnow Mandarin Leather using Banana Inflorescence Extract

Payel Das, Ankan Das

Institute of Agricultural Sciences, University of Calcutta, Kolkata 700019, West Bengal, India

A research study was carried out at the Department of Horticulture, Institute of Agricultural Sciences, University of Calcutta, to produce fortified kinnow mandarin fruit leather. The primary goals were to reduce post-harvest losses of the fruit and improve its nutritional profile. The study focused on developing fruit leathers from kinnow mandarin juice, incorporating banana inflorescence extract as a fortifying agent. High-quality kinnow fruits were selected, and ingredients were obtained from both local markets and online suppliers. The base formulation for the fruit leather consisted of 100 ml kinnow juice combined with 3 g pectin, 1 g stevia, and 600 ppm potassium sorbate. To achieve fortification, banana inflorescence extracts were added at varying levels: 10%, 15%, 20%, and 25%. After preparation, the products were properly packaged and stored in desiccators and their attributes were evaluated during storage period. Comprehensive analysis of various parameters revealed that the highest overall quality was obtained with the 25% fortification level. This variant exhibited superior nutritional composition, including protein at 446.56 mg/100 g, total phenolics at 43.48 mg GAE/g, carbohydrates at 52.17%, total sugars at 4.54%, fat at 7.97%, and crude fiber at 3.11%.

Keywords: Dehydration, Fortification, Fruit leather, Kinnow mandarin, Pectin

For correspondence: Payel Das <daspayel23717@gmail.com>

Cultivating Tomorrow's Leaders: Advancing Inclusive Leadership in Agri-Food Systems

Nancy, Rohit Jakhar

Chaudhary Charan Singh Haryana Agricultural University (CCSHAU), Hisar 125004, Haryana, India

The agri-food sector is at a defining point, with issues like climate change, food security, technological innovation, and changing global markets. This technical session at the Global Conference on Women in Agri-Food Systems (GCWAS) will highlight and discuss the way forward for leadership in the agri-food sector in particular, with a special focus on enhancing the role of women and the youth in these areas.

The session will examine approaches to developing leadership qualities via education, mentorship, capacity development, and inclusive policy approaches. The importance of digital agriculture, entrepreneurship, research, and value chain approaches in developing future generations of leaders will specifically be emphasized. Best practices and case studies can help illustrate approaches to achieving productivity, climate-smart agriculture practices, and a strengthened food system via inclusive leadership.

This session seeks to help realize a more inclusive, sustainable, and future-ready agri-food sector by cultivating responsive leadership opportunities for both genders and facilitating fair access to resources and opportunities for decision-making and networking. This session will help policymakers, practitioners, and development partners who are keen to see more women assume leadership positions in agri-food systems to gain key insights from the forum.

Keywords: Agrifood, Climate, Digitalization, Gender, Leadership, Sustainability, Youth

For correspondence: Nancy <dubannancy2005@gmail.com>

Women-Led Transformation of Indigenous Agri-Food Systems in Himachal Pradesh

Manisha Kaushal

Dr Y S Parmar University of Horticulture and Forestry, Nauni, Solan 173230, Himachal Pradesh, India

In the hilly state of Himachal Pradesh agri-food systems are driven by small farm holdings, horticulture based livelihoods and strong participation of women through SHGs, cluster level federations and village organization's. Rural women drawing on traditional knowledge have transformed indigenous cuisines and local produce into diverse value added products like chuli oil and apricot preserves from Kinnaur, apple jam and squashes from Shimla and kullu, millet based foods and traditional snacks like Patande, siddu, and seera mixes from Shimla and Mandi, bamboo shoot pickles, chukh and other pickles from wild fruits and vegetables in Chamba and Lahaul spiti which have preserved regional culinary heritage while creating sustainable livelihood opportunities for rural women. These products are collectively marketed through She Haat, a women-centric platform that promotes local foods, strengthens rural enterprises and preserves the state rich culinary heritage. Further the abundance of local fruits, vegetables and flora such as pear, wild berries, wild pomegranate, chayote, stinging nettle, rhododendron, curry leaves, kochhar etc. offers significant scope for value addition into preserves, dry fruits, herbal blends and traditional formulations. These women led agri-food startups reduce postharvest losses, enhance shelf life and marketability which improves farm incomes at household and community level. Building on the rich base of indigenous food and locally available horticulture produce, the startup works closely with women Self-Help Groups (SHGs) across districts by sourcing raw material locally and engaging women in processing, value addition and packaging activities while promoting nutrition-sensitive foods and environmentally sustainable practices suited to fragile hill ecosystems. The success story illustrates how women-led startups supported through platforms such as She Haat can effectively scale traditional cuisines, strengthen local agri-food value chains and foster women's economic empowerment offering a replicable model for other hill and marginal regions. Empowering women in agri-food systems and allied sectors is therefore pivotal for achieving sustainable development goals, strengthening food systems resilience and securing a livelihood security in the hilly regions of Himachal Pradesh.

Keywords: Agri food systems, Empowerment, Entrepreneurship, Horticulture, Self Help Groups, Value addition

For correspondence: Manisha Kaushal <manishapht@gmail.com>

Participatory Assessment of Climate Change Effects on Women Dairy Farmers in Haryana

Yasa Sirilakshmi, Bidyut Pritom Gogoi, Apoorva Veldandi, Akash Singh Chandel, Vangala Bhavani, Sanchita Garai, Sanjit Maiti

ICAR-National Dairy Research Institute, Karnal 132001, Haryana, India

Women play a central role in dairy farming in India, yet their livelihoods and productivity are increasingly affected by climate change. This study aimed to assess the impacts of climate variability such as heat stress on dairy. Heat stress has emerged as a major climate-induced challenge affecting dairy cattle productivity and farmer livelihoods in semi-arid regions of India. The present study aimed to develop a participatory adaptation plan for women dairy farmers for managing heat stress in cattle by assessing farmers' perceptions, existing practices, and constraints in Hisar district of Haryana. A total of 120 women dairy farmers were engaged through focus group discussions (FGDs), Fuzzy Cognitive Mapping and participatory appraisal techniques to capture experiential knowledge on heat stress impacts and coping mechanisms. The study assessed the perceived effects of heat stress on milk yield, animal health, reproductive performance, and overall dairy management. Based on farmer insights and participatory analysis, a locally relevant adaptation plan was formulated to enhance heat stress management at the farm level. The study documented key heat stress indicators such as elevated ambient temperature, prolonged heat waves, and water scarcity, and analyzed their effects on milk yield, reproductive performance, animal health, and labor efficiency. Based on participatory inputs, a locally relevant adaptation plan was developed, emphasizing improved housing design, affordable cooling strategies, optimized feeding and watering schedules, and strengthened extension support. The findings underscore the value of participatory approaches in designing practical, farmer-centered climate adaptation strategies. The study highlights the need for integrated extension interventions and policy support to enhance adaptive capacity, sustain dairy productivity, and improve resilience of cattle-based farming systems under increasing heat stress conditions.

Keywords: Adaptation, Climate change, Dairy farming, Heat stress, Resilience, Women farmers

For correspondence: Yasa Sirilakshmi <siriyasa0406@gmail.com>

Combating Hidden Hunger among School-Age Children through Complementary Nutrition Education: Evidence from Punjab to Nurture the Next Generation of Agri-Food Leaders

Monika Choudhary¹, Amarjeet Kaur¹, Renuka Aggarwal¹, Harpreet Kaur¹, Khwairakpam Bembem², Nancy Sahni³

¹Punjab Agricultural University, Ludhiana 141004, Punjab, India; ²ICAR-Central Institute of Post-Harvest Engineering and Technology, Ludhiana, 141004, Punjab India; Postgraduate Institute of Medical Education and Research (PGIMER), 160012 Chandigarh, India

Nurturing the next generation of agri-food leaders requires investing early in nutrition, health, and food literacy, as these form the foundation of cognitive capacity, learning ability, and long-term productivity. School-age children (6-13 years) represent a critical yet overlooked life stage for building human capital essential for resilient and sustainable agri-food systems. This study aimed to assess the nutritional status of school-age children in Ludhiana district, Punjab, and to design and evaluate a complementary nutrition education plan to address gaps in knowledge, attitude, and practices. A quantitative research approach was adopted, comprising a large-scale cross-sectional survey followed by a pre- and post-test intervention model. A total of 20,084 children (10,086 girls and 9,998 boys) from 51 government schools were assessed using socio-demographic profiling, dietary intake surveys, and anthropometric measurements analyzed through WHO AnthroPlus and DietCal software. Findings revealed that 93% of families belonged to the upper-lower socio-economic class, with 55.13% of mothers being illiterate. Dietary analysis identified severe inadequacies, as green leafy vegetable (GLVs) consumption met only 18-20% of Suggested Dietary Intake (SDI). Although 79.09% consumed regular meals, 39.69% skipped meals, with breakfast being the most frequently missed by girls. Hydration was critically low, with 68.29% of children drinking less than 500 ml of water daily. Nutrient adequacy analysis showed that while protein intake was generally sufficient (>60%), the adequacy of Riboflavin, Niacin, Folic acid, Vitamin C, and Calcium remained consistently below 50% across all groups. Clinical signs confirmed these deficiencies, with 50.11% of subjects exhibiting hair dyspigmentation and 55.65% suffering from angular stomatitis. Anthropometric results showed low adherence to growth standards; only 59.19% of girls met IAP height standards, and BMI adequacy was extremely low (0.66% for girls and 5.25% for boys). Severe wasting was more prevalent in boys (8.62%) than in girls (5.51%), while girls showed slightly higher rates of stunting (5.36%). Socio-economic status (SES) was strongly positively correlated with linear growth and weight, yet micronutrient inadequacies persisted even in higher SES subsets. The complementary education plan proved highly effective, with boys' knowledge scores increasing by 128.6% and girls' scores by 62.6%. Girls demonstrated a 45.8% improvement in practical application compared to 8.5% in boys. The study concludes that there is a need to revamp Mid-Day Meal programmes to prioritise micronutrient density alongside mandatory hygiene education and targeted parental awareness to combat the hidden hunger prevalent in school-age children.

Keywords: Attitude, Complementary education, Knowledge, Nutritional status, Practice, School-age children

For correspondence: Monika Choudhary <drmchoudhary@pau.edu>

Climate Risk Perception and Adoption of Sustainable Agricultural Practices: Insights from Kenya's Central Highlands

Pallavi Rajkhowa, Giulia Zane, Marie-Charlotte Buisson, Michael Kinyua

International Water Management Institute (IWMI), National Agricultural Science Complex (NASC), 2nd Floor, CG Block C, Dev Prakash Shastri Marg, Pusa 110012, New Delhi, India

Smallholder farmers are increasingly exposed to climate variability that threatens agricultural productivity and household livelihoods. Sustainable agricultural practices (SAPs) are widely recognized as a key pathway for sustaining yields, conserving natural resources, and enhancing climate resilience. Identifying the factors that shape adoption decisions is therefore critical for designing effective adaptation strategies. While existing literature has largely emphasized socio-economic determinants of technology adoption, the role of behavioral factors, particularly climate risk perceptions, remains comparatively underexplored. Using cross-sectional survey data from the Central Highlands of Kenya and a Poisson regression framework, this study examines how farmers' climate risk perceptions are associated with the adoption of SAPs and identifies which types of practices are most responsive to climate concerns. The results reveal a non-linear relationship between climate risk perception and adoption, with significant increases in adoption occurring only at high levels of perceived climate concern. Importantly, exposure to climate shocks alone does not appear sufficient to induce behavioral change; rather, adoption responds to the perception of these shocks as serious threats. We further highlight heterogeneity in these relationships across gender of decision maker and plot size. We find that risk communication and awareness interventions are most effective among farmers managing smaller plots and male-managed plots, where increased awareness is sufficient to trigger behavioral change. In contrast, for female-managed plots, heightened awareness alone does not lead to adoption, indicating that structural constraints such as limited access to education, inputs, credit, or labor must be addressed alongside climate risk communication. Similarly, encouraging the adoption of sustainable agricultural practices among medium- and large-scale plot owners is likely to require sustained efforts that go beyond information provision, including the removal of structural barriers and the use of market-based incentives such as certification schemes, premium pricing for sustainably produced goods, carbon credits, or payments for ecosystem services. In addition, practices such as organic input use and soil and water conservation are more sensitive to climate perceptions than more resource-intensive practices, including irrigation, intercropping, and no-tillage. While not causal, the findings highlight the role of behavioral and perceptual factors in adoption and offer practical guidance for context-sensitive extension and outreach.

Keywords: Climate risk perception, Gendered adoption, Kenya, Smallholders, Sustainable agricultural practices

For correspondence: Pallavi Rajkhowa <pallavi.rajkhowa@cgiar.org>

Empowering Women for Resilient Agri-Food Systems: A Systematic Review

Tulika Kumari, Nidhi, Bineeta Satpathy, Sangeeta Deo

Dr Rajendra Prasad Central Agricultural University (RPCAU), Pusa, Samastipur 848125, Bihar, India

Women play multi-dimensional role as they are contributing from seed sowing to food preparation. The labour force participation of women in agriculture is more as compared to men. The role of women is not limited to labor alone; they are increasingly recognized as custodians of traditional knowledge, innovators, and entrepreneurs, who contribute significantly to food security, income generation, and the overall sustainability and resilience of agri-food system. Despite their indispensable contribution, the role of women is often undervalued and inadequately documented. The present study included the systematic review on women empowerment and agri-food systems. The scopus data was used for the purposes and a total of 930 documents were found on scopus database. It was observed from the data that there is sharp acceleration of research since 2015 with the launch of sustainable development goal (SDGs) in 2015. India has conducted a large number of researches (160) after United States (197) and International Food Policy Research Institute took lead in this area. The systematic literature review presented the strong link between women empowerment and nutritional status of child and elders. Women are the one who is taking care of children and elders along with the preparation of food. Therefore, the women empowerment can improve the food and nutritional security in the world. The future research should be conducted on different aspects of women empowerment in agri-food system in order to improve the status of women as well as food and nutritional security.

Keywords: Agri-food systems, Food security, Nutritional security, SDG, Women empowerment

For correspondence: Tulika Kumari <tulika@rpcau.ac.in>

Farmers Producer Organization: A Collective Action for Women Empowerment in Secondary Agriculture

Nisha Tiwari, Brijesh Pandey

Krishi Vigyan Kendra, Gumla 835207, Jharkhand, India

Women's economic empowerment is pivotal for sustainable development, yet financial exclusion, education disparities, and socio-cultural constraints sometimes hinder their development in the society. For the development of farm women, Farmer Producer Organizations (FPOs) serves as vehicles for transforming the economic condition of farm women in the agricultural landscape of India and other developing nations by enhancing the socio-economic conditions of farmers, particularly women. This article explores how FPOs contribute to promote women's empowerment in secondary agriculture through improved access to resources, market linkages, capacity building and social inclusion. By examining their functions, challenges and impact on rural women, the paper emphasizes how collective approach of FPOs plays a critical role for transforming the lives of farm women through secondary agriculture. To strengthen the farm women, focussed efforts and collective approach are required for the capacity building of FPO's members, financial support, good backward and forward linkages and market access. In recent years, Farmer Producer Organizations (FPOs) have emerged as transformative entities that have the potential to empower women in agriculture. FPOs are collectively owned and operated by farmers to enable better bargaining power, resource pooling and enhanced access to markets.

Keywords: Collective action, Farmers Producer Organization, Secondary agriculture, Women empowerment

For correspondence: Nisha Tiwari <nishaccas@gmail.com>

Socio-Economic Profile of Farmers Engaged in Millets Production in Kalyanpur Block of Samastipur in Bihar

Neelam Kumari, Sradha Kumari, Gitanjali Chaudhary, Sangeeta Deo, Usha Singh

Dr Rajendra Prasad Central Agricultural University (RPCAU), Pusa, Samastipur 848125, Bihar, India

Millets are gaining importance due to their nutritional value, climate resilience, and suitability for small and marginal farmers. The present study was undertaken to analyze the socio-economic status of millet production farmers in Kalyanpur block of Samastipur district, Bihar. The study was conducted using a descriptive research design. A total of 150 respondents, including farmers and farm women, were selected from Kalyanpur block. All respondents were members of the Krishi Kalyanpur Producer Company Ltd., a Farmer Producer Organization (FPO). Primary data were collected through the personal interview method using a structured interview schedule, and the collected data were systematically analyzed. The socio-economic profile of respondents was assessed using ten selected characteristics. The findings revealed that a majority of farmers and farm women belonged to the middle-age group (36-55 years). Most respondents were from the Other Backward Classes (OBC) category and lived in nuclear families. Educational status was moderate, with a considerable proportion having education up to the Intermediate and Graduate levels. Agriculture was the major occupation, and most respondents depended primarily on farming for their livelihood. Landholding analysis indicated that the majority of respondents were marginal farmers, followed by small farmers. More than half of the farmers had access to borewell irrigation, while a significant proportion lacked any irrigation facility. The economic analysis showed that a large majority of respondents belonged to the Below Poverty Line (BPL) category, with low annual income levels. However, many respondents had more than ten years of farming experience, indicating substantial practical knowledge. The study highlights that millet farmers in the study area are economically weak but experienced, emphasizing the need for targeted interventions such as capacity building, irrigation support, and income-enhancing strategies to improve their socio-economic conditions.

Keywords: Climate resilience, FPO, Nutritional value, Socio-economic profile, Structured interview schedule

For correspondence: Neelam Kumari <neelam.kumari@rpcau.ac.in>

Development of *Moringa* Leaves and Pearl Millet Based Multipurpose Flour with Minimum Antinutrient Contents

Savita Kumari, Sangeeta Deo, Veena Shahi, Kiran, Ranjana Kumari

Dr Rajendra Prasad Central Agricultural University (RPCAU), Pusa, Samastipur 848125, Bihar, India

A study was conducted to prepare iron rich multipurpose flour based on moringa leaves powder with pearl millet flour for reduction of anaemia among children. As moringa leaves contains antinutrients which hinder the bioavailability of iron. To analyse antinutrients the moringa leaves powder was developed through three processing treatments as boiling, blanching and steaming along with control. Each processed leaves were dried with three methods - sun, shade and oven. The prepared moringa leaves was estimated for major antinutrient as phytate, oxalate, tannins and total phenolic content. Iron content was also measured and data showed that there was maximum reduction in antinutrients content in boiled and oven dried moringa leaves powder in compare to control. The reduction was 67% for phytate, 58% for oxalate, 66% for tannin and 82% for phenolic compounds. Unprocessed leaves secured highest iron content followed by boiled and oven dried moringa leaves powder. Bajra flour was also developed by four treatments as soaking, germination, roasting and boiling. Germinated bajra flour showed minimum oxalate and phytate content with highest iron among all treatments. Tannin and phenolic compounds were minimum in boiled bajra flour followed by germinated flour. On the basis of this analysis boiled and oven dried moringa leaves and germinated bajra flour will be selected for development of iron rich moringa based bajra flour.

Keywords: Anaemia reduction, Antinutrients, Iron enrichment, Moringa, Pearl millet

For correspondence: Savita Kumari <savita.kumari@rpcau.ac.in>

Strengthening Women-Centric Agri-Food Systems through Extension, Nutrition, Climate Resilience, Entrepreneurships and Digital Innovations from KVK Interventions

D.V. Singh, Anjani Kumar, Md. Monobrullah, Amrendra Kumar, Tejaswini Kapil, Shalini Roy

Agricultural Technology Application Research Institute (ATARI), Indian Council of Agricultural Research (ICAR-ATARI), Patna 800014, Bihar, India

Women are central to agri-food systems, contributing substantially to agricultural production, household nutrition, value addition and livelihood security. However, gender-specific constraints limit their access to resources, technologies, and decision-making processes. This paper presents field-based evidence from Krishi Vigyan Kendras (KVKs) under ICAR-ATARI, Patna highlighting the role of gender-responsive extension approaches in empowering women within agri-food systems. KVK interventions focusing on nutrition-sensitive agriculture, climate-resilient practices, women-led entrepreneurship and digital extension tools were implemented through on-farm trials, frontline demonstrations, capacity-building programmes and advisory services. Promotion of nutri-cereals, nutri gardens, biofortified crops, and value-added food products significantly improved household dietary diversity and nutritional awareness among farm women. Climate-resilient technologies such as drought-tolerant varieties, integrated farming systems, water-saving practices and natural resource management enhanced adaptive capacity and reduced vulnerability to climate risks. Entrepreneurship development through self-help groups, Farmer Producer Organizations and skill-based enterprises enabled women to engage in processing, packaging and marketing of agri-produce, leading to income enhancement and livelihood diversification. The integration of digital tools mobile-based advisories, ICT platforms, and social media strengthened women's access to timely information, market linkages, and institutional support. The findings demonstrate that KVK-led, women-centric extension strategies foster inclusive participation, improve nutritional outcomes, enhance climate resilience and promote sustainable entrepreneurship. The study underscores the importance of institutional convergence, capacity building and gender-sensitive innovations to transform agri-food systems. Empowering women through integrated extension models is critical for achieving sustainable agriculture, food and nutritional security and the Sustainable Development Goals.

Keywords: Agri-food systems, Climate resilience, Digital extension, Nutrition-sensitive agriculture, Women empowerment

For correspondence: D. V. Singh <drdvs.icar@gmail.com>

Women-Centric Digital Agriculture Models through KVK Interventions for Inclusive Agri-Food Systems in Bihar and Jharkhand

D.V. Singh, Anjani Kumar, Md. Monobrullah, Amrendra Kumar, Tejaswini Kapil, Shalini Roy

Agricultural Technology Application Research Institute (ATARI), Indian Council of Agricultural Research (ICAR-ATARI), Patna 800014, Bihar, India

Digital agriculture offers transformative opportunities to enhance women's participation in agri-food systems by improving access to information, services, and markets. This paper presents quantitative evidence from Krishi Vigyan Kendra led digital extension interventions under ICAR-ATARI, Patna, assessing their impact on technology adoption, income enhancement, and nutrition outcomes among farm women in Bihar and Jharkhand. The study is based on field-level data generated during 2022-25 through digital literacy trainings, ICT-enabled advisory services, mobile-based agro-advisories, social media platforms and decision-support tools implemented across selected KVKs of Bihar and Jharkhand. About 840 farm women associated with self-help groups and farm households were covered. Baseline and end-line surveys were conducted to measure digital adoption, livelihood outcomes, and nutrition indicators. KVK digital interventions facilitated access to real-time weather forecasts, crop advisories, pest and disease alerts, nutrition messages, and market information. Adoption of digital tools ranged from 60-78%, with higher uptake observed for mobile-based advisories and WhatsApp knowledge groups. Women using digital advisories recorded a 15-22% reduction in input costs and a 20-30% improvement in crop productivity due to timely decision-making. Income analysis revealed an average annual income increase of 18-30% among digitally empowered women, driven by productivity gains, market linkages and participation in digitally supported enterprises. Nutrition outcomes also improved with Household Dietary Diversity Scores increasing by 20-30% and nutrition awareness related to balanced diets, food safety, and micronutrient intake rising by over 40%. Increased access to digital nutrition messaging and kitchen garden advisories contributed significantly to dietary improvements. The findings demonstrate that KVK led digital agriculture interventions effectively enhance women's adoption capacity, economic resilience, and nutrition outcomes. The study concludes that scaling gender-responsive digital extension models is crucial for building inclusive, efficient, and nutrition-sensitive agri-food systems in eastern India.

Keywords: Decision-support tools, Digital agriculture, Gender-responsive digital extension models, Income analysis, KVK

For correspondence: D. V. Singh <drdvs.icar@gmail.com>

From Waste to Wealth: Women-Led Mushroom Enterprises as Pathways for Sustainable Livelihoods

A.R. Reddy, J.V. Prasad, B. Malathi, Shaik N. Meera

ICAR-Agricultural Technology Application Research Institute, Santoshnagar, Hyderabad 500039, Telangana, India

Mushroom cultivation has emerged as a viable and inclusive agri-based enterprise, particularly for women from economically and socially vulnerable backgrounds. Owing to its low capital requirement, short production cycle, efficient utilization of agricultural waste, and assured market demand, mushroom farming offers substantial potential for income generation and livelihood security. The present study documents selected success stories of women mushroom entrepreneurs from Andhra Pradesh, Puducherry, and Tamil Nadu, representing diverse agro-ecological contexts, who successfully established mushroom-based enterprises and emerged as leaders in the agri-food sector. The documented cases illustrate how women, initially dependent on irregular wage labour, waste picking, or household-based activities, were empowered through structured interventions facilitated by Krishi Vigyan Kendras and allied institutions. Capacity-building initiatives included intensive hands-on training on compost preparation, spawning, crop management, harvesting, hygiene practices, and basic enterprise management. Continuous technical guidance, field-level mentoring, and institutional convergence enabled adoption of low-cost production structures and environmentally sustainable practices using locally available agricultural residues and household waste, following waste-to-wealth and circular economy principles. As outcomes, the women established backyard and semi-commercial milky mushroom units with 15-25 production beds per enterprise. Average production ranged from 7-10 kg per day, generating monthly incomes between ₹30,000 and ₹45,000. Benefit-cost ratios ranged from 1:2.0 to 1:2.5. Several entrepreneurs diversified into value-added products such as mushroom soup mix and pickles, further improving profitability, market stability, and consumer acceptance. Beyond economic gains, mushroom cultivation significantly enhanced women's confidence, decision-making ability, and social recognition. Many entrepreneurs emerged as trainers and local role models, motivating other rural women to adopt mushroom-based enterprises. The study concludes that women-led mushroom cultivation represents a scalable and sustainable pathway for inclusive rural livelihoods, women empowerment, and resilient agri-food systems. This evidence highlights the replicability of KVK-supported mushroom enterprises for poverty reduction, employment generation, and inclusive agripreneurship nationwide among rural women.

Keywords: Milky mushroom, Waste-to-wealth approach, Women empowerment, Women entrepreneurship

For correspondence: A. R. Reddy <ar.reddy@gmail.com>

Women-Led Value Addition Enterprises: Pathways for Income Enhancement and Sustainable Rural Livelihoods

B. Malathi, A. Bhaskaran, T.R. Sahoo, B. Devojee, Shaik N. Meera

ICAR-Agricultural Technology Application Research Institute (ATARI), Santoshnagar, Hyderabad 500059, Telangana, India

Value addition in agriculture plays a pivotal role in enhancing farm income, reducing post-harvest losses, generating rural employment, and promoting sustainable and inclusive growth. In recent years, women-led value addition enterprises have emerged as effective models for transforming primary agricultural produce into profitable, market-oriented agri-food systems. The present study documents selected case studies of successful women entrepreneurs from Tamil Nadu, Andhra Pradesh, Telangana, and Puducherry, representing diverse agro-climatic regions and farming systems, with a focus on enterprise development, institutional support, and measurable socio-economic outcomes. The documented cases cover a wide range of value addition interventions, including processing of millets and traditional rice varieties, preparation of pickles and processed foods, dehydration of fruits and vegetables, direct marketing of organic farm produce, mushroom-based products, and fisheries-based value-added commodities. The women entrepreneurs transitioned from subsistence farming and home-based activities to organized micro-enterprises by adopting improved processing technologies, hygienic production practices, quality control protocols and standardized packaging. Despite constraints such as limited initial capital, lack of technical knowledge, regulatory requirements, and weak market access, the entrepreneurs demonstrated strong resilience and managerial capacity. Krishi Vigyan Kendras and allied institutions facilitated this transformation through structured skill development programmes, hands-on training, exposure visits, continuous technical backstopping, and support for statutory compliances such as FSSAI and MSME registration. Quantitative assessment revealed a significant increase in annual net income, ranging from ₹3.0 lakh to ₹25.0 lakh per enterprise, with employment generation of 2-12 persons per unit. Post-harvest losses were reduced by 20-35%, while benefit-cost ratios improved to 1.8-3.2 across enterprises. Beyond economic gains, the enterprises enhanced women's decision-making ability, leadership skills, and social recognition. The study concludes that women-led value addition enterprises offer a scalable pathway for strengthening rural livelihoods, entrepreneurship, and resilient agri-food systems.

Keywords: Agri-food systems, Income enhancement, KVK interventions, Sustainable rural livelihoods, Value addition, Women entrepreneurship

For correspondence: B. Malathi <malathizpd@gmail.com>

Insights of Women Engagement in Post-Harvest Operations

G. Swarupa Rani, R. Neela Rani, W. Jessie Suneetha, Swetha Kodali, Lakshmi Challa

All India Coordinated Research Project on Women in Agriculture (AICRP-WIA), Professor Jayashankar Telangana Agricultural University (PJTAU), Rajendranagar, Hyderabad 500030, Telangana, India

Agriculture formed the backbone of rural livelihoods in Telangana, where women constituted about 75% of the rural agricultural workforce. While their contributions to crop production received wide recognition, women's roles in post-harvest operations such as harvesting, cleaning, drying, grading, storage, processing, and value addition remained under documented and undervalued. The feminization of agriculture, driven by male out-migration affecting up to 37% of India's population and leading to higher female labour in fields, intensified women's responsibilities in farm-related activities. This study examined women's engagement in post-harvest operations in Ranga Reddy district, a semi-arid region with red sandy loam soils and mixed cropping systems including paddy and millets. It aimed to document the nature, extent, and gendered dynamics of their participation.

The study adopted an ex-post facto research design and selected a sample of 320 farm women through random sampling. Primary data was collected using structured interviews depicting women's participation across various post-harvest tasks, while secondary data from published reports provided contextual support. Descriptive statistics such as frequencies, percentages, and mean scores examined women's physical participation, supervision and decision-making roles.

Results showed a clear gendered pattern in post-harvest management. Women's independent participation reached its highest level in labour-intensive activities such as shelling (72.1%), cleaning (69.6%), de-husking (60.8%) and drying (54.4%). Joint participation proved significant in threshing, drying and storage. Women supervised post-harvest activities at moderate levels. They showed higher involvement in shelling, cleaning, and drying. However, their independent supervision rarely exceeded 35%. Decision-making mostly occurred jointly, market activities like produce marketing showed low female involvement, with less than 5% independent decision-making.

Overall findings indicated that women played a central role in executing post-harvest operations but detained limited control over strategic, market-linked and managerial decisions. These results emphasized the need for gender-responsive interventions to improve access to technology, post-harvest infrastructure and women-friendly tools while strengthening decision-making power and promoting economic empowerment in agriculture.

Keywords: Agriculture, Gender roles, Participation, Post-harvest, Supervision and decision-making

For correspondence: G. Swarupa Rani <swarupa6@pjtau.edu.in>

Farm Women Empowerment through Employing Creative Skills

Lakshmi Challa, R. Neela Rani

Professor Jayashankar Telangana Agricultural University (PJTAU), Miyapur, Hyderabad 500049, Telangana, India

Empowering women farmers through entrepreneurship and creative skills involves leveraging their traditional knowledge and adding value to their produce to increase income, financial independence, and decision-making power within their households and communities. This approach moves women beyond unpaid labour roles into recognised economic agents. Value Addition through creative skills can transform raw agricultural products into marketable, value-added goods. These results can be achieved through making Handicrafts and Artisanal Products utilising natural materials, such as natural dyes, paper bags, jute bags, fashion accessories, incense, mosquito repellent sticks and local handicrafts. Economic Empowerment and Financial Independence for women can be achieved through increased income from value-added products that often command higher prices, leading to a significant increase in income compared to selling raw produce. With a stable income stream, women gain better access to formal financial services, such as bank loans, as demonstrated by the use of mobile apps to track income and secure credit. Increased financial power enables women to purchase productive assets, which further boost productivity and income. Financial contributions to the household increase a woman's bargaining power and involvement in key agricultural and household decisions. Skill development and successful entrepreneurial ventures build self-confidence and self-reliance, encouraging women to move outside their homes for market access and networking. Successful women entrepreneurs become role models in their communities, inspiring other women to pursue similar ventures and challenging traditional gender norms. Providing women with vocational training in crafts, food processing, packaging, financial literacy, and digital marketing to equip them with the necessary tools for entrepreneurship. Encourage the formation of women-only cooperatives and Self-Help Groups (SHGs) to share resources and knowledge, and to access markets and financial support collectively. Leverage technology and e-commerce platforms to help women reach broader markets and access real-time information, overcoming geographical and mobility constraints.

Keywords: Digital inclusion, Innovation, Sustainable leadership, Value-added roles

For correspondence: Lakshmi Challa <lakshnichalla2475@gmail.com>

Homestead Technologies for Boosted Sustenance and Financial Viability among Rural Households

W. Jessie Suneetha, R. Neela Rani, G. Swarupa Rani, Swetha Kodali, Lakshmi Challa

All India Coordinated Research Project on Women in Agriculture, Professor Jayashankar Telangana Agricultural University (PJTU), Rajendranagar, Hyderabad 500030, Telangana, India

The concept of cultivating vegetables and poultry rearing are not new to rural populations in India but it decreased drastically due to changing life style patterns. Hence, the idea of homestead technologies is being encouraged to rural folks in their backyards. Kitchen gardens and poultry rearing ensure cost effective replicas for regular and handy supply of fresh vegetables, eggs and chicken meats to provide vital nutrients as they have resources like land and water but lack technical knowledge on easily cultivable low cost healthy and pesticide free foods.

As part of the intervention study, the rural households were provided with vegetable seeds for year-round availability of fresh produce. Also, they were encouraged to grow perennial trees like drum stick, guava and acid lime as they provide much needed dietary fibre, micronutrients and antioxidants required daily. Each farm family were provided with poultry birds for eggs and meat production. These families were able to save about ₹ 10,250 to ₹ 13,000 per household annually due to vegetable cultivation and poultry rearing. The consumption of greens and vegetables increased by 2 to 3 times with roots and tubers by 1 to 2 times per week as they are readily harvested at homes. The consumption of eggs and meats also improved by 2 to 3 times per week due to the rearing of birds. Also, two families started pickle making with these pesticide free vegetables and earning modest amounts as they are in the initial stages of establishing an enterprise. In conclusion, homestead technologies can provide nutritional security and additional income to their income through agricultural activities.

Keywords: Consumption, Enterprise, Homestead technologies, Kitchen gardens, Micronutrients

For correspondence: W. Jessie Suneetha <wjsuneetha@gmail.com>

Strengthening the Food Chain through Women Empowerment

Gayatri, Sangeeta Deo

Dr Rajendra Prasad Central Agricultural University (RPCAU), Pusa, Samastipur 848125, Bihar, India

Women are integral to the food chain, contributing significantly to agricultural production, post-harvest management, processing, marketing, and household nutrition. Despite their extensive involvement, women often face structural barriers such as limited access to land, credit, technology, training, and decision-making opportunities, which restrict their effective participation in the food chain. Strengthening the food chain therefore requires focused efforts on women empowerment. This paper highlights the role of women-centric interventions including capacity building, skill development, entrepreneurship promotion, and institutional support in enhancing women's participation across different stages of the food chain. Empowered women adopt improved agricultural and post-harvest practices, engage in value addition and agri-based enterprises, and improve market access, leading to increased household income, food security, and dietary diversity. Collective approaches such as self-help groups, cooperatives, and women producer organizations further strengthen women's bargaining power, resilience, and inclusion in formal markets. The study emphasizes that integrating gender-responsive strategies into food chain development is essential for building sustainable, inclusive, and resilient food systems. Women empowerment thus emerges as a key driver for strengthening the food chain while promoting gender equity and nutrition security.

Keywords: Agri-food systems, Food chain, Food security, Value addition, Women empowerment

For correspondence: Gayatri <gayatri@rpcau.ac.in>

Suposhit Bharat for a Viksit Bharat - A Nutrition Solution for a Healthier Future

Seema Singh¹, Rekha Sinha¹, Pragya Bhadauria², Anvi Kumud³

¹Birsa Agricultural University (BAU), Ranchi 834006, Jharkhand, India; ²ICAR-Agricultural Technology Application Research Institute (ICAR-ATARI), Patna 800014, Bihar, India; ³Punjab Agricultural University (PAU), Ludhiana 141001, Punjab, India

Malnutrition, micronutrients deficiencies and livelihood vulnerability remain persistent challenges in rural and peri-urban district of Jharkhand, particularly among women and children. Nutrition sensitive agriculture has emerged as a sustainable pathway to address these interconnected issues. This review paper synthesizes the outcomes of integrated interventions implemented by Krishi Vigyan Kendra, Dhanbad under Birsa Agriculture University, Ranchi Jharkhand. Major initiatives reviewed include *Poshan vatika* (Nutrition Garden) promotion of Millets, post harvest management and value addition, women led rural enterprises, and allied activities such as bamboo handicrafts, herbal gullal, medicinal plants and mushroom cultivation. Evidence from front line demonstration, Nutrition Education and community based interventions indicate improvement in dietary diversity, anemia reduction, income generation and women empowerment. The review highlights KVK Dhanbad's convergence - based "farm to fork" model as a scalable approach for achieving the National vision of *Supposhit Bharat for Viksit Bharat*. The integrated approach adopted by KVK Dhanbad provides a replicable and scalable framework for achieving *Suppsshit Bharat for Viksit Bharat*. Expansion of nutrition gardens, millet clusters FPO/ SHG enterprises and institutional convergence at grassroot level with district and national level which can significantly improves rural nutrition and economic resilience in Jharkhand and similar regions. Future efforts should focus on scaling biofortified crops, integrating millet foods into ICDS and Mid-day meal program and strengthening branding and market linkage for SHG/FPO local agri foods products.

Keywords: Millets, Nutrition sensitive agriculture, *Poshan vatika*

For correspondence: Seema Singh <seema21jan@gmail.com>

Ergonomic Evaluation of Drudgery-Prone Agricultural Activities of Farm Women of Agro Climatic Zone-I and II of Bihar

Vinita Kashyap, Bineeta Satpathy, Sangeeta Deo, Usha Singh, R.K. Tiwari

Dr Rajendra Prasad Central Agricultural University (RPCAU), Pusa, Samastipur 848125, Bihar, India

The study aimed to assess the vulnerability of farm women to occupational drudgery using the Human Physical Drudgery Index (HPDI). A total of 240 farm women from selected 8 villages from the 2 districts under agro climatic zone I and II of Bihar were surveyed through a random sampling technique, followed by experimental evaluation of drudgery-prone agricultural activities such as weeding and livestock operations. For physiological assessment, three replications of a 10-minute work cycle were conducted among women aged 25-45 years, free from chronic illnesses. HPDI was computed through a linear combination of seven parameters: time spent, task performance, difficulty level, body posture, frequency of posture change, postural discomfort, and load/force. The index categorized risks into four levels, ranging from low (<20) to very high (>40). The assessment of occupational drudgery among farm women revealed notable variations in the HPDI across agricultural operations. Nursery preparation recorded the lowest drudgery (HPDI=10.1), categorized as low risk. In contrast, weeding (HPDI=35.01) and livestock fodder carrying (HPDI=30.78) emerged as the most drudgery-prone tasks, both classified as high risk, indicating a strong need for ergonomic interventions and mechanization to minimize musculoskeletal strain. Livestock cleaning and washing (HPDI=29.09) and spraying by knapsack sprayer (HPDI=20.92) fell under medium risk, suggesting the necessity of task modifications and ergonomic training. Overall, the findings highlight that farm women are predominantly engaged in medium to high-risk operations, underscoring the urgent requirement for improved tools, ergonomic practices, and supportive policies to reduce health hazards and enhance work efficiency.

Keywords: Agro climatic zone, Drudgery, Health hazard, HPDI, Knapsack sprayer

For correspondence: Vinita Kashyap <vinita.kashyap@rpcau.ac.in>

From Agricultural Labourers to Agri-Entrepreneurs: Policy Pathways for Rural Women's Inclusion

Pranita J. Kadu

Krishi Vigyan Kendra, Amravati-I, Near Taponeshwar, Amravati 444904, Maharashtra, India

Women constitute a substantial proportion of the rural agricultural workforce; however, their participation in agri-food systems remains predominantly informal, undervalued, and constrained by persistent structural inequities. In many rural regions, farming women lack access to critical enablers of modern economic participation, including smartphones, personal mobility through two-wheeler mopeds, and legal ownership of agricultural land. This systemic exclusion restricts their access to information, markets, financial services, digital platforms, and government welfare schemes, thereby limiting their socio-economic mobility and entrepreneurial potential.

This presentation contends that targeted interventions by state and central governments can serve as transformative catalysts for women's inclusion in agri-food systems. The provision of smartphones, affordable mobility solutions, and land ownership or joint land titles through dedicated public schemes can bridge the digital, physical, and legal divides confronting rural women. Such measures would strengthen women's access to agri-technology, extension services, market linkages, and institutional credit, facilitating their transition from agricultural labourers to agri-entrepreneurs.

Furthermore, decentralised access to farm-friendly agricultural equipment at subsidised rates through Gram Panchayats and local government institutions can substantially reduce physical drudgery and enhance productivity. Collectively, these interventions have the potential to integrate rural women into agri-business value chains, reinforce food system resilience, and advance inclusive, gender-responsive rural development.

Keywords: Agri-food systems, Digital inclusion, Land ownership, Women empowerment

For correspondence: Pranita J. Kadu <drpranitakadu@gmail.com>

Economic Upliftment through Front Line Demonstration in Button Mushroom Cultivation Under Scheduled Caste Family of District Arwal, Bihar

Anita Kumari¹, Anjani Kumar¹, D.V. Singh¹, Kavita Dalmia²

¹ICAR-Agricultural Technology Application Research Institute (ICAR-ATARI), Zone IV, Patna 800014, Bihar, India; ²Krishi Vigyan Kendra, Arwal, Lodipur 804427, Bihar, India

The Arwal district of Bihar, a significant portion of the population comprises small, marginal, and landless laborers belonging to Scheduled Castes (SC), often with low, unstable income levels. Mushroom cultivation has emerged as a high-potential, women-friendly, and income-generating enterprise, particularly suited for rural, small-scale, and landless women farmers. This paper analyzes the impact of Front-Line Demonstrations (FLDs) conducted by Krishi Vigyan Kendra, Arwal (during the year 2023-24 and 2024-25) on improving the economic status of scheduled caste rural women. In which Button mushroom kit was given among 150 beneficiaries under FLD. Prior to conducting FLD, the beneficiaries were made abreast with scientific production methods of mushroom through group meeting and training under FLD and 100 of them were selected randomly. The data were collected through questionnaire developed related to mushroom production and analysis was done with suitable statistics like Percentage increase yield, Extension gap, Potential gap, Technology index and Respondent satisfaction index to know the impact of FLD. The result revealed that technologies given in FLD gave more yield by 50.7% over control. It showed that there was technology gap (TG), extension gap and technology index of 0.9 kg/bag, 0.85 kg/bag and 32.0% respectively. The economic performance on FLD showed an extra return of ₹ 139 /bag with extra cost of cultivation of ₹23/bag with BC ratio of 3.72 for demonstration and 2.46 for Local Check. 59.00% of them found to had high satisfaction towards Front Line Demonstration. Therefore, FLDs in mushroom cultivation are a crucial, sustainable tool for promoting gender equality, reducing poverty, and fostering the economic upliftment of scheduled caste rural women.

Keywords: Economics, Extension gap, FLD, Technology gap, Technology index, Yield

For correspondence: Anita Kumari <arwalkvk@gmail.com>

Impact of Multigrain Ragi Laddu Supplementation on Nutritional Status of School-Going Children

Archana Kumari¹, M. Smita¹, Arpna Bajpai²

¹Pondicherry University, 605014 Puducherry, India; ²Krishi Vigyan Kendra, Kasturbagram, Indore 452020, Madhya Pradesh, India

Krishi Vigyan Kendra (KVK), Kasturbagram, Indore, Madhya Pradesh, implemented a three-years (2019-20 to 2022-23) community-based nutrition intervention in Village Machal, Block: Depalpur, District Indore, with the objective of improving the nutritional status and growth of school-going children. The intervention involved regular supplementation of a multigrain ragi laddu consisted of ragi flour (300 g), wheat flour (200 g), maize flour (150 g), Bengal gram flour (150 g), groundnuts (100 g), jaggery (200 g), and ghee (100 g). The multigrain ragi laddu provided approximately 400-420 kcal of energy, 9-11 g protein, 60-65 g carbohydrates, 9-11 g dietary fiber, 10-14 g fat, 280-320 mg calcium, and 3.5-5.0 mg iron per 100 g. Baseline assessment indicated suboptimal nutritional status among children, with average height ranging from 102-105 cm, body weight from 14.0-15.2 kg, Body Mass Index (BMI) from 12.8-13.5 kg/m², and haemoglobin levels between 9.5-10.8 g/dl, reflecting undernutrition and a high prevalence of iron-deficiency anaemia. Following regular consumption of the multigrain ragi laddu throughout the intervention period, significant improvements were observed, with post-intervention height increasing to 106-110 cm, body weight to 16.5-18.0 kg, BMI to 14.2-15.0 kg/m², and haemoglobin levels improving to 11.2-12.5 g/dl. Sensory evaluation revealed high acceptability of the laddu among children, supporting consistent intake. The study demonstrates that multigrain ragi laddu is an effective, sustainable, and culturally appropriate supplementary food for improving growth, nutritional status, and anaemia outcomes among school-going children.

Keywords: Growth, Multigrain ragi laddu, Nutritional status, Supplementation

For correspondence: Archana Kumari <archusinghmki1988@gmail.com>

Perception and Awareness of Farm Women Regarding Entrepreneurial Development

Beenu Singh, Manisha Gahlot, Kalplata Pant

All India Coordinated Research Project on Women in Agriculture, Govind Ballabh Pant University of Agriculture and Technology (GBPUAT), Pantnagar, Rudrapur 263145, Uttarakhand, India

The number of female entrepreneurs across the world has been gradually increasing in recent years, drawing greater attention from researchers and policymakers. The survey of sample size 1000 farm women revealed that only a small proportion of respondents in both AER-14 and AER-6, were interested in starting an enterprise, primarily to achieve self-sustainability and support their families. Results revealed that only 29.50% respondents wanted to start an enterprise. Majority of respondents (70.50%) do not have thought of running an enterprise. Reasons for not running an enterprise were that majority of respondents were not interested because they were hesitant due to lack of family support, appropriate skill/ knowledge, confidence, market research and fear of failure. In case of respondents who were ready to start an enterprise want to develop personal skills, want to support husband and family and want to become self-sustainable. On the basis of findings of survey, need based entrepreneurial avenues and skill based trainings were imparted for millet-based cookies. An entrepreneurial module Empowering Farm Women through Millet-Based Enterprises was also designed focusing on millet-based product development.

Keywords: Entrepreneurial module, Income generation, Millet-based enterprises, Women empowerment, Women entrepreneurship

For correspondence: Beenu Singh <beenuindolia8@gmail.com>

Sericulture and Women's Economic Inclusion: A Pathway for Sustainable Rural Livelihoods

K.B. Nirmala¹, W. Jessie Suneetha², R. Neela Rani²

¹Professor Jayashankar Telangana Agricultural University (PJTAU), Rajendranagar, Hyderabad 500030, Telangana, India; ²All India Coordinated Research Project on Women in Agriculture (AICRP-WIA), Professor Jayashankar Telangana Agricultural University (PJTAU), Rajendranagar, Hyderabad 500030, Telangana, India

Sericulture is a labour-intensive, agro-based enterprise that integrates biological resources with traditional skills and local knowledge, making it highly suitable for inclusive rural development. In developing economies such as India, it has emerged as a viable livelihood option supporting income generation, employment creation, and social empowerment particularly for rural women. India occupies a distinctive position in the global silk sector, producing multiple varieties of silk through region-specific production systems. The decentralized structure of sericulture enables activities such as silkworm rearing, cocoon harvesting, reeling, and post-cocoon processing to be carried out at household and community levels, making the sector accessible to women who face constraints related to land ownership, mobility, and capital availability.

Women constitute a substantial share of the workforce across the sericulture value chain, especially in rearing and reeling operations. From a development perspective, sericulture contributes directly to women's economic inclusion by offering regular, year-round income opportunities with relatively low investment. The sector's high employment intensity supports livelihood security for women from small and marginal farming households, tribal communities, and landless families. Income earned through sericulture enhances women's financial independence and strengthens their role in household decision-making, generating positive spill-over effects on nutrition, education, and health outcomes.

Sericulture also redistributes income from urban to rural areas, as silk consumption is largely driven by higher-income consumer groups, thereby strengthening rural economies and positioning women as key contributors to value creation. Additionally, it reduces seasonal unemployment and distress migration by providing locally available employment for women excluded from formal labour markets. However, realizing its full empowerment potential requires addressing challenges such as limited access to quality inputs, infrastructure gaps, disease management, and market competitiveness. Targeted interventions including women-centric training, access to credit, producer collectives, improved rearing practices, and strengthened market linkages are essential. In conclusion, sericulture represents a gender-responsive livelihood strategy that aligns economic growth with social inclusion and supports sustainable rural development and women-led economic transformation.

Keywords: Entrepreneurship, Gender sensitive agriculture, Income generation, Sericulture, Women empowerment

For correspondence: K.B. Nirmala <balanirmalakale@gmail.com>

Holistic SCSP Approach for Socio-Economic Upliftment of SC Women in Gaya District of Bihar

Farhana Khatoon¹, Anil Kumar Ravi¹, Manoj Kumar Roy¹, Monika Patel¹, Ashok Kumar¹, Abhay Kumar Mankar², Anjani Kumar³

¹Krishi Vigyan Kendra, Manpur, Gaya, Bihar, India; ²Deputy Director Training, Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India; ³ICAR-Agricultural Technology Application Research Institute (ATARI), Zone IV, Patna, Bihar, India

Women belonging to Scheduled Caste (SC) communities in Bihar often face multiple constraints such as limited access to resources, skills, technologies, and income-generating opportunities, which affect their socio-economic status. To address these challenges, Krishi Vigyan Kendras (KVKs) have implemented interventions under the Scheduled Caste Sub Plan (SCSP) in adopted villages with a high concentration of SC population. The programme aims to strengthen livelihoods, improve income, and enhance the overall quality of life of SC women through a holistic and need-based approach. The programme adopts an integrated approach covering horticulture, field crops, livestock, drudgery reduction, and nutritional security. Major interventions include training and demonstrations on improved production technologies in vegetables, fruits, and field crops; promotion of backyard poultry, goatery, and dairy-based enterprises, introduction of women-friendly tools and implements to reduce physical drudgery, and establishment of kitchen and nutrition gardens. Capacity building on value addition, post-harvest management, and small-scale agri-enterprises is also emphasized. KVK-led SCSP interventions focus on enhancing skills, improving access to quality inputs and technical know-how, and promoting income-generating activities suitable for women. The programme significantly increase productivity and income, reduce workload, ensure household food and nutritional security, and strengthen the decision-making role of SC women. Overall, the holistic SCSP approach in adopted villages of Bihar contributes to sustainable livelihoods, reduced socio-economic disparities, and empowerment of SC women.

Keywords: Nutritional security, Scheduled Caste Sub Plan (SCSP), Socio-economic

For correspondence: Farhana Khatoon <2farhanakhatoon@gmail.com>

Organic Vegetable Cultivation: A Way Towards Transformation

Kumari Vibha Rani

Krishi Vigyan Kendra, Harnaut, Nalanda 803110, Bihar, India

Smt. Usha devi is a progressive women farmer from Bhojpur village in the Griyak block of the Nalanda district. She is a role model for many women farmers across different villages in her block. In addition to farming, she motivates and empowers women to become self-dependent. After getting technical guidance from Krishi Vigyan Kendra, Nalanda she began cultivating organic vegetables and using zero energy cool chamber to extend their shelf life, which helped her secure better market returns. She formed an organic vegetable cultivation group named Nav Bihar Bahuuddeshiya Mahila Vikas Swavlambi Sahkari Samiti Limited. This self-help group has been active since 2007. Later, they formed an association called Mahila Vikash Morcha, which was registered under the Cooperative Society Act on July 16 2018, with thirteen board members. Initially the association received financial support from the Nav Bihar Kalyan Pratishtha Kendra, Pawapuri. Currently, thirty-six self-help groups consisting of six hundred sixty-two members work with this cooperative. The members have leased forty acres of land in adjoining villages for vegetable cultivation. They sell their produce in Giriyaq, Pawapuri, Chorsua, Bihar Sharif and Nawada. The members also received vegetable processing training from Krishi Vigyan Kendra, allowing them to create value added product during the peak harvest season. Consequently, they are now generating a substantial income from both fresh vegetables and processed products. For her commendable work Usha devi was honored with the Best Woman Farmer Award by B.A.U., Sabour in 2019 during Kisan Mela. She was also awarded the Indira Shakti Puraskar for her contributions to women's empowerment and social security.

Keywords: Collective farming, Organic vegetable cultivation, Self-help groups (SHGs), Value addition, Women empowerment

For correspondence: Kumari Vibha Rani <kumarivibhaa1@gmail.com>

Integrated Farming System: A Gateway of Success for Farm Women

Seema Kumari

Krishi Vigyan Kendra, Harnaut, Nalanda 803110, Bihar, India

Smt. Rinku devi is a women entrepreneur from Mirzapur village in the Parwalpur block of the Nalanda district. She has carved out a unique identity for herself by adopting the Integrated Farming System (IFS) as a business enterprise in the district. During challenging times, she sought motivation and training on various subject from Krishi Vigyan Kendra, Nalanda, which inspired her to establish an integrated farming system. She established her IFS model on 2.5 acre of land. This system is pond based; she utilizes two acres for the pond and the remaining half acre for cultivating field crops. Additionally, she has planted papaya and vegetables on the pond embankments (bunds) and banana trees on the bunds of other plots. Her diverse operations also include mushroom cultivation and beekeeping. During peak harvesting seasons, she performs value addition on her vegetables and mushrooms to increase profitability. Beyond her role as an entrepreneur, she serves as a trainer for other women farmers, guiding them toward social upliftment. Her proactive nature, sincerity and hard-work have been key contributors to her grand success. In addition to technical guidance from Krishi Vigyan Kendra she received financial support from state agriculture department. Currently she earns 6-7 lacs per annum from IFS model. She established a Fisheries Farmer Producer Organization (FPO) named Matsyasya Farmer Producer Company, which currently has two hundred seventy members. For her outstanding achievements, she has received the DD Kisan award and Innovative farmers award by BAU, Sabour. She was also esteemed member of extension council meeting at BAU, Sabour, Bhagalpur in 2024 and was elected as the ATMA president of the Parwalpur block for the 2023-2025 term.

Keywords: Farmer Producer Organization (FPO), Integrated farming system, Pond based system, Value addition, Women entrepreneur

For correspondence: Seema Kumari <entoseema@yahoo.co.in>

Women Empowerment through Agri-Horti Interventions of Krishi Vigyan Kendras (KVKs)

Manju Kumari¹, Rajeev Singh²

¹Krishi Vigyan Kendra, Kishanganj, Bihar Agricultural University (BAU), Sabour, Bhagalpur, 813210 Bihar, India; ²Krishi Vigyan Kendra, Khagra, Kishanganj 855107, Bihar, India

Women constitute the backbone of rural agriculture and horticulture, contributing significantly to crop production, post-harvest management, and household nutrition. Despite their central role, women often face socio-economic barriers such as limited access to land, credit, inputs, technology, and extension services. Krishi Vigyan Kendras (KVKs), as frontline agricultural extension institutions, play a pivotal role in empowering women by providing need-based trainings, on-farm demonstrations, capacity-building programmes, and exposure visits aimed at enhancing technical knowledge and entrepreneurial skills. Through these interventions, women adopt improved cultivation practices, engage in crop diversification, establish small-scale agri-horti enterprises, and participate in post-harvest processing and marketing activities, thereby generating additional household income and employment opportunities. Promotion of nutrition-sensitive agriculture, including kitchen gardens and cultivation of nutrient-rich crops, ensures the availability of diverse and nutritious foods, improving dietary patterns and reducing micronutrient deficiencies among farm families. Participation in self-help groups and community-based initiatives further strengthens women's decision-making power, confidence, and leadership capacity in both household and farm management. Evidence from field studies indicates that women beneficiaries of KVK interventions show higher adoption of innovations, better income generation, enhanced employment opportunities, and improved household nutrition compared to non-participants. These interventions not only enhance economic security and nutritional well-being but also contribute to social empowerment and sustainable rural development. Strengthening women-focused KVK programmes through continuous training, technological support, improve socio-economic status, thereby creating a sustainable model for livelihood and nutritional security.

Keywords: Agri-horti enterprises, Diversification, Sustainable

For correspondence: Manju Kumari <manjubortibau2106@gmail.com>

Community Animal Health Centre as a Tool for Improving Livestock Health and Women's Empowerment in Banka District of Bihar

Neha Singh¹, Sanjit Kumar¹, Brajendu Kumar¹, D.V. Singh², Dharmendra Kumar³, Abhay Mankar⁴

¹Krishi Vigyan Kendra, Banka, Bihar Agricultural University, Sabour, Bihar, India; ²ICAR-Agricultural Technology Application Research Institute (ATARI), Patna, Bihar, India; ³Bihar Animal Science University, Patna, Bihar, India; ⁴Bihar Agricultural University, Sabour, Bihar, India

Community Animal Health Centre (CAHC) play a significant role in improving livestock management and empowering rural women in Banka district of Bihar. Livestock rearing is an important livelihood activity in the district, with women being primarily responsible for daily animal care, feeding, milking, and health management. Delayed disease diagnosis and treatment caused mortality of 15-20 cow/year and more than 150 goats/ year/ village, mainly due to unavailability of veterinary facilities. The CAHC model, an ICAR-approved technology, has been developed by KVK, Banka. Model is running with objectives of improving livestock health, empowering rural women with improved access to veterinary services. The most frequently availed services are vaccination of animals (f=1181, 41.58%) followed by deworming of animals (f=1154, 40.63%) and treatment of diseases (f=483, 17.01%). The CAHC intervention significantly reduced the average distance covered to seek animal health services from 22.83 km to 6.40 km after CAHC ($p < 0.01$). Additionally, the ease of seeking animal health care services at the doorstep significantly improved, with the mean score increasing from 4.64 to 6.68 following the intervention ($p < 0.01$). Improved animal health through CAHC interventions enhances livestock productivity, leading to increased household income and better nutritional security of the family. Furthermore, CAHCs contributes to capacity building by creating opportunities for women to acquire skills in animal health management, either as informed livestock keepers or as trained community animal health workers by working as Pashu Sakhi a community-based livestock extension approach that builds the capacity of rural women to serve as trained animal health workers. Pashu Sakhis earns ₹ 50 per castration, earning up to ₹ 5,000 per month when work is available, and additionally produces 100 kg of mineral mixture monthly, sold at ₹ 70 per kg. Their total income averages ₹ 8,000-9,000 per month in good seasons and ₹ 3,500-5,000 during lean periods. The CAHC intervention did not result in a significant change in the effectiveness of services (7.01 before vs. 6.92 after; $p = 0.650$); however, the timeliness of services improved significantly from 4.83 to 7.38 after CAHC ($p < 0.01$). With greater focus towards effective expansion of the CAHC model for the benefit of rural women, KVK, Banka is actively working to achieve its set targets by strengthening timely and accessible animal health services through Pashu Sakhi. Overall, Community Animal Health Centres strengthen rural livelihood, promote women's economic empowerment, and support sustainable livestock development in Banka district.

Keywords: Community animal health center, Livestock management, Veterinary services, Women empowerment

For correspondence: Neha Singh <nebbaa88@gmail.com>

Drudgery Reduction in Maize Planting: Ergonomic Assessment of Manual Planters for Female Farm Workers

Vinita Kashyap, R.K. Tiwari, Varsha Kumari, Sumit Kumar Singh, R.K. Jha, Anjani Kumar, Bharati Upadhaya

Krishi Vigyan Kendra, Birauli, Dr Rajendra Prasad Central Agricultural University (RPCAU), Pusa, Samastipur 848113, Bihar, India

Manual planting of maize in the Paddy-Maize-Green gram cropping system is highly labour-intensive and imposes considerable physical drudgery on female farm workers, particularly under conditions of labour scarcity. To address these constraints, an On-Farm Trial (OFT) was conducted to evaluate improved manual maize planting techniques with respect to drudgery reduction, operational efficiency, and economic performance. The study compared three planting methods: farmers' practice of manual planting, manual vertical dibbler, and manual rotary dibbler. The trial was conducted on farmers' fields covering 2.5 ha with eight replications. Performance evaluation was based on technical parameters (field capacity, germination percentage, labour saving), ergonomic indicators (heart rate response, oxygen consumption rate, and energy expenditure rate), economic indicators (yield and benefit-cost ratio), and farmers' perception. Results revealed that the manual rotary dibbler performed superiorly over the other methods. It recorded the highest field capacity (0.272 ha h^{-1}) and achieved 13% labour saving compared to conventional manual planting. Ergonomic assessment indicated a substantial reduction in physiological workload, with the lowest heart rate increment and minimum energy expenditure rate (7.12 kJ min^{-1}), confirming reduced drudgery. Germination percentage remained comparable across treatments. Maize yield increased by 10.69% over the farmers' practice, resulting in the highest benefit-cost ratio (3.2). Farmers expressed positive feedback regarding ease of operation and reduced fatigue. The study concludes that the manual rotary dibbler is an effective, low-cost, and ergonomically efficient technology for maize planting, particularly suitable for small and marginal farmers.

Keywords: Drudgery reduction, Ergonomic evaluation, Maize planting, Manual rotary dibbler, On-farm trial

For correspondence: Vinita Kashyap <vinita.kashyap@rpcau.ac.in>

Quality Protein Maize (QPM) for Livelihood and Employment Generation of Rural Women

Reeta Singh, Pushpam Patel

Krishi Vigyan Kendra, Bihar Agricultural University (BAU), Patna, Bihar, India

Maize is an important cereal crop of the world and is known as ‘Queen of Cereals’ due to its multifarious uses and high productivity potential. Maize is the third most important crop after wheat and rice, accounts for 9% of the total food grain production in India. India ranks 4th and 7th in terms of global Maize acreage and production, contributing to about 4.6% and 2.4% respectively. Maize plays a very important role in human and animal nutrition. Maize is used as food products in various ways *viz.* Biscuits, Chapati, Ladoo, Halwa, idli, roasted kernels, puffs, pops, flakes, starch, syrup etc. Maize is also used in non-food products like toothpaste, detergent, paper, dyes, etc. It is a good source of carbohydrates, vitamin B-complex, vitamin C, A and K together with a large amount of beta-carotene and fair amount of Selenium that help to improve thyroid gland. Potassium is a major nutrient present which has a good significance because an average human diet is deficient in it.

QPM is an improved variety which contains higher amount of lysine and tryptophan than those contained in normal maize. As more than 85% of the maize is used directly for food and feed, the quality has great role for food and nutritional security in the country. At present, maize is used mainly for feed (63%), food (23%), starch industries (12%), seed breweries and miscellaneous uses (2%) in India. In spite of wide range of health benefits offered by maize as a source of high fiber, antioxidants and vitamins and minerals, major portion of maize is still not being used for human consumption and goes for poultry and animal feed. In India, even after achieving self-sufficiency in cereals and grains production, about 50% children are still fighting with malnutrition. Maize being the cheap crop, has the potential to be the first choice for poor and underprivileged population. nutritional and medicinal benefits of the maize through value added product development, utilization and commercialization will support in ensuring better health of the Rural Women. Availability of value-added food products of maize on industrial level will ensure better nutritional and livelihood security Commercialization, Promotion and Adoption of Maize based value added food products will not only ensure higher return to farmers but also generate employment for rural women and youth with improved dietary diversity.

Keywords: Employment generation, Livelihood security, Nutritional security, Quality protein maize, Rural women, Value addition

For correspondence: Reeta Singh <reetakvk@gmail.com>

Women-Centric Nutrition Interventions through KVK-Based Extension Models in Agri-Food Systems in Bihar and Jharkhand

Anjani Kumar, D.V. Singh, Md. Monobrullah, Amrendra Kumar, Tejaswini Kapil, Shalini Roy

ICAR-Agricultural Technology Application Research Institute (ATARI), Patna 800014, Bihar, India

Women are key drivers of household nutrition and food security in eastern India, yet malnutrition and micronutrient deficiencies remain prevalent in Bihar and Jharkhand. This paper presents quantitative field evidence from Krishi Vigyan Kendras (KVKs) under ICAR-ATARI, Patna, highlighting the impact of women-centric, nutrition-sensitive extension interventions on adoption behaviour, income enhancement, and nutritional outcomes. The study is based on data generated through on-farm trials, frontline demonstrations, participatory training programmes and nutrition awareness campaigns conducted during 2022-2025 across selected KVKs of Bihar and Jharkhand. A total of approximately 850 farm women from self-help groups and farm households were covered. Baseline and end-line assessments were carried out to evaluate adoption rates, income changes, dietary diversity and nutrition knowledge. KVK interventions focused on promotion of nutri gardens, biofortified crops (iron-rich pearl millet and zinc-rich rice), nutri-cereals, pulses, backyard poultry, and value addition of nutrient-dense foods. Results indicated adoption levels ranging from 65-80% for kitchen gardens and nutri-cereal cultivation, and 58-72% for biofortified crops within one year. Household Dietary Diversity Scores (HDDS) improved by 28-38%, with notable increases in consumption of vegetables, pulses, millets, and eggs. Nutrition knowledge and awareness regarding anaemia, balanced diets, and infant and maternal nutrition increased by 42-48% among participating women. Income analysis showed that women engaged in nutrition-linked enterprises such as seedling production, millet processing, and backyard poultry reported an average annual income increase of 20-30%, strengthening household food expenditure and resilience.

The study demonstrates that KVK-led, women-focused extension approaches integrating agriculture and nutrition significantly improve adoption, livelihoods, and nutritional outcomes. Scaling such region-specific, nutrition-sensitive agri-food system models is crucial for addressing malnutrition and achieving inclusive and sustainable development in eastern India.

Keywords: Agri-Food Systems, Food security, Household dietary diversity, Nutrition interventions

For correspondence: Anjani Kumar <anjani.icar@gmail.com>

Empowering Smallholders through Community-Driven Seed System Innovation: Impacts on Rice Seed Extension and Rural Growth in Bangladesh

Muhammad Ashraful Habib, Nuruzzaman, Rehana Noor, Swati Nayak, Mosharaf Hossain

International Rice Research Institute (IRRI), House 07, Road 56, Gulshan-02, Dhaka 1217, Bangladesh

The rice-based farming system of northern Bangladesh faces increasing climatic extremes, production risks, and market uncertainty, where ensuring farmers' income stability is an important policy priority. In this context, the rapid propagation of high-yielding and stress-tolerant rice varieties (STRVs) and the availability of quality seeds are considered an effective adaptation strategy. Although significant progress has been made in the development of improved rice varieties in Bangladesh, in reality, the adoption rate of these varieties is slow and often limited to a limited range. The study analyzed the effectiveness of a community-driven extension model based on women-led community organizations that particularly targeted the 30 members of the Women Federation Group (WFG). Evidence of field implementation in northern Bangladesh shows that seed production by women-led groups has increased from 80 tons to nearly 200 tons between 2021-22 and 2023-24, indicating the rapid spread of improved varieties and strengthening of seed supply at the community level. This model has brought about a significant positive change in the increase in variety-wise knowledge, quality seed production, and adoption of seed quality management practices such as quality seed production and germination testing. Besides, the maximum value addition of up to 71.43% has been achieved in seeds through processing at the women-led community-based rice seed entrepreneurship model (WLCBRSEM), which has meaningfully increased the income and participation of women entrepreneurs. This research-extension-community linkage-based seed extension model can serve as an effective and replicable pathway to achieve rapid adoption of improved rice varieties, resilience of seed systems, and inclusive rural growth.

Keywords: Community-driven extension, Inclusive rural growth, Quality seed production, Seed system, Women-led federation

For correspondence: Muhammad Ashraful Habib <m.habib@cgiar.org>

Women as Agripreneurs: Evidence of Gender-Responsive Livelihood Transformation in Odisha, India

S. Tanuja

ICAR-Central Institute for Women in Agriculture (CIWA), Plot No. 50-51, Mouza Jokalandi, Baramunda Post, Bhubaneswar 751003, Odisha, India

Rural women's entrepreneurship plays a pivotal role in driving a nation's economic progress through capital formation, regional development, employment generation, and the promotion of self-reliance. Micro- and small-scale enterprises (MSEs), being both affordable and manageable, offer significant opportunities for rural women. To fully harness the transformative potential of entrepreneurship in rural contexts, it is essential to design models that are contextually relevant and sustainable. The present study introduces and validates the Gender-Responsive Community Agripreneurship Model (GCAM) for rural women's agripreneurship development. The model was field-tested using participatory action research with rural women farmers across six districts of Odisha Ganjam, Jagatsinghpur, Puri, Khordha, Cuttack, and Jajpur. Enterprise development activities focused on value-added fish products, small-scale poultry production, and broiler goat rearing, supported through technological backstopping, capacity building, formation of women's collectives, establishment of community resources, and facilitation of credit and market linkages. Enterprise integration strategies were tailored to each district, taking into account resource availability, women's interests, and the local entrepreneurial ecosystem. While small-scale poultry farming and broiler goat rearing were promoted as individual enterprises, value-added fish processing was implemented through a group-based approach via women's collectives. The interventions resulted in a 96% increase in income of women farmers through small scale poultry production, by adopting improved varieties such as Vanaraja and Kadaknath, following recommended production practices. Goat-rearing units adopted the broiler goat technology, with each unit comprising 20+1 Black Bengal goats and it resulted in a 114% increase in income of the women farmers. The women SHG groups could realise a 67% increase in their income through the production and sale of hygienic dry fish, pickles, and papads. The GCAM model thus demonstrates practical strategies and best practices for promoting rural women's agripreneurship and offers valuable insights for rural service providers, practitioners, and policymakers aiming to strengthen women-led enterprise development.

Keywords: Fisheries, Implications, Livestock, Process, Rural women agripreneurship

For correspondence: S. Tanuja <tanujasomarajan@gmail.com>

Livestock Based Integrated Farming System Improved Livelihood and Nutritional Security Round the Year for Rural Farm Women

Asem Ameeta Devi¹, Khuml Levish¹, Y. Prabhabati Devi², K. Sonamani Singh¹, Ch. Basudha³

¹Krishi Vigyan Kendra, Chandel, Bamon Leikai, Munge Makhong Leirak, Manipur, India; ²Krishi Vigyan Kendra, Imphal East, Manipur, India; ³ICAR-Manipur Centre, Imphal, Manipur, India

Chandel district is predominantly inhabited by tribal population is agrarian in nature and practice traditional farming systems raising both crops and animals which has been an integral part of life since time immemorial. Majority of the farmers are marginal and small land holders with low per capita income who practice subsistence farming to make their livelihood by rearing livestock and poultry through backyard farming with less knowledge

On integration of livestock based farming. The present success story highlights the empowerment of a rural woman farmer through the adoption of a livestock-based integrated farming system With technical guidance and capacity-building support, the farmer integrated horti/goatery/piggery/poultry with crop production, fodder cultivation, and value addition activities. Efficient utilization of farm resources such as crop residues for livestock feeding and recycling of animal waste as organic manure significantly reduced production costs and improved soil fertility. The diversified farming approach ensured year-round income, enhanced household nutritional security, and minimized risk from crop failure. As a result, the woman farmer naming Agnes aging 54 years old from Lamphoupasna village achieved a substantial increase in farm productivity and net income, leading to improved living standards and financial independence. The intervention also strengthened her decision-making ability, social recognition, and participation in community-level agricultural activities. This success story demonstrates that livestock-based integrated farming systems are a sustainable and viable pathway for enhancing income, livelihood security, and women in this way her income achieved triple times as compare to earlier income. livelihood security, and increased women empowerment in rural areas of Chandel district Manipur.

Keywords: Farming, Integration, Livestock, Organic, Recycling

For correspondence: Asem Ameeta Devi <asemameeta2007@gmail.com>

Srinidhi Bird Rearing Under Semi-Intensive System Can Increase Double Income of Rural Farmer

Asem Ameeta Devi¹, Khuml Levish¹, Y. Prabhavati Devi², K. Sonamani Singh¹, Ch. Basudha³

¹Krishi Vigyan Kendra, Chandel, Bamon Leikai, Mange Makhong Leirak, Imphal, Manipur, India; ²Krishi Vigyan Kendra, Imphal East, Imphal, Manipur, India; ³ICAR Research Complex for North Eastern Hill Region, Manipur Centre, Imphal, Manipur, India

The present study documents the success of Hunhring, a progressive farm woman belonging to Lamphou pasna village who adopted under TSP programme on demonstration of improved dual purpose breed of poultry Srinidhi bird rearing as a viable enterprise for double income generation under a semi-intensive farming system. As in hill district of Manipur backyard poultry farming is a traditional system. Production of eggs and meat from the local fowl is not adequate to cater the needs of the state. The demand of chicken and eggs is very high than the broiler birds. A dual purpose bird Srinidhi bird was introduced in the year 2020 and supported her by providing 50 nos. of Srinidhi birds of 4 weeks old. Srinidhi birds performed very well in body growth, egg production and capacity to withstand the changing climate and diseases compared to local/desi. Initially, the farmer reared a small nos. of birds using low-cost housing, but after KVK intervention balanced feeding practices, and scientific health management under semi intensive system of rearing was incorporated, Srinidhi bird performed tremendously better than the local bird as 3.5 kg adult body weight, laying capacity as 160 eggs/bird/year as compare to 1.8kg and 75 eggs/bird per year in local desi bird. The birds exhibited early maturity, higher egg production, better body weight gain, and superior adaptability to local agro-climatic conditions. Regular egg production provided a steady source of daily income, while the sale of surplus male birds and spent layers generated substantial periodic returns, thereby ensuring dual income streams. In addition, on-farm utilization of poultry droppings as organic manure improved soil fertility and crop productivity, further enhancing overall farm income. Adoption of biosecurity measures and timely vaccination significantly minimized disease incidence, leading to higher survival rates which increase in annual income, improved household nutritional security. Srinidhi bird rearing is a low-risk, cost-effective, and scalable livelihood option capable of doubling farmers' income while promoting sustainable rural poultry production and livelihood diversification. She is the role model in Chandel district as her success story affects on horizontal spread of poultry farming with improved dual purpose breed like Srinidhi birds can increase their income and food security minimize malnutrition.

Keywords: Bird, Backyard, Egg, Meat, Nutrition and production

For correspondence: Asem Ameeta Devi <asemameeta2007@gmail.com>

Cultivating Change: Challenges in Natural Farming and a Shepreneurship Framework

Ankita Sahu

ICAR-Central Institute for Women in Agriculture (CIWA), Bhubaneswar 751003, Odisha, India

Natural farming has emerged as a sustainable alternative to conventional agriculture; however, its adoption among farm women is constrained by several socio-technical and institutional factors. The present study employed Garrett ranking analysis to identify and prioritize the key challenges faced by farmers in adopting natural farming practices. The study was conducted in Khordha, Nayagarh and Kandhamal district of Odisha. The Garrett ranking analysis revealed several key constraints faced by farmers in adopting natural farming practices. The most critical constraint, ranked first, was the irregular availability of natural inputs such as Jeevamrut and Ghanajeevamrut, largely due to their time-intensive preparation, which discouraged farmers from adopting natural farming practices. This was closely followed by reduced or highly variable yields during the transition period, placed in the second rank. Insufficient training and extension support on natural farming methods emerged as the third major constraint, highlighting the need for stronger capacity-building efforts. The lack of cattle or animal resources for preparing essential bio-inputs was ranked fourth, while poor market access and the absence of price premiums for natural produce stood fifth. High labour requirements and drudgery, along with difficulties in managing pests, diseases, and weeds without chemicals, were both ranked sixth, indicating substantial operational challenges. Additionally, logistics and scalability issues in producing or distributing bio-inputs were identified as the seventh constraint, followed by costly and lengthy certification procedures in natural produce, ranked eighth. The least-ranked but still significant constraint was the lack of local research trials and validated protocols, pointing to the need for evidence-based region-specific recommendations. The ranking clearly shows that improving input availability, training, market support, and research validation are essential for enhancing the adoption and success of natural farming among farmers. Against this backdrop, and based on the prioritized constraint of input availability, a framework was developed to promote shepreneurship among farm women through the establishment of women-led bio-input resource production units. These units will function as income-generating enterprises while facilitating wider adoption of natural farming in the region.

Keywords: Bio-input resource production units, Constraints, Input availability, Natural farming, Women farmers

For correspondence: Ankita Sahu <ankitaicar18@gmail.com>

Turning Fish into Fortune: A Rural Women Empowerment Success Story from Thoothukudi, Tamil Nadu

S. Sumathi, T. Masanaseelvam, V. Palanichamy

ICAR-SCAD Krishi Vigyan Kendra, Muduvaithanendal Post, Vagaikulam, Thoothukudi, Tuticorin 628102, Tamil Nadu, India

Rural women entrepreneurship has emerged as a key catalyst for enhancing livelihood security, income diversification, and inclusive growth in coastal and fisheries-dependent communities. In many fishing villages, women remain confined to low-return activities due to limited access to skills, technology, finance, and organized markets. Mrs. A. Thommai Innasi, a fisherwoman from Vellapatti village and one among the 18 members of the Sorojini Women Self Help Group, aspired to enhance her income through enterprise development. Owing to the absence of scientific processing knowledge, inadequate infrastructure, and poor market access, the group was constrained to selling raw produce at marginal prices, resulting in low and unstable incomes. Knowing after this, ICAR-SCAD KVK conducted comprehensive hands-on training on hygienic handling, standardization, packaging, labelling, branding, solar drying techniques, modern marketing strategies and facilitated institutional convergence by establishing a marketing outlet at the district collectorate campus with financial support from Mahalir Thittam and enabling access to institutional credit amounting to ₹3.50 lakhs. As a result, the beneficiaries acquired the technical skills to prepare a range of fish products like fish, prawn, massi pickles, fish cutlets, fish fingers, fish nuggets, and dried fish. Exposure visits to the Fisheries College and Research Institute and the Entrepreneurship Development and Innovation Institute-MPBIF Thoothukudi, further enhanced their technical understanding and entrepreneurial orientation. Through sustained handholding and mentoring support of ICAR SCAD KVK, Mrs. Thommai Innasi successfully established a fish processing unit and commercialized her products under the brand name QUEEN after obtaining FSSAI certification. Now the enterprise expanded progressively with the involvement of 5 WSHG members earning a monthly income of ₹45,000 to ₹60,000 and participation in district, state, and national level exhibitions, as well as online marketing platforms. The intervention demonstrates a scalable and replicable model of women-led entrepreneurship in fisheries, underscoring the transformative impact of skill development, institutional support, and market integration in improving livelihoods and socio-economic empowerment of rural fisherwomen.

Keywords: Fish processing, Livelihood security, Market integration, Self-help groups (SHGs), Women entrepreneurship, Value addition

For correspondence: S. Sumathi <sumathikvk2025@gmail.com>

ARYA in Action: Women Entrepreneurs Creating Sustainable Livelihoods through Spice Value Addition in Neemuch District

Shilpi Verma, C.P. Pachauri, J.P. Singh, P.S. Naruka, S.S. Sarangdevot

ICAR-Krishi Vigyan Kendra, Neemuch, Qtr. No. 01, KVK Campus, Neemuch 458441, Madhya Pradesh, India

Under the ARYA (Attracting and Retaining Youth in Agriculture) Project, Krishi Vigyan Kendra (KVK), Neemuch facilitated the establishment of women-led enterprises in spice value addition to enhance sustainable livelihoods. Rural women were provided structured training on scientific processing, grading, drying, grinding, packaging, quality control, and basic entrepreneurship. Prior to intervention, beneficiaries had no independent income and relied on seasonal agriculture. Through continuous handholding support, 15 women entrepreneurs adopted spice value addition using locally available raw materials. The intervention resulted in an average annual income increase of ₹60,000-₹80,000 per beneficiary. The enterprise generated self-employment for all participants and additional employment for 20-25 rural women at the village level. Improved market linkages enabled product sales in local and nearby markets.

The ARYA intervention significantly enhanced women's technical skills, economic independence, and social recognition. The Neemuch experience demonstrates that spice value addition is a viable enterprise for women entrepreneurship and highlights the effectiveness of the ARYA-KVK model in promoting sustainable, income-generating rural livelihoods. Entrepreneurial trainings like these played an important role in developing the skills among the rural youths and also benefiting them for income generation. Skill training programmes are very useful to the rural youth to earn their livelihood through subsidiary occupations and improve agriculture income with the development supplementation of this income. ARYA acts as a catalyst linking skills to markets and finance, ensuring sustainable income generation, enterprise sustainability, and enhanced livelihood security for rural youth and women agripreneurs.

Keywords: ARYA project, Skill development, Spice value addition, Sustainable livelihoods, Women entrepreneurs

For correspondence: Shilpi Verma <acsbilpi@gmail.com>

Empowering Rural Women through Tomato Value Addition: A Study on Shelf Life, Sensory Quality, and Economic Viability in Jharkhand, India

Bharti

Krishi Vigyan Kendra, Birsa Agricultural University (BAU), Simdega, Ranchi 834006, Jharkhand, India

Women play a pivotal role in post-harvest management and food processing in rural India, yet their economic contribution often remains undervalued due to limited access to market-oriented skills and technologies. This study evaluates the potential of tomato value addition as a livelihood-enhancing activity for rural women through the preparation of tomato puree and tomato paste. An on-farm trial was conducted in Kisko village, Lohardaga district of Jharkhand, involving women participants to assess shelf life, sensory quality, and economic feasibility under room temperature and refrigerated conditions. Tomato puree (12-15° Brix) and tomato paste (25° Brix) were prepared using standardized protocols. Sensory evaluation was carried out using a 5-point hedonic scale, and an economic analysis was undertaken to determine cost of production, net returns, and benefit-cost ratios. Results revealed that tomato paste exhibited a longer shelf life (up to 60 days at room temperature and 90 days under refrigeration) compared to tomato puree (45 days at room temperature and 60 days under refrigeration). Both products showed high initial sensory acceptability, with gradual decline over storage time. Economic analysis indicated favourable benefit-cost ratios of 3.68:1 for tomato puree and 3.44:1 for tomato paste. The study demonstrates that tomato value addition is a viable, low-cost, and women-friendly enterprise that can enhance income, reduce post-harvest losses, and strengthen women's economic empowerment. Integrating such interventions into rural development programs can significantly contribute to gender-inclusive growth and food system resilience.

Keywords: Livelihood, Rural entrepreneurship, Sensory evaluation, Shelf life, Tomato processing, Value addition, Women empowerment

For correspondence: Bharti <bhartibau@gmail.com>

Empowerment of Rural Women through Azolla-Based Livestock Interventions in Gondia District of Maharashtra

Kalyani Wasudeorao Sarap, V.P. Ubarhande, R.D. Chavan, V.T. Kore, M.V. Bhomte

Krishi Vigyan Kendra, Hivara, Gondia, Dr Panjabrao Deshmukh Krishi Vidyapeeth (PDKV), Akola 441614, Maharashtra, India

The present investigation was conducted to assess the effectiveness of Azolla (*Azolla pinnata*)-based livestock feeding as a nutritional and livelihood intervention for promoting women's economic inclusion in Gondia district of Maharashtra. The study was carried out for a period of six months (July-December) under frontline demonstrations organized by Krishi Vigyan Kendra (KVK), Gondia. A total of 60 rural women dairy farmers were purposively selected for the study.

Women participants were trained in the establishment and management of low-cost Azolla production units and supplemented fresh Azolla @ 1.0-1.5 kg/animal/day along with the existing feeding schedule. Data on milk yield and feed cost were recorded before and after intervention using a structured interview schedule. Statistical analysis was performed using mean \pm standard error (SE) and percentage change.

The results revealed that the mean daily milk yield increased significantly from 6.42 \pm 0.18 litres/animal/day (pre-intervention) to 7.05 \pm 0.21 litres/animal/day (post-intervention), registering an increase of 9.81%. The average concentrate feed cost decreased from ₹112.50 \pm 4.30/day/animal to ₹88.60 \pm 3.75/day/animal, indicating a reduction of 21.24%. The net additional income realized due to Azolla supplementation ranged between ₹1,800-2,600 per household per month, depending on herd size. The benefit-cost ratio (B:C) of Azolla production units was found to be 2.32:1, demonstrating high economic feasibility.

In addition to economic gains, women exhibited marked improvement in technical knowledge, skill competency, and participation in livestock-related decision-making. The study concludes that Azolla-based livestock feeding is a scientifically validated, economically viable, and gender-responsive intervention capable of enhancing dairy productivity and empowering rural women. Scaling up Azolla technology through women-centric livestock extension programmes can contribute significantly to sustainable dairy development in agro-climatic conditions similar to Gondia district of Maharashtra.

Keywords: Azolla pinnata, Dairy productivity, Economic inclusion, Gondia district, Livestock nutrition, Women empowerment

For correspondence: Kalyani Wasudeorao Sarap <ishasarap@gmail.com>

Beyond Training to Transformation: A Replicable KVK Model Advancing Women's Economic Inclusion in Agri-Food Systems of India

B. Neeharika¹, G. Prasad Babu¹, Shaik N. Meera², M. Sheshu Madhav³

¹ICAR-National Institute of Rice Research and Education - Krishi Vigyan Kendra (NIRCA-KVK), Kandukur, Andhra Pradesh, India; ²ICAR-Agricultural Technology Application Research Institute (ATARI), Zone-X, Hyderabad, Telangana, India; ³ICAR-National Institute of Rice Research and Education (NIRCA), Rajahmundry, Andhra Pradesh, India

Women's economic inclusion in India's agri-food systems faces multiple barriers including limited access to technology, markets, finance and policy support. ICAR-NIRCA-Krishi Vigyan Kendra (KVK), Kandukur, Andhra Pradesh demonstrates how an integrated, gender-responsive extension approach can transform women's livelihoods from skill development to sustainable enterprise across diverse agri-food sectors.

Over five years, more than sixty rural women were empowered through interventions spanning mushroom cultivation, vermicomposting and poultry management alongside food processing and value addition. In processing, women gained skills in preparing jams, pickles, sauces, millet-based bakery products, fruit and vegetable dehydration techniques and dairy products. The model promotes collective action through women-centric groups, self-help groups (SHGs) for savings, credit and cooperative production and active participation in farmer producer organizations (FPOs) enabling women farmers to strengthen market linkages, bargaining power and enterprise sustainability.

The KVK approach links the full agri-food value chain to actionable strategies and policy frameworks. Interventions include needs assessment, capacity building, access to technologies, food safety and FSSAI compliance and guidance on branding and packaging, combined with structured market exposure through exhibitions, local retail and institutional platforms. Beneficiaries are trained as peer trainers, facilitating horizontal knowledge transfer and replication of best practices across villages. Government schemes such as PMFME (Prime Minister Formalization of Micro Food Enterprises) and PMEGP (Prime Minister's Employment Generation Programme) are leveraged to provide credit, formal registration, subsidies, and market support, enabling women to convert skills into sustainable livelihoods.

The outcomes are transformative. Women-led enterprises generate annual net incomes of ₹ 1.8-4.5 lakh per entrepreneur, create local employment and strengthen household economic resilience. Beyond financial gains, participants report increased confidence, active engagement in enterprise and financial decision-making and greater social recognition within their communities.

By fostering diverse agri-food enterprises and women-centric collectives, the KVK Kandukur model contributes directly to national women empowerment strategies, including SDG 5 (Gender Equality), the National Rural Livelihood Mission (NRLM) and India's agripreneurship initiatives. Its replicable, end-to-end framework demonstrates how extension services can transition from training-focused programs to sustainable enterprise development, offering actionable lessons for KVKs, states and rural development programs seeking to enhance women's economic inclusion.

Keywords: Agri-entrepreneurship, Economic inclusion, Integrated extension model, Self-help groups, Women empowerment

For correspondence: B. Neeharika <bneeharika05@gmail.com>

Assessment of Livelihood and Financial Status of Farm Women of MKSP and Non-MKSP Villages of Tamil Nadu

G. Sashidevi, R. Vijayalakshmi

Tamil Nadu Agricultural University (TNAU), Madurai 625104, Tamil Nadu, India

The study was conducted in Agricultural Ecological Zone-19 of Tamil Nadu. In AER-19th zone four districts, eight blocks and sixteen villages were selected for this study. Tenkasi and Tirunelveli district were selected for MKSP and Dindigul and Theni district were selected for Non MKSP adopted villages for data collection with random sampling. Livelihood analysis based on eight securities was assessed in all the selected villages of MKSP (Mahila Kisan Sashaktikaran Pariyojana) and Non-MKSP financial security was assessed by the framed questionnaire among the families of number of earning members and their annual income and savings, household and farm assets, availability of bank, post office and crop insurance. The results of the assessment showed the financial security most of the family have one earning member. During the lean period availability of employment is not adequate in Non-MKSP adopted villages of Dindigul and Theni district. In non MKSP only 34% of the respondents have a crop insurance to compensate their losses arising due to uncertainties. But in MKSP villages having 50.5% of crop insurance. Small hold farmers and poor households are extremely vulnerable to natural uncertainties and becoming over debted. About 82 to 62.5% of the respondents have 5 household assets out of 10. But in the terms of farm assets only 30 to 19.5% of the respondents have 5 assets out of 10. They only have small farm assets like plough, spade and hoe. About 38% of the respondents avail tractors as rental basis only. In both MKSP and non MKSP respondents have savings around ₹ 50000. Financial sustainability was achieved through the training and other interactions designed to have strong lines of messaging on farm women. Financial literacy programmes were arranged to have knowledge on savings, deposit etc. The availability of employment during lean period were for MKSP 85.5% and Non - MKSP 71.5%, more than 60% frequency for repayment of credit and 10-20% frequency for sold any assets to meet household expenditure. Financial status of MKSP adopted villages was highly significant, since they are accessible to credits compared to Non-MKSP.

Keywords: Financial, Livelihood, MKSP, Non MKSP

For correspondence: G.Sashidevi <sashidevi.g@tnau.ac.in>

The Challenges Faced by Self Help-Groups (SHGs) for Sustainable Development

Shivani Rana, Shikha Sharma

Punjab Agricultural University (PAU), Ludhiana 141004, Punjab, India

Self Help Groups (SHGs) have emerged as powerful catalysts for agricultural development, transforming rural communities by empowering farmers and agricultural workers to collectively address their challenges. A group of 10 to 20 members can form a self- help group. The amount so collected was used for disbursement of loan. Those who do not have formal banking facilities can avail these loans for self- employment and livelihood. The self- help group and microfinance is for those who do not have access to formal credit facilities such as banks or co-operative societies. It is facing social, economic, political and marketing problems. This study focuses on those problems and gives suggestions. Self-Help groups disburses small loans to the rural and urban poor for the purpose of making them self-reliant and encouraging them to enter into the mainstream of economic activities. Ultimately results in financial inclusion. With this objective the study was conducted with the following objectives under All India Coordinated Research Project-Women in Agriculture. (1) To study the self- help groups in rural areas and the socio-economic characteristics of the respondents. (2) To find out the challenges faced by members of self-help groups by SWOT analysis. (3) To give suggestions to overcome those problems. The sample size is 100 respondents from 5 self- help groups. Primary and secondary data were collected through questions relating to problems faced by members of SHGs. The study concludes that addressing the challenges faced by Self-help groups(SHG) requires collective effort from society, government, NGOs, banks and institutions. Incentives and subsidies can further improve SHG effectiveness. SHGs, if given equal recognition as formal businesses, hold significant human potential to drive economic development. The success of SHGs depends on their operational efficiency. Further, results showed that the practical training programs to be conducted to create awareness among villagers. The SHGs members were advised to utilize the amount only for carrying out the income-generating activities and not for domestic purposes. Book-keeping and transparency is a must to avoid conflicts among the SHG members.

Keywords: Economic independence, Savings, Self-help groups, Sustainable development, Women empowerment

For correspondence: Shivani Rana <shivanirana@pau.edu>

Economic Empowerment of Women through Self-Help Groups: A Case from KVK Ratlam

Barkha Sharma, Sarvesh Tripathy, Ramdhan Ghaswa, Shish Ram Jakhar

Krishi Vigyan Kendra, Kalukheda, Tehsil Piploda, Ratlam 457340, Madhya Pradesh, India

Women's economic empowerment is a critical component of inclusive and sustainable rural development. However, rural women often face constraints related to financial inclusion, skill development, and access to livelihood opportunities. The Self-Help Group (SHG) approach has emerged as an effective mechanism to enhance women's income and decision-making capacity.

This abstract presents a case of women's economic inclusion facilitated through the interventions of Krishi Vigyan Kendra, Ratlam. Mrs. Krishna Kapasiya, a resident of Kansar village, initially a homemaker from a financially weak background, was motivated by KVK to form a Self-Help Group and link with the National Rural Livelihoods Mission (NRLM). With a government grant of ₹20,000, she established a beauty parlour and cosmetics enterprise. Capacity building through Rural Self-Employment Training Institutes (RSETIs) and Bank Sakhi training enabled her to assist SHGs in banking and financial services.

She played a significant role in the formation of 199 SHGs and 18 Village Organizations and is presently working as an instructor at Jan Shikshan Sansthan, Ratlam, imparting skill-based training to adolescent girls and women. Through diversified livelihood activities, she is earning approximately ₹35,000 per month and has achieved the status of a Lakhpati Didi.

The case highlights the role of KVK-led interventions in promoting economic inclusion, entrepreneurship, and sustainable empowerment of rural women.

Keywords: Economic inclusion, KVK interventions, Rural livelihoods, Self-help groups (SHGs), Skill development, Women empowerment

For correspondence: Barkha Sharma <asbarkbasharma@gmail.com>

Empowering Women Farmers through Backyard Poultry: Socio-Economic and Nutritional Impacts Under Schedule Caste Sub-Plan (SCSP) in Bhojpur, Bihar

Shobha Rani¹, Alok Bharti¹, Anjani Kumar², Md. Monobrullah², D.V. Singh², Pragya Bhadauria²

¹Krishi Vigyan Kendra, Bhojpur, Bihar Agricultural University (BAU), Ara, Bihar, India; ²ICAR-Agricultural Technology Application Research Institute (ATARI), Zone IV, Patna, Bihar, India

Backyard poultry interventions are increasingly recognized as effective strategies for promoting rural livelihoods, food security, and women's empowerment. This intervention is being promoted by the Krishi Vigyan Kendra, Bhojpur among the rural families through Schedule Caste Sub Plan (SCSP) every year in the adopted villages. Under this programme, during 3 years (2022-25), an average of 40-50 improved poultry chicks (Kadakhnath and Vanaraja) were provided to 75 women farmers across three adopted villages namely Dogra Tola (Bihya), Chandi (Koilar), and Dhamar (Ara) in Bhojpur district, Bihar and were trained in feed management, housing, health care, and routine husbandry practices for backyard systems. Continuous monitoring and supervision was done with timely technical inputs. Both breeds are dual-purpose, with Vanaraja producing over 160 eggs annually and reaching an average of 2.7 kg in 12 months, while Kadakhnath yields 70-90 eggs and commands high meat value.

Post-intervention monitoring recorded 85.4% chick survival, with higher productivity than the local indigenous birds. Further, socio-economic assessment showed annual incremental household income of ₹ 15,000-22,000, derived from egg and meat sales, supporting asset accumulation and cash flow. Nutritional security improved via increased protein availability, particularly for children and women. On an average, women involved in backyard poultry spared a maximum of 1 hour on their overall management as compared to those families who are not involved in backyard poultry. It was also noticed that farm women play a dominant, often central role in the day-to-day management of backyard poultry, particularly in feeding (90%), watering (90%), and chick supervision (87.5%). While their labour contribution is high, their formal decision-making authority, especially regarding large financial investments is often limited or shared with male household heads.

Women reported enhanced decision-making autonomy, regular supplementary income, and integration of poultry management into household routines, reflecting empowerment. Low investment requirements and minimal infrastructure made the intervention feasible and sustainable. These all contributed towards improvement in socio-economic status of families involved in backyard poultry farming.

This study demonstrates that targeted distribution of high-yield backyard poultry to women farmers can deliver measurable economic, nutritional, and empowerment benefits, suggesting that scaling such programs with market linkages and technical support can strengthen inclusive rural development and livelihood diversification in Bhojpur and other districts.

Keywords: Backyard poultry, Kadakhnath and Vanaraja, Livelihood improvement, Nutritional security, Socio-economic impact, Women farmers

For correspondence: Shobha Rani <shobhakuar@gmail.com>

Role of Women Farmers in Advancing Financial Inclusion and Livelihood Support: Evidence from Bhojpur District of Bihar

Shobha Rani¹, Alok Bharti¹, Anjani Kumar², Md. Monobrullah², D.V. Singh², Pragya Bhadauria²

¹Krishi Vigyan Kendra (KVK), Bhojpur, Bihar Agricultural University (BAU), Ara 813210, Bihar, India; ²ICAR-Agricultural Technology Application Research Institute (ATARI), Zone IV, Patna 800014, Bihar, India

Women farmers have emerged as critical drivers of financial inclusion and livelihood transformation in Bihar, with particular significance in Bhojpur district, where agriculture and allied activities constitute the backbone of the rural economy. This study synthesizes recent empirical evidence on the role of women farmers primarily mobilized through Self-Help Groups (SHGs) under the JEEVIKA framework in advancing financial inclusion and strengthening rural livelihoods, situating district-level trends within the broader state context. The analysis highlights women's expanding integration into formal financial systems through Pradhan Mantri Jan Dhan Yojana accounts, Aadhaar-linked services, social security schemes, and women-oriented savings instruments, which together have enhanced household-level financial resilience and reduced dependence on informal credit sources.

In Bhojpur, female literacy stands at 58.03%, exceeding the state average of 51.50%, although a substantial gender gap persists relative to male literacy (81.74%). Women constitute nearly 17% of the agricultural workforce and perform the majority of livestock-related activities, accounting for over 70% of labour input, comparable to the state average of approximately 75%. On average, rural women in Bhojpur devote 4-6 hours daily to animal husbandry, underpinning 60-90% of livestock management functions and contributing directly to household income generation.

Women farmers have also played a decisive role in channelizing institutional credit through SHG-bank linkage programmes, enabling investments in agriculture, dairy, goatery, and backyard poultry enterprises. The strong demand for women-centric livelihood initiatives is evidenced by nearly 195,000 applications from women in Bhojpur for the Mukhyamantri Mahila Rojgar Yojana within two days of its launch. While the absolute scale of financial flows in Bhojpur is smaller than the state aggregate, the structural patterns of women-led financial inclusion and livelihood diversification closely mirror statewide trends. The findings reaffirm that women farmers are central to inclusive and resilient rural development in Bhojpur, Bihar.

Keywords: Financial inclusion, Livelihood support, Rural development, Self Help Groups, Women farmers

For correspondence: Shobha Rani <shobhakuar@gmail.com>

Turning Dessert into an Oasis: Her Story

Nakka Sugandhi, Priya Sugandhi Geddam

Krishi Vigyan Kendra, Bellampally, Professor Jayashankar Telangana State Agricultural University (PJTAU), Gaddipally, Suryapet, Telangana, India

In the dessert of financial crisis, with skin of less water daily wages where her family survival was hard, she started digging the pit of hope. There, she has found an oasis. That oasis itself is today her entrepreneurship on value addition to millets. She is Mrs. M. Kalyani, hails from Kalmalcheruv village, Garidepally mandal, Suryapet District, Telangana. During trainings on millets value added products at KVK, Gaddipally, Mrs. Sugandhi, SMS (Home Science), taught and showed various millet ready to eat snacks. Mrs. Kalyani has learned how to mould raw millets into traditional shapes and crunchy modern food items such as Ragi laddu, Jowar laddu, Murukulu where she got the opportunity to serve nutritious millets value added products to the public. Further 6 days training on millet value added products was the boosting phase for Mrs. Kalyani to start her own enterprise who has become now from daily wager to self-reliant, earns ₹ 15000/month and well full of water could provide employment to 3 other women and standing as a living testimony as an oasis from dessert. Hopefully this oasis will never become crisis again.

Keywords: Income generation, Millet value addition, Rural development, Self-reliance, Women entrepreneur

For correspondence: Nakka Sugandhi <sugandhisagar@gmail.com>

Empowering Women and Promoting Entrepreneurship through Millet Based Bakery Skill Development Training

S. Anitha¹, Gopika C. Muttagi¹, Deepak²

¹ICAR-Krishi Vigyan Kendra, Bangalore Rural, University of Agricultural Sciences (UAS), Bengaluru, Karnataka, India; ²ICAR-JSS Krishi Vigyan Kendra, Mysuru, Karnataka, India

Women belonging to vulnerable section of society need special support and skill training as they have limited opportunity to get exposed to scientific techniques and modern methods of value addition to enhance their skills and managerial potential. Rural women specially belonging to scheduled caste need to be provided such capacity building trainings to enhance their livelihood security. It is also to be noted that the awareness created will enhance the knowledge about nutritional importance of millets. Skill training to rural women specially belonging to scheduled caste need to be provided to enhance their livelihood security.

India is the 2nd largest producer of biscuits in world. Millets are known as super foods, have low glycemic value and associated with phenolic and ioactive compounds. So, utilization of locally available crops in Hassan district to produce healthy value added product and also it has impact on providing nutrition to family and increasing the house hold income.

This three-day skill development training program, held from 09/01/2025 to 11/01/2025 at College of Agriculture, Karekere, Hassan, University of Agricultural Sciences, Bangalore under the Indian Council of Agricultural Research (ICAR) Scheduled Caste Sub Plan (SCSP/SDC) for 20 rural women aimed to promote livelihood enhancement for participants through value-added millet products. Recognizing the growing demand for nutritious, millet-based foods, the program focused on providing practical knowledge in producing bakery items using nutrient rich grains like finger millet and sorghum. The training programme focused on preparing, processing, packaging, FSSAI licence, labelling and branding of millet-based products, including biscuits, muffins, and cookies made from finger millet and other millets. The main objectives of the programme are to provide awareness about millet-based bakery products and to give skill training about preparation of value-added products. The program empowered participants to shift from traditional consumption to commercial production. Outcomes for trainees was fostering entrepreneurial skill sets, improving technical capacity for value addition, and creating awareness about marketing strategies for millet-based products. Participants were equipped with the knowledge to initiate self-employment opportunities and strengthen rural economies. The training concluded with an assessment of skills acquired, equipping participants with the knowledge to establish small-scale, health-focused, and profitable millet-based food businesses.

Keywords: Finger millet, Livelihood security, Skill development, Women empowerment

For correspondence: S. Anitha <anithas080@gmail.com>

Standardization of a Gender-Responsive Production Technology for Bhringraj (*Eclipta alba* L.)

Swarajya Laxmi Nayak

ICAR-Central Institute for Women in Agriculture (CIWA), Bhubaneswar 751003, Odisha, India

Bhringraj (*Eclipta alba* L.) is an important medicinal plant widely used in traditional and herbal hair-care formulations, particularly valued for its bioactive compound wedelolactone, known to promote hair growth and scalp health. In view of its relevance to women's health, income generation, and suitability for small-scale cultivation, a field experiment was conducted during 2023-25 at ICAR-Directorate of Medicinal and Aromatic Plants Research (DMAPR) to standardize a women-friendly package of practices for Bhringraj under nutrient management. The experiment was laid out in a split-plot design with three spacings (30 × 30 cm, 30 × 45 cm, and 45 × 45 cm) as main-plot treatments and three manure sources namely, castor cake, vermicompost, and farmyard manure (FYM) applied on a nitrogen-equivalent basis to meet the recommended dose of fertilizers (RDF) as sub-plot treatments. Growth, yield, and wedelolactone content were recorded and analysed over two consecutive years. Results revealed that Bhringraj planted at a spacing of 30 × 45 cm along with application of vermicompost consistently produced superior plant growth, higher fresh herbage yield (7.5 t/ha) and significantly higher wedelolactone content (3.3 kg/ha) compared to other treatment combinations. Vermicompost application combined with 30 × 45 cm spacing emerged as an efficient, eco-friendly, and gender-responsive production technology for Bhringraj, requiring minimal external inputs and particularly suitable for women-managed farms and homestead gardens.

Keywords: Bhringraj, Medicinal plants, Nutrient management, Vermicompost, Women-friendly technology

For correspondence: Swarajya Laxmi Nayak <swarajyalaxminayak@gmail.com>

Harnessing the Potential of Traditional Rice and Millets for Entrepreneurship in Thiruvannamalai District

T. Margaret, V. Suresh, M. Ishwarya

¹Krishi Vigyan Kendra, Thiruvannamalai, Kilnelli, Cithathur Post, Vembakkam Taluk, Tiruvannamalai 604410, Tamil Nadu, India

The farmers in Thiruvannamalai district are mainly cultivating paddy around 184925 ha., traditional rice varieties are being cultivated in an area of 13,980 ha. Millets are the traditional crops which are cultivated in area of 14,660 ha. The entrepreneurial journey of KVK Thiruvannamalai promoted Dhanushree SHG's from Soraputhur village of Thellar block in Thiruvannamalai district, who transformed traditional rice and millets into a sustainable livelihood enterprise. Their family income remained irregular and insufficient from farms. With continuous motivation and technical guidance from Krishi Vigyan Kendra (KVK), Thiruvannamalai and through participation in NABARD-sponsored skill development trainings on value addition, the group gained hands-on knowledge in processing millet and traditional rice based products under LEDP.

Encouraged by market response and consumer preference, they established a home-based value addition unit named Dhanushree Organic Foods. They standardized production under hygienic conditions, ensured quality packaging and labelling and registered the unit under MSME with FSSAI compliance. The unit currently produces more than 15 varieties of value-added products with a monthly production capacity of 200-230 kg, generating a net income of about ₹55,200 per month. Their success has inspired neighbouring women and farmers to establish similar enterprises, leading to the emergence of new rural micro-enterprises in Thellar block. This case demonstrates the role of institutional support, skill development and value addition in enhancing farm income and promoting women-led rural entrepreneurship.

Keywords: Millets, Self-help groups (SHGs), Traditional rice, Value addition, Women-led entrepreneurship

For correspondence: T. Margaret <kvktvmalai91@gmail.com>

Transforming Millets into Livelihoods: Success Stories of Farm Women Entrepreneurs in Belagavi

Rekha Bhaskar Karabhari, Maruti N. Malawadi, Datta A. Mhetre

ICAR-BIRDS Krishi Vigyan Kendra, BIRDS Campus, Near Navaprabha School, Tukkanatti, Belagavi 591224, Karnataka, India

Millets are nutritionally rich cereal grains containing phytochemicals, dietary fiber, and essential micronutrients, and are consumed by over one-third of the global population. Ranking sixth among cereal crops worldwide, millets have gained renewed importance due to their climate resilience, low input requirements, and contribution to food and nutritional security. Despite these advantages, millet cultivation often offers limited economic returns when sold in raw form, particularly affecting small and marginal farmers and farm women.

The present study was conducted in Belagavi district of Karnataka under the guidance of ICAR-Krishi Vigyan Kendra (KVK), Belagavi, with the objective of promoting millet-based entrepreneurship as a sustainable livelihood option for farm women. The initiative focused on enhancing income, skills, and livelihood security through value addition to locally grown millets. To achieve this, KVK organized nutritional education programmes, skill development trainings, and awareness activities on millet nutrition, processing, and enterprise management. Farm women were trained in preparing a variety of millet-based value-added products, including ready-to-cook and ready-to-eat foods, catering to changing consumer preferences and increasing health awareness. Emphasis was also placed on hygienic processing, packaging, labeling, and basic marketing strategies to improve product quality and market acceptance. These interventions enabled participants to transition from subsistence farming to small-scale entrepreneurial ventures.

The documented success stories reveal significant improvements in income generation, self-employment opportunities, and confidence among farm women. Value addition resulted in better price realization, improved household nutrition, and preservation of traditional millet crops while adapting them to modern consumer demands. The study highlights the vital role of ICAR-KVK Belagavi in promoting millet entrepreneurship as a sustainable livelihood option. The success stories documented serve as strong motivation for rural women and farming communities to adopt millet-based enterprises. These initiatives contribute significantly to women empowerment, nutritional security, and climate-smart agriculture. Overall, they strengthen local food systems, generate rural employment, and enhance long-term socio-economic resilience in millet-growing regions of Karnataka.

Keywords: Climate-smart agriculture, Livelihood security, Millet entrepreneurship, Nutritional security

For correspondence: Rekha Bhaskar Karabhari <rekhabkarabhari21@gmail.com>

Rural Women Empowerment through Biofortified Rice Processing

Nisha Sharma

Krishi Vigyan Kendra, Anjora, Dau Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya (DSVCKV), Durg 491001, Chhattisgarh, India

An on-farm trial was conducted during 2024 to assess income enhancement and livelihood improvement of rural women through value addition of bio-fortified rice by developing tomato-flavored rice papad. The study was implemented in selected Self Help Group (SHG) villages of Jevra and Sirsa in Durg district, Chhattisgarh, with active participation of farm women. The primary objective was to address the knowledge gap in processing and utilization of bio-fortified rice while promoting women empowerment through small-scale food processing enterprises.

The bio-fortified rice variety CR Dhan 310, a protein-rich variety developed by the Central Rice Research Institute (CRRRI), Cuttack, Odisha, was utilized for papad preparation. Two treatments were evaluated: T_1 - papad prepared from locally available rice, and T_2 - papad prepared from bio-fortified rice. Economic parameters including cost of gross returns, net returns, and benefit-cost ratio (B:C) were analyzed to determine economic feasibility. The results revealed that bio-fortified rice papad (T_2) recorded substantially higher production. The gross and net returns from T_2 were ₹9,292.5 and ₹6,903, respectively, with a higher B:C ratio (3.88) compared to T_1 (2.94), indicating superior profitability and economic viability.

The study demonstrates that value addition of bio-fortified rice into papad not only enhances income but also contributes to nutritional security due to its higher protein content. The intervention strengthened technical skills, entrepreneurial capacity, and economic independence of rural women. Adoption and scaling up of such value-added processing technologies can significantly contribute to sustainable livelihood enhancement, women empowerment, and inclusive rural development.

Keywords: Bio-fortified rice, Income enhancement, Nutritional security, Rice papad

For correspondence: Nisha Sharma <nsharma1418@gmail.com>

Role of Farm Women in Nutritional Gardens for Improving Household Nutritional Security

Manisha Choudhary

Krishi Vigyan Kendra, Raigarh 496001, Chhattisgarh, India

The present study was conducted on nutritional gardens with the objective of improving nutritional security among farm households, with special focus on the role of farm women. India is one of the leading producers of vegetables, yet malnutrition remains a serious problem, mainly due to deficiency of micronutrients in the daily diet. Factors such as lack of awareness, illiteracy, low purchasing power, and limited availability of fruits and vegetables contribute to this issue. The recommended dietary allowance (RDA) of vegetables is 400 g per person per day, including green leafy vegetables, roots and tubers, and other vegetables. Malnutrition leads to several health problems, affects physical growth, and hampers mental development. Farm women play a key role in planning, establishment, and management of nutritional gardens, as they are mainly responsible for household food production, crop selection, harvesting, and food preparation. Adoption of nutritional garden practices using sustainable methods provides a long-term solution to nutritional insecurity. Nutritional gardens ensure regular supply of fresh fruits and vegetables for household consumption and help in preventing nutritional deficiencies. Effective use of backyard land by farm women not only improves family nutrition but also provides additional income and enhances their self-reliance and decision-making ability. Compared to traditional homestead gardens, improved nutritional gardens include diversified crops that can be harvested throughout the year to meet household needs and generate economic benefits. Thus, nutritional gardens are an effective strategy for improving nutritional security and empowering farm women. The study revealed that nutritional gardens are a feasible livelihood option for resource-poor farm households and contribute to improved availability of vegetables, better nutrient intake, and enhanced economic status.

Keywords: Farm households, Farm women, Nutritional garden, Nutritional security

For correspondence: Manisha Choudhary <manisha.kvk@gmail.com>

Women-Led Agri-Food Entrepreneurship for Economic Inclusion: A Case Study of Traditional Food Value Addition in Karnataka

Vinutha Muktamath¹, Surekha Sankangoudar¹, K.J. Sannapamma¹, Rajeshwari Desai¹, Y. Ravi¹, Mridula Devi², Priya Hegde¹

¹All India Coordinated Research Project on Women in Agriculture (AICRP-WIA), University of Agricultural Sciences (UAS), MARS, Krishinagar, Dharwad 580005, Karnataka, India; ²ICAR-Central Institute for Women in Agriculture (ICAR-CIWA), Bhubaneswar 751003, Odisha, India

Women's economic inclusion through agri-food entrepreneurship is critical for strengthening rural livelihoods, food security, and sustainable development. This case study examines the transformation of a rural woman from a subsistence homemaker to a successful agri-food entrepreneur through institutional support, capacity building, and value addition of traditional foods. Smt. Arundhati Mahantesh Ritti, a small farmer from Haveri district, Karnataka, possessed indigenous knowledge of preparing traditional foods such as jowar roti, pickles, and chutney powders; however, lack of standardization, processing infrastructure, and market access constrained income generation.

Intervention under the All India Coordinated Research Project on Women in Agriculture (AICRP-WIA), with convergence of state and district institutions, enabled structured training in post-harvest handling, food processing, quality and safety standards, branding, pricing, and enterprise management. Adoption of scientific processing practices and compliance with FSSAI, GST, and UDYAM regulations facilitated the commercialization of traditional products under the registered brand Parampara Ruchi. Production scaled from household-level quantities to nearly two tonnes per month, resulting in a significant increase in annual income from less than ₹1 lakh to approximately ₹8 lakh.

The enterprise generated regular employment for women from local self-help groups, contributing to women-led economic inclusion and collective empowerment. Beyond income enhancement, the intervention strengthened the entrepreneur's decision-making capacity, social recognition, and leadership role within the community. The case demonstrates that integrating traditional knowledge with modern agri-food technologies, institutional convergence, and market-oriented approaches offers a scalable and replicable model for promoting women's economic inclusion within agri-food systems.

Keywords: Agri-food entrepreneurship, Institutional convergence, Rural livelihoods, Traditional food systems, Value addition, Women's empowerment

For correspondence: Vinutha Muktamath <vinumuktamath@gmail.com>

Story of a Successful Women Entrepreneur, Smt. Neetu Kundu

Sarita Joshi, Pramod Kumar

Krishi Vigyan Kendra, Village Pursi, Ghaziabad 201206, Uttar Pradesh, India

Smt. Neetu Kundu is a resident of village Mohammadpur Dhedha block Muradnagar District Ghaziabad. Both husband and wife were earning from farming and running their household. They were just hand to mouth. Smt. Neetu did not have any technical skill which made it difficult for her to find job. Her primary drive was to provide her two daughters good education and dignity through self reliance which lead her to acquire skill of fruit and vegetable preservation. A turning point came in Neetu's life when she met home scientist in Gram Panchayat Dheda in 2023 and heard about training program on value addition at Krishi Vigyan Kendra where she learned and mastered the skill of making pickles, murabba, jam, jelly, candy and various other products which enables her to established agro business enterprise (Radhika aachar). She started her work with ₹2500 /only. Initially she prepared apple jam and mixed vegetable pickle and sold her products .Demand for pickles and jam grew. After building confidence and acquiring marketing skills she obtained FSSAI registration no. and entrepreneur certificate. She expanded her products and made more varieties of pickles and other products to include over 40 different products. To meet growing demands she began involving other local women in production process thus creating employment oppourtunities. Presently she developed market linkage beyond direct sale from stall to supply her products to local vendors and earned about 30-35% profit from this entrepreneurship. It employs about eight women on regular basis and another 35 women seasonally for tasks like cutting, peeling, grinding and packing. Women's empowerment and employment generation for rural areas are two main economic significance. She is serving as inspiring role model and provides training to other women and SHG members and rural youths. Her products highlighted for using natural ingredients like rock sugar (mishree), vinegar and herbs appealing to health conscious consumers and potentially contributing to a healthier community. She has been recognized by various government organizations and NGOs on her achievement, honored by CPC Doordarshan Kisan. She has also been awarded by Ex M.P. General V.K. Singh, Ghaziabad, U.P. (2023), by MLA Ajeet Pal Tyagi, Muradnagar block (2023) and got an opportunity to interact with Governor of U.P. Smt. Anandi Ben Patel. She also had the honour of meeting the Honorable P.M. Modi due to her hard work.

Keywords: Agro-based enterprise, Fruit and vegetable processing, Rural livelihood, Self-reliance, Women entrepreneurship

For correspondence: Sarita Joshi <saritajoshi156@yahoo.com>

Perception and Awareness of Farm Women Towards Entrepreneurship Development

Y. Ravi, K.J. Sannapamma, Surekha Sankangoudar, Vinutha Muktamath, Rajeshwari Desai, Mridula Devi

All India Coordinated Research Project on Women in Agriculture (AICRP-WIA), University of Agricultural Sciences (UAS), Dharwad 580005, Karnataka, India

Farm women increasingly recognize entrepreneurship as a pathway for economic empowerment, skill utilization and social advancement, however, their participation is strongly influenced by perceptions related to family, society, enterprise viability and institutional support, as well as their level of entrepreneurial awareness. The present study examined the perception and awareness of farm women towards entrepreneurship development in Gadag and Haveri districts of Karnataka during 2023-24, covering 1,000 farm women from selected villages. The findings revealed an overall favourable perception towards entrepreneurship, with (68.10%) of farm women expressing a positive and (15.10%) a very positive perception. Analysis of perception dimension reveals most respondents possessed strong self-belief and confidence; however, (34.60%) perceived higher education as essential to start an enterprise. With respect to family and family members, women largely disagreed that family would restrict or discourage entrepreneurial activities, though (31.00%) expressed concern that business failure could adversely affect their family. Perception regarding society and people revealed uncertainty, as (43.10%) of respondents were unsure about societal reactions in the event of enterprise failure, despite many strongly disagreeing that people would discourage them at the initial stage. Perception related to the enterprise itself highlighted uncertainty regarding returns and funding requirements, while issues such as market competition, profitability and limited selling areas were not perceived as major barriers. Some procedural delays in loan documentation, sanction and disbursement were perceived as significant constraints. Awareness analysis revealed substantial gaps across critical areas of entrepreneurship development. Limited awareness was observed regarding training opportunities (8.60%), financial procedures (18.00%), legal and licensing requirements (11.10%), business practices (production, distribution, promotion and selling) (14.70%) and market and marketing aspects (23.30%). A considerable proportion of respondents lacked adequate awareness of government schemes, institutional support systems, NGO/SHG assistance and market linkages. Overall, while farm women exhibit a strong positive perception and readiness towards entrepreneurship development, limited awareness and procedural knowledge continue to be major barriers. The findings underscore the need for targeted awareness programmes, hands-on training, financial literacy and market-oriented support mechanisms to effectively translate favourable perceptions into successful women-led entrepreneurial ventures in rural areas.

Keywords: Entrepreneurship development, Farm women, Institutional support, Perception and awareness, Rural entrepreneurship, Women empowerment

For correspondence: Y. Ravi <raviy@uasd.in>

Value addition to Banana Stem- Saga of Successful Women Entrepreneur Supported by Krishi Vigyan Kendra, Chamarajanagara

M.K. Shruthi, N.T. Naresh, S. Chandrashekar Kallimani, A.B. Mohankumar, B. Pompanagowda, J. Deepa, H.P. Rajath, Hanamantappa Meti

ICAR-Krishi Vigyan Kendra, Chamarajanagara, University of Agricultural Sciences (UAS), Bengaluru, Chamarajanagar 571127, Karnataka, India

Women entrepreneurship plays a crucial role in strengthening rural livelihoods, promoting gender equity and fostering inclusive development, particularly in remote village of Chamarajanagara district of Karnataka, characterized by diversified crops and cropping system. Banana alone occupies major area (27,193 ha) under irrigation which created significant challenges in disposing the waste after harvest of crop. In this context, Krishi Vigyan Kendra (KVK), Chamarajanagara, has emerged as an important institutional technical and handholding support system for promoting women-led entrepreneurship through capacity building, technology dissemination, and institutional convergence in converting the banana waste into valuable products. Mrs. Varsha w/o Shrikantaswamy from Demahally village, Chamarajanagara district, Karnataka is a multifaceted entrepreneur involved in fabricating value added branding and marketing of edible and non-edible products prepared out of banana stem. KVK Chamarajanagara provided various platforms for showcasing her products in conferences, krishimelas, market and business meets and exposers visits to such other enterprises which boosted her confidence in marketing and branding. She is recognized through her work in earning a wealth from waste where she converted banana stem waste into many value added products like banana craft through weaving mats, bags, purse, wallets, gift ornaments using banana fibres and also developed many edible products like banana stem pickles, banana flower chutney, curry and banana chips etc. with her brand name Akruithi Ecofriendly Enterprises. She is earning income from selling and showcasing such products in various online markets as well as many local outlets. In addition, Mrs. Varsha created employment opportunities for the local rural women and helped them to earn their livelihoods. Mrs. Varsha is also recognized and appreciated by Hon'ble Prime minister in Man Ki Baat programme and got chance to participate in Republic Day programme at Dehli during 2025 and 2026. The annual turnover of the enterprise is 5.4 lakhs excluding equipments cost and net profit earned is 2.5 lakhs per annum. She is also interested in re-using the banana juice rich in potassium obtained during fibre extraction process to the agricultural crop which helped in saving the fertilizer cost by considering its nutritive value. Varsha's banana stem utilization enterprise provides an opportunity to dispose this banana plant waste into valuable products inspiring many rural women to think of converting a waste into wealth.

Keywords: Banana fibre, KVK Chamarajanagara, Livelihood, Value added products, Women entrepreneurship

For correspondence: M.K. Shruthi <sbruthimangala21@gmail.com>

Empowering Women Through Millet Based Entrepreneurship Development From Top to Bottom

S. Poomathi, T. Sundarraj, S. Udhayakumar

Krishi Vigyan Kendra, Elumichangiri Village, Mallinayanapalli Panchayat, Krishnagiri 635120, Tamil Nadu, India

Krishnagiri district most suitable for cultivation of millets with an area of 45,000 hectares. Women lack scientific techniques of preservation with poor shelf life. There is great demand for millet based products scope in the domestic and rural market. KVK has made efforts to empower women through various training programmes in value addition of millets, RTE and RTU products. Mrs. S. Girija, aged 49 years old farm woman educated upto 9th standard finds difficult to cater to the needs of the family. From Mathur block, underwent training at KVK on millet-based bakery items, dehydrated powders, ready-to-eat mixes, moringa food products, and FSSAI license. With technical guidance on branding, packaging, and marketing, she launched an enterprise under the brand name Giri Traditional Organic Foods, with 10 women obtaining FSSAI certification (No. 22424103000090) with an initial investment of ₹ 50,000/-.

Supported by machinery distributed under the ICAR-IIMR SCSP initiative, she increased production of millet snacks, dehydrated food mixes, papads, and herbal mixes, pickle. Her monthly income rose from ₹ 5,000/- in 2022 to ₹75,000/- in 2025-26. Adoption of scientific preservation and value addition improved the quality packaging and shelf life of the products. She has been awarded by renowned institutes for her recognition in organic farming, traditional rice variety, millet varieties, millet products through Department of Agriculture, Asia International Culture Organization Academy, The Indian Red Cross Society, Vinayaga Matriculation School Naam Alwar Viruthu, Kamban Kalagam and Rotary Club of Hosur District Level Mango Exhibition.

Her success has motivated over 200 women to take up millet processing as a livelihood. With enhanced confidence and ongoing KVK support, she has approached NABARD to expand her enterprise into a marketing hub within Krishnagiri town. Mrs. Girija the housewife now turned in to a FPO farmer and a good entrepreneur with the improved social economic status. Initially she produced the small Endeavour of 20 kg as rose to 300 Kg per month of millet based products. The products gave good feedback from the people from and gained momentum. Thus, with continued support from KVK and guidance she has got a good opportunity to grow well socio economically and also motivates other farm women of unemployment nature to venture into food enterprises for improved livelihood. Mrs. Girija's journey reflects how targeted training, institutional support, and local resource utilization can uplift rural women through sustainable agro-based enterprises.

Keywords: Food processing, Millet value addition, Ready-to-eat products, Rural livelihood, Women entrepreneurship

For correspondence: S. Poomathi <mathiyokash@gmail.com>

Empowering the Women through Training on Minimal Processing and Value Addition of Fresh Field Beans

S. Anitha¹, S. Sowjanya¹, B.S. Swetha², G. Pramod², Deepa Pujar², B.S. Rajendra Prasad², D.C. Preethu²

¹Krishi Vigyan Kendra, Bangalore Rural, 561203 Karnataka, India; Krishi Vigyan Kendra, Ramanagara, University of Agricultural Sciences (UAS), Bengaluru, Kalya Post, Magadi Taluk, Magadi 562120, Karnataka, India

Field bean (*Dolichos lablab*) is a dual-purpose legume. The outer peel of the seed is removed and the inner soft part is used for a variety of dishes. This form is called hitakubeleavarekaalu, which means pressed (hitaku) field bean, and these de-skinned beans known as Hitikidaavarekalu. Whole field bean and de-skinned bean are used as vegetables. This study aims to increase the shelf-life of de-skinned beans. The main objectives of the study is to process different methods (such as KMS 2% and blanched and without treatment (control) and after treatment surface drying with solar dryer and vacuum packing. processed field beans are storing in different conditions (normal, refrigerated and freezing condition). Conduct training for SHGs mainly on processing, value addition, packing and labelling. The results of the study shows the processed field beans can store under room temperature with treatment 2% KMS, surface drying and Vacuum packing for up to three days and Blanching for 700C can store up to 2 days and control without treatment up to one day. In refrigeration temperature field beans can store up to 5 days with treatment 2% KMS, but Blanching for 700C can store up to 4 days and control without treatment up to 3 day surface drying and Vacuum packing. In freezer we can store up to one month and no significant difference on treatment for 2% KMS, Blanching and control. In conclusion the fresh pressed field beans can retain fresh up to 5 days with treatment of KMS 2%, surface drying using solar dryer and vacuum packing for by storing in refrigerating condition. Training conducted for SHGs regarding the processing methods, product development (field beans chakli, mixture, Khadabu and papad).

Keywords: Blanching, Field bean (*Dolichos lablab*), Shelf-life extension, Solar drying, Vacuum packaging, Value addition

For correspondence: S. Anitha <anithas080@gmail.com>

Facilitation Role of KVK-Lakshadweep in Fostering Development with Women Neighbourhood groups

C.A. Raju, P.N. Ananth

Krishi Vigyan Kendra, Lakshadweep, ICAR–Central Marine Fisheries Research Institute (CMFRI), Kavaratti 682555, Lakshadweep, India

Women in Lakshadweep contribute immensely to the agri-food systems of Lakshadweep, a geographically isolated and ecologically fragile archipelago. Since time immemorial, women in Lakshadweep have been using coconut and fish for household nutrition and supporting livelihoods. Many R&D agencies have been working on development of women in this sector. The Department of Rural Development, UT Administration of Lakshadweep works closely with women and the associated groups. This study aims at presenting the status of women in using the two natural products *viz.*, Coconut and fish to provide nutritional security and contribute to the economy. Mostly the women are involved in value addition, processing and in enterprise development. Women Self Help Groups (SHG), locally organized as Neighbourhood Groups (NHG) under Island Level Federations (ILF) across all ten inhabited islands, are actively engaged in standardization and improvement of traditional products such as virgin coconut oil, copra, coconut oil, coconut halwa, tuna fish pickle, masmin and other marine products. Scientific validation of processing practices, capacity building on hygiene and quality, and access to basic processing equipment enhanced product consistency, shelf life and market acceptability. Capacity building initiatives targeted more than 500 women farmers and SHG members, strengthening technical skills, food safety awareness and entrepreneurial capacity. A landmark initiative, Women and Coconut, brought together 113 women from Self Help Groups from all ten inhabited islands. Extension platforms such as Coco Fest-2024 and Matsyamela-2026 enabled women to participate in exhibitions, live demonstrations and direct marketing, facilitating exposure to advanced processing technologies and strengthening market linkages. Complementary nutrition and gender focused awareness programmes conducted during World Women's Day, World Food Day and National Nutrition Week highlighted women's roles in household food security, nutri-gardens and kitchen gardens, contributing to improved dietary diversity and health outcomes. Overall, the Lakshadweep experience demonstrates that women-centered agri-food interventions supported by scientific standardization, institutional convergence, and inclusive extension approaches can significantly enhance livelihood resilience, promote sustainable island agri-food systems, and advance women's economic empowerment in small island contexts.

Keywords: Coconut, Fisheries, Food security, Value addition, Women

For correspondence: C.A. Raju <rajuca80@gmail.com>

Development and Evaluation of Value-Added Products from Eucalyptus Essential Oil

Varnika Tyagi¹, Rashmi¹, Nisha Verma²

¹Sardar Vallabhbhai Patel University of Agriculture and Technology (SVPUAT), Modipuram, Meerut 250110, Uttar Pradesh, India; ²ICAR-Indian Institute of Farming Systems Research (ICAR-IIFSR), Meerut 250110, Uttar Pradesh, India

Eucalyptus essential oil, obtained mainly from the leaves of Eucalyptus species, is a valuable plant-based resource widely appreciated for its antimicrobial, anti-inflammatory, insect-repelling, and aromatic characteristics. Traditionally used in pharmaceutical and medicinal applications. Eucalyptus oil has significant potential for diversification into value-added products that cater to the growing demand for natural, eco-friendly, and wellness-oriented goods. The present study investigates the formulation and utilization of eucalyptus essential oil based value-added products across several sectors, including personal care, health and wellness, household sanitation, and pest management. Products such as balms, inhalation aids, soaps, surface disinfectants, air fresheners, and insect repellents illustrate how strategic formulation, functional enhancement and product differentiation can significantly improve commercial value. Value addition not only extends product durability and usability but also enhances market acceptance and consumer appeal. The integration of this natural oil into diversified product lines supports sustainable agro-industrial development, minimizes reliance on synthetic chemical inputs, and aligns closely with current trends in green consumerism. Overall, the study underscores the economic feasibility and environmental advantages of eucalyptus essential oil as a flexible raw material with strong potential for both small-scale and large-scale entrepreneurial applications.

Keywords: Agro-industrial, Anti-inflammatory, Essential oil/volatile oil, Pharmaceutical, Value-added products

For correspondence: Varnika Tyagi <tvarnika34@gmail.com>

Innovative Approaches for Women Empowerment With Economic Inclusion: Agri-Entrepreneurs Service Centre – KVK Experiences

M. Siva, A. Premalatha, P. Alagesan

Krishi Vigyan Kendra, MYRADA, 272 Perumal Nagar, Pudhuvalliyampalayam Road, Kalingiam Post, Gobichettipalayam, Erode 638453, Tamil Nadu, India

Agricultural entrepreneurship in India has gained renewed momentum due to globalization, policy reforms, and rapid transformation in agribusiness systems. Expanding rural markets, increasing demand for value addition, and technological advancements have positioned agripreneurship as a key pathway for employment generation, income enhancement, women empowerment and inclusive rural development. However, women and rural youth, despite their active involvement in agriculture and allied sectors, often face constraints such as limited access to mentoring, enterprise networks, finance, and market linkages, restricting their transition into sustainable enterprises.

The Agri Entrepreneurs' Service Centre (AESC), established at ICAR-Krishi Vigyan Kendra, Erode, Tamil Nadu, demonstrates an effective institutional model for addressing these challenges through structured handholding support. Between 2017 and 2025, AESC facilitated over 94 skill-based training programmes, benefiting more than 4,700 participants, including 1,300 women and rural youth and developed 84 trained mentors across diversified agri-enterprises. The centre promoted women- and youth-led enterprises in banana fibre value addition, millet processing, honey production and desi poultry rearing. Notably, 174 entrepreneurs were supported in banana fibre enterprises, producing 16 tonnes of value-added fibre, while honey clusters involving 22 youth-managed units maintained over 430 bee boxes with an average production of 350 kg of honey per month.

Women mentor-driven cluster approaches enabled enterprise related to agro-food systems for nutritional security and sustainable income enhancement with beneficiaries realizing additional monthly incomes ranging from ₹5,000 to ₹85,000. The outcomes highlight improved livelihood security, employment generation, and strengthened participation of women in agribusiness with digital marketing. The AESC model plays critical role in promoting inclusive agri-entrepreneurship and resilient agri-food systems and offers a scalable framework for sustainable rural livelihoods and urban areas too. This successful model (AESC) stands as a replicable model for KVKs, NGO's and other institutions.

Keywords: AESC, Agri-entrepreneurship, Institutional support, Rural livelihoods, Value addition, Women and youth empowerment

For correspondence: M. Siva <myradakvkbs@gmail.com>

Celebration with Natural Colours: An Effort by Smt. Manorama Joshi

Roopa S. Patil

Krishi Vigyan Kendra, Uttara Kannada, Banavasi Road, Sirsi 581401, Karnataka, India

The toxic chemicals *viz.*, lead oxide, copper sulfate, Aluminium bromide, prussian blue, mercury sulphate etc. used in preparations of dry colour powders, oily pastes, water colours pose significant, long-term and acute risks to human health. These compounds are often used to create vibrant, dark or glossy shades of colours. Children are at the highest risk, as their developing bodies absorb more lead and heavy metals than adults and they are prone to direct ingestion during play. Pune based civil society organization, which was creating awareness about eco friendly holi colours checked with Smt. Manorama Joshi, Nandi Honda, a hamlet in Sonda of Uttara Kannada district, Karnataka about the possibility of producing such colours. Though it was challenging at first, but determined efforts made her to prepare four to five colours from the numerous colours available in nature. These natural colours are made from plant based ingredients, making them biodegradable and safe for the environment. She has standardized the methods through trial and error. Six colours - red, blue, saffron, pink, green and yellow are prepared using different combinations of turmeric, kumkum and indigo, with rice flour as main base. Some herbs are also added for soothing properties as well. Initially in 2003, Manorama's family produced 60 Kg of colours, as market improved the production also increased (1,500 kg) and this has become a reliable subsidiary income generating activity along with plantation crops cultivation. In 2025, about 500 Kg of colours are produced. She has engaged 10 to 12 rural farm women of neighboring village for 3 months in a year for this work. The stages of natural colour preparation includes, drying of the extracts, mixing, sieving the powder and packing. Most of the ingredients are sourced from farmers and the colours are sold under the brand name Maitri. This enterprise though looks encouraging, struggle between demand and supply is challenging. She got support from many NGOs, private organic outlets, schools and colleges. ICAR-KVK Uttara Kannada too facilitated her to get grant in aid of ₹ 5.00 Lakhs under RKVY - RAFTAAR scheme for promotion of agri-entrepreneurship and innovation. The enterprise has successfully transitioned from traditional chemical colors to natural, safe and biodegradable alternatives, fostering local employment and ecological awareness.

Keywords: Agri-entrepreneurship, Biodegradable colours, Natural dyes, Plant-based pigments, Rural livelihood

For correspondence: Roopa S. Patil <patilroopas@uasd.in>

A Rural Women Empowerment Success Story from Dindigul, Tamil Nadu

K. Srikumari, S. Senthilkumar

Krishi Vigyan Kendra, Gandhigram Rural Institute, Dindigul 624302, Tamil Nadu, India

Dindigul, Tamil Nadu where it is locally known as Murungai leads Moringa production in an area of 2645 Ha. Moringa native of India has long been valued in various traditional practices for its versatility. Different parts of the plant from seed to roots are used in food and folk remedies in Tamil Nadu. Due to unawareness of scientific processing of the Moringa leads to poor income for the Moringa growers. Mrs. P. Ponnarasi of Nodcihodapatty village of Gujiliamparai taluk, Vedasanthur block has 20 Acres of land cultivating Moringa as primary crop. Due to unawareness of scientific processing, inadequate infrastructure facilities, price fluctuation she was constrained to sell the produces at marginal prices led to low income. The meagre income from the Moringa sales is not adequate to run the family and to support studies of her daughters. In this situation, she came to know about KVK, Dindigul through Block Technology Officer, Vedasanthur and she approached KVK, Dindigul. KVK Dindigul conducted comprehensive hands-on training on hygienic handling, standardization, packaging, labelling, branding, solar drying techniques and modern marketing strategies on value addition of moringa. She got trained in preparation of moringa leaf powder, moringa fruit powder, instant moringa soup powder and moringa seed oil preparation. She marketed her products in the brand name Arasi Murungai Products and got FSSAI certificate. The beneficiary has engaged in online marketing for which she is having accounts in social media such as Instagram, Facebook, YouTube and Whatsapp. She is also getting income from giving training related to value addition of moringa to other farmers. On an average, she is earning, ₹75,000/- to ₹1,00,000/- per month (including honorarium received from providing trainings). Now, she transformed her 10 acre property by developing 36 products and she built a customer base of over 1 lakh people.

Keywords: Agri-based enterprise, Digital marketing, Moringa (Murungai), Moringa processing, Rural livelihood enhancement, Solar drying technology

For correspondence: K. Srikumari <srikumarivenkatesh@gmail.com>

Climate Resilient Farming System Model for Enhancing Income Security and Nutrition Status among Farm Families

V.K. Marwalikar, S.L. Suryawanshi

Krishi Vigyan Kendra, Tuljapur, Latur Road, Osmanabad 413601, Maharashtra, India

Farming is main livelihood of a majority of people in India. In the 21st century, climate change, water scarcity, increasing population, rising food prices, and other socio-economic impacts are expected to generate a great threat to agriculture and food security, especially for the poorest people who live in arid and sub-arid regions like Marathwada. It is essential to encourage small and marginal farmers for implementing climate resilient mixed farming in one acre so that they can meet the nutritional and income security. The underlying principle of Farming System for Nutrition (FSN) is ensuring the availability, accessibility and utilization of nutrient dense foods to farm families for their nutritional security as well as income security through crop diversification, as it is climate resilient farming. KVK, Tuljapur Dist. Dharashiv was conducted Front line demonstration (FLD) during 2022-25 at village Masla from Tuljapur tehsil in Kharif and Rabi season, to explore the feasibility of nutrition-sensitive agricultural interventions. The baseline survey in 2021-22 revealed that the population in the study area was largely undernourished and that household diets were cereal-dominated. Farming System for Nutrition (FSN) model was designed in such a way that to increase availability of nutrient-dense cereals and pulses, by enhancing production and crop diversification at the farm level, promoting cultivation of nutrient-rich fruits and vegetables in nutrition gardens and supporting interventions to promote access to animal foods. Hence, for combating the nutritional deficiencies and to increase economic status, KVK introduced and distributed assorted seed kit having cereals, pulses, oilseeds and 16 types of vegetable seeds with some fruit plants seedlings for establishment of FSN model at village level. During the year 2022 to 2025, under the technical guidance of KVK, total 215 FSN plots were established at village level. At the end survey, due to FSN plot maximum food items are always available at home, as it is cultivated in its own field. Also, increased the consumption of 60% more amount of millets, pulses, oilseeds and fresh fruits and vegetables in regular diet as well as 41% saving in monthly expenditure on purchasing of food items. Another important key result of FSN is that increase in income of ₹ 18,000 – ₹ 24,800 per year in one acre by selling surplus produce due to crop diversification. The FSN model is widely adopted in the district due to income and nutritional security.

Keywords: Climate resilient, Food security, FSN, Income generation, Nutritional security

For correspondence: V.K. Marwalikar <varshamarwalikar@gmail.com>

Promotion of Nutritional Garden through Year-Round Seed Kit Distribution to Farm Women

Anita Yadav¹, Veena Yadav², Savita Arya³

¹Krishi Vigyan Kendra, Baghpat, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh, India; ²Krishi Vigyan Kendra, Meerut, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh, India; ³Krishi Vigyan Kendra, Muzaffarnagar-I, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh, India

The nutritional garden program aims to improve nutritional intake and house hold food security by promoting year round cultivation of vegetable to women participation among rural families. Women beneficiaries were provided with seasonal vegetable seeds kits throughout the year to ensure continuous vegetable production. The seed kits included different varieties of vegetables suitable for Kharif, Rabi and Zaid seasons. Along with seed distribution, advisory support and training were also provided on cultivation practices, organic inputs and pest management. Women are also trained in basic gardening practices and efficient use of space and water. The activities resulted in increased availability of fresh vegetable, improved dietary diversification, reduce food expenditure and enhanced awareness among women regarding balanced nutrition and healthy food habits. The nutritional garden strengthens the role of women in family nutrition and contributes to improve health and food security at the house hold level.

Keywords: Dietary diversification, Household food security, Kitchen gardening, Nutrition security, Nutritional garden, Rural livelihoods, Seed kit distribution, Sustainable nutrition, Vegetable cultivation, Women empowerment

For correspondence: Anita Yadav <anitay1517@gmail.com>

Strengthening Livelihood through Promotion of Millet Production and Consumption in Drought Prone Latur District

A.A. Gunjal, P.D. Matai, S.S. Digrase

Krishi Vigyan Kendra, Latur, P-160 Additional MIDC, Harangul (B), Latur 413531, Maharashtra, India

Latur district frequently faces drought conditions that threaten farm incomes, food security, and rural livelihoods. Millets, being climate-resilient, low-input, and water-efficient crops, offer a sustainable alternative for small and marginal farmers. Under a Nutrition Farming approach, millet cultivation was implemented among 200 women farmers from six drought-prone villages of Latur district during 2020-25 to assess its impact on value addition and household dietary diversity. Baseline observations revealed that household diets were predominantly cereal-based, and millets like sorghum were largely procured from markets rather than home production.

Krishi Vigyan Kendra (KVK), Latur carried out 24 interventions like seed distribution, awareness programmes, field visits, trainings, demonstrations on good agricultural practices, different activities for promotion of millets, value addition, and entrepreneurship development. Biofortified seeds of pearl millet, finger millet, foxtail millet, barnyard millet, and proso millet were supplied along with continuous technical support during the cultivation period. End-line assessment indicated a significant shift, with participating families cultivating biofortified pearl millet and other millets primarily for household consumption, resulting in an average annual own production of 1.5-2.0 quintals per family. Noticeable improvements were observed in food consumption patterns: sorghum consumption increased from 17% to 42% of households, while diversified millet consumption (finger millet, foxtail millet, barnyard millet, and proso millet) 2 to 3 times per week rise from 2% at baseline to 24% at end line. Total 17 women farmers establish enterprises through processing activities such as cleaning, milling, flaking and preparation of ready-to-cook, ready-to-eat products further enhanced profitability and utilization. The study highlights that promotion of millets contributes to multiple securities food, fodder, health, nutrition and income enhancement thereby strengthening resilience and sustainability of small and marginal farming households in drought-prone regions.

Keywords: Dietary diversity, Millets, Nutrition farming

For correspondence: A. A. Gunjal <anjaligunjal26@gmail.com>

Inspirational Empowerment of Women Entrepreneurs through Nutrient-Enriched Millet and Traditional Rice-Based Value Added Products in Kanyakumari District

J. Selvi, S. Suresh, K. Kavitha, S. Nazreen Hassan

Krishi Vigyan Kendra, Tamil Nadu Agricultural University (TNAU), Thirupathisaram, Kanyakumari, Nagercoil 629901, Tamil Nadu, India

Inspiration is the fuel that powers the journey of every founder. Real-life success stories entrepreneurs tell create emotional connections, spark motivation, and help build resilience during tough times. Millets and rice are the traditional crops which are cultivated in area of 1,200 ha. The primary objective of the millet processing unit is to promote the availability of healthy millet products within India. With rising awareness of the nutritional benefits and sustainable aspects of millets, there is a growing demand for these super foods in the market. Mrs. K. Anu venture plays a vital role in meeting this demand by delivering high-quality, processed millets that are safe for consumption. The entrepreneurial journey of KVK Kanyakumari promoted K. Anu entrepreneur from Sunkaan kadai village of Thovalai block in Kanyakumari district, who transformed millets and traditional rice into a sustainable livelihood enterprise. Their family income remained irregular and insufficient from farms. With continuous motivation and technical guidance from ICAR- Krishi Vigyan Kendra (KVK), Kanyakumari and through participation in NABARD-sponsored skill development trainings on value addition, the group gained hands-on knowledge in processing millet and Nutrient enriched millet based products. Encouraged by market response and consumer preference, they established a home-based value addition unit named Oonjal Foods. They standardized production under hygienic conditions, ensured high quality packaging and labelling and registered the unit under FSSAI compliance. The unit currently produces more than 10 varieties of value added products with a monthly production capacity of 100-150 kg, generating a net income of about ₹42,500 per month. Their success has inspired neighbouring women and farmers to establish similar enterprises, leading to the emergence of new rural micro-enterprises in Thovalai block. This case demonstrates the role of institutional support, skill development and value addition in enhancing farm income and promoting young women-led rural entrepreneurship. This is an example for inspiration and empowerment of women who aspire to take up economic activities as a livelihood for their upliftment.

Keywords: Millet processing unit, Millet value addition, Nutritional foods, Rural livelihood, Women entrepreneurship

For correspondence: J. Selvi <selvi.j@tnau.ac.in>

Nutrition Garden Demonstration - A Sustainable Way to Rural Nutritional Food Security and Women Empowerment

Nivedita Prashant Shete, Prashant G Shete, Deepali M Maske

Agricultural Technology Application Research Institute (ATARI), Pune College of Agriculture Campus, Shivajinagar, Pune 411005, Maharashtra, India

Women's empowerment found a strong foundation in home gardening through a study conducted with 250 farm families in Pune district. By providing seed kits for nutrition gardens, the initiative not only improved food availability but also transformed decision-making roles within households. Women, who were earlier dependent on weekly markets for vegetables, began taking charge of what their families ate and how food was produced at home. The impact was visible and measurable. After establishing nutrition gardens, per capita vegetable availability increased from 173 grams per day to 280 grams per day an impressive 59.6% rise in consumption. On average, families were able to meet 93.32% of the recommended dietary allowance for vegetables. In addition to better nutrition, households also benefited economically, with an average monthly income increase of ₹1,500-₹2,000 after the project. The need for such an intervention was evident. According to NFHS 5-2019, in rural Pune district, iron deficiency anaemia is widely prevalent among 58.7% of children (6-59 months) and 53.2% of women in the age group of 15-49 years. In tehsils like Junnar and Ambegaon, most farmers practicing mono cropping and relying heavily on weekly bazaars for vegetables. This dependence often results in limited dietary diversity, despite adequate vegetable production at the national level and availability falling short of recommended nutritional requirements at the household level. To bridge this gap, nutrition gardens were promoted as a practical and sustainable solution to ensure daily access to fresh vegetables at the household and community level. One inspiring example is that of Mrs. Anjali Waman from Kalwadi village in Junnar taluka. She developed a backyard nutrition garden using organic farming practices and soon became a local role model. Beyond improving her family's diet and health, her efforts led to increased vegetable consumption, reduced production costs, and additional income through surplus vegetable sales. The success of her initiative encouraged neighbouring villages to adopt similar practices. Feedback from participating farm women highlighted several positive outcomes: a more diverse vegetable diet, higher vegetable intake, improved family health, and significant savings due to reduced dependence on market purchases. While challenges such as seed availability and water scarcity were encountered, these were effectively addressed through targeted training and technical guidance. Overall, the establishment of nutrition gardens went far beyond improving food availability. It strengthened nutritional security, empowered women to lead household food production decisions, and promoted self-reliance, health, and overall well-being within rural communities.

Keywords: Household decision-making, Nutrition gardens, Nutritional security, Sustainable livelihoods, Women's empowerment

For correspondence: Nivedita Prashant Shete <niveditadawkhbar@gmail.com>

Homestead Nutrition Gardens: Community - Based Strategy for Nutri-Smart Villages

Laxmi Priya Sahoo, Jyoti Nayak, Arun Kumar Panda, S. Tanuja, Geeta Saha

ICAR-Central Institute for Women in Agriculture (ICAR-CIWA), Bhubaneswar 751003, Odisha, India

Impact of nutritional interventions like homestead agriculture and nutri-garden on nutritional awareness, participation, improvement in consumption pattern, change in behaviour like knowledge, attitude and practice and benefit cost ratio was studied in participation of 300 farm women from 10 villages and other stakeholders for evaluating its contribution towards development of Nutri-smart villages. Gender sensitive Nutri Sensitive agriculture methodologies like intensive awareness campaign, field activities on nutri-village, nutri-food, nutri-thali etc. assessment of nutritional status of farm families, establishment of nutri-gardens in villages and schools, promoting mixed cropping systems / crop diversification / IFS incorporating minor millets and Nutritional awareness and education through ICT were followed.

Most of the participants (60%) being in 36-50 years age group, with primary (42.7%) and secondary (19.3%) education level with small and marginal holdings (84%), had agriculture as their primary occupation (77.7%). Nutri-sensitive agricultural interventions like homestead nutri-gardens development with optimum use of resources like homestead lands, water, kitchen/farm products, family labour, organic way of crop management, quality seeds, nutrition education and adoption of HYVs of green leafy vegetables, other vegetables, fruits for ensuring regular supply of micro nutrients and vitamins helped farm women in better access to nutrition and improved the frequency of its intake by 224.6% improvement in establishment of nutri-gardens. Mean improvement in behavioral attributes like Knowledge, Attitude and Practice (KAP) post interventions using parameters like knowledge on balanced diet, importance of vitamins, minerals, diet supplements, attitude for development of nutrition garden, inclusion of green leafy vegetables, personal hygiene and nutr-smart practices like healthy consumption, chemical free food production, milk and animal protein in diet etc was (63.38%). The interventions resulted in increasing the number of farm women consuming leafy vegetables (100%) and other vegetables daily (30%) and fruits (95%) at least once in week. Mean increase in consumption of fruits and vegetables was 75.39%. Improved BC ratio (228%), by putting monetary value to home consumption was realized in nutri-gardens indicating effectiveness of the production units in imparting nutritional and economic advantages to the farm women and their families. Impact of nutri-gardens highlighted the role of nutri-gardens as the first step toward attaining nutritional sufficiency in rural areas and development of nutri-smart villages.

Keywords: Behavioral attributes, Benefit-cost ratio, Crop diversification, Farm women, Homestead agriculture, Nutri-sensitive agriculture, Nutri-smart villages, Nutritional awareness

For correspondence: Laxmi Priya Sahoo <laxminrcwa@yahoo.co.in>

Women's Empowerment Through Organic Farming: Challenges and Opportunities

Shriti Moses¹, Md. Monobrullah², Ram Eshwar Prasad¹, Saloni Chauhan¹, Pinaki Roy¹, Sachchidanand Prasad¹, Manohar Panjekar¹, Kinkar Kumar¹

¹Krishi Vigyan Kendra, Sitamarhi 843320, Bihar, India; ²ICAR-Agricultural Technology Application Research Institute (ICAR-ATARI), Zone-IV, Patna 800014, Bihar, India

Women play an important and major role in organic farming development and allied fields including in the main agricultural production like horticulture, livestock, agroforestry, social forestry, postharvest operations, fisheries, poultry etc. Involvement of women in organic farming is also not a new concept as it is a proven fact that women are conservers and preservers of the traditional knowledge including agriculture. With the promotion of organic farming, the role of women also increased in development of the family, home and economy. The environment and extent of women's involvement in organic agriculture differ from region to region. Even within a region, their involvement varies widely among different farming systems, ecological sub-zones, castes, classes and stages in the family cycle. But regardless of these variations, there is hardly any activity in agricultural production, except ploughing in which women are not actively involved. Several studies on women in organic farming conducted in India and other developing and underdeveloped countries concluded that women contribute far more to agricultural production than has generally been approved.

In all farm production, women's average contribution is estimated at 55% to 66% of the total labour. Women are the major stakeholders in organic agriculture, precisely because they are the worst victims of chemical farming.

“Organic farming is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines to benefit the shared environment and promote fair relationships and a good quality of life for all involved (IFOAM, 2005). Pest management in organic farming can be done by using trap crops, pheromones and green pesticides. These sustainable approaches have high activity against insect and mite pests, nematodes and plant pathogens.

Keywords: Development and empowerment, Organic farming, Sustainable, Women

For correspondence: Shriti Moses <sbritimoses361@gmail.com>

Small Landholdings to Sustainable Enterprises: Empowering Women from Farm Families through Agro-Processing in Punjab

Manpreet Kaur, Bikramjit Singh, Raminder Kaur

Krishi Vigyan Kendra, Amritsar, Punjab Agricultural University (PAU), Punjab, India

Women from small landholding farm families in Punjab contribute substantially to agricultural production and post-harvest activities; however, their participation in agro-processing and enterprise development remains limited. Agro-processing offers a viable pathway for transforming smallholder agriculture into women-led livelihood enterprises, enabling value addition, income diversification, employment generation, and enhanced economic inclusion of farm women. This paper examines agro-processing as a gender-responsive strategy to empower women from small and marginal farm households in Punjab.

Drawing on evidence from rural development initiatives, collective enterprise models, and policy programmes, the paper identifies interconnected constraints limiting women's engagement in agro-processing, including inadequate processing infrastructure, limited technical knowledge, restricted access to institutional credit, weak market linkages, and significant time poverty. A critical socio-psychological barrier arises from the predominance of male land ownership, which reinforces the perception of farming as a male domain and confines women to household and farm-supportive roles, thereby limiting their participation in farm decision-making. Consequently, most farm produce is sold as raw material in mandis under a production-centric approach, despite agro-processing being essential for enhancing farm incomes. To address these challenges, the paper proposes a family-based agro-processing enterprise model that positions women as economic actors and micro-entrepreneurs, leading processing, value addition, and marketing activities near the household, while engaging men through joint capacity-building programmes to promote shared responsibility. This joint household enterprise approach enables farm families to function as self-help-group-like units, fostering collective decision-making, efficient labour utilisation, enhanced income retention, and gradual shifts towards more inclusive and value-oriented farming systems.

The paper further advances a women-centric empowerment framework integrating skill development, collective enterprise mechanisms, technology-enabled processing, and strengthened market linkages, supported by gender-responsive policies and governance. Implementation of this strategy can improve household incomes, reduce post-harvest losses, enhance nutrition security, and strengthen women's leadership within agri-food value chains, contributing to sustainable, resilient, and inclusive agri-food enterprises in Punjab.

Keywords: Agro-processing, Farm families, Small landholding, Value addition, Women's economic empowerment

For correspondence: Manpreet Kaur <manatwalpau@pau.edu>

Strengthening Rural Women's Livelihoods through Economic Inclusion: A Study of SHG Women in Venkatagiri Mandal, Tirupati District, Andhra Pradesh

B. Vijayasree¹, D. Sreedhar¹, P. Nagarjuna Reddy¹, D. Thirupal¹, I. Rajeevana¹, B. Srinivasulu², Shaik N. Meera³

¹Krishi Vigyan Kendra, Periyavaram, Dr YSR Horticultural University (YSRHU), Venkatagiri, Tirupati 524132, Andhra Pradesh, India; ²Dr. YSR Horticultural University (YSRHU), Venkataramannagudem 534132, Andhra Pradesh, India; ³ICAR-Agricultural Technology Application Research Institute (ATARI), Zone X, Hyderabad 500059, Telangana, India

Economic inclusion of rural women through Self-Help Groups (SHGs) plays a crucial role in enhancing livelihood security, income generation, and socio-economic empowerment. The present study quantitatively assesses the impact of KVK Home Science interventions on strengthening the livelihoods of SHG women through skill development, technology dissemination, and entrepreneurship promotion in Venkatagiri Mandal of Tirupati District, Andhra Pradesh. The study covered 120 SHG women from 12 villages, who actively participated in KVK-organized skill trainings, On-Farm Trials (OFTs) like moringa and millet based biscuits, antioxidant rich millet nutribar, Front Line Demonstrations (FLDs) like fruit toffees, processing and value addition of acid lime and capacity-building programmes related to food processing, value addition and entrepreneurship development. Primary data were collected using structured schedules, and impact was measured through pre- and post-intervention. The key livelihood indicators such as income levels, employment generation, adoption of technologies, savings, and empowerment parameters were analyzed.

Results revealed that 78.3% of SHG women adopted at least one income-generating activity after KVK interventions. Participation in OFTs and FLDs resulted in 65-70% improvement in technical knowledge and skill competency. The average annual income of SHG women increased from ₹48,500 to ₹82,000, indicating a 69.1% rise in income. About 72% of respondents reported improved savings behaviour, while 67% experienced enhanced decision-making ability within the household and SHG institutions. Entrepreneurship development programmes enabled 32% of women to establish micro-enterprises, contributing to sustainable livelihood diversification. The study concludes that KVK interventions significantly contribute to economic inclusion and livelihood strengthening of SHG women by integrating skill training, technology dissemination, and entrepreneurship development. Strengthening market linkages, continuous handholding, and advanced enterprise training are recommended to ensure long-term sustainability and inclusive rural development.

Keywords: Economic inclusion, Socio economic empowerment, Sustainable rural livelihoods

For correspondence: B Vijayasree <drvijayasree20@gmail.com>

Women-Managed Cage Farming of Asian Seabass as a Resilient Livelihood Option in Coastal Agri-Food Systems

R. Geetha, R. Jayakumar, Debora Vimala, T. Bhuvanewari, V. Karthik, M. Kailasam, Kuldeep K. Lal

ICAR-Central Institute of Brackishwater Aquaculture (ICAR-CIBA), No. 75, Santhome High Road, MRC Nagar, R.A. Puram, Chennai 600028, Tamil Nadu, India

Women's economic participation is essential for sustainable and resilient coastal agri-food systems. Under the Scheduled Caste Sub-Plan (SCSP), cage culture of Asian seabass (*Lates calcarifer*) was introduced as a women-managed aquaculture intervention in Kottaikadu and Kolathur villages of Chengalpattu district, Tamil Nadu, to promote inclusive and resilient coastal aquaculture systems. Women Self-Help Groups operated small-scale cages following standardized protocols for stocking, feeding and routine management. Across culture cycles, cage farming achieved average survival rate of 78% and feed conversion ratios of around 1.8 - 2.2, reflecting efficient use of natural brackishwater bodies for high value fish production. Harvested fish attained market-preferred sizes, enabling direct sale to local traders. Economic analysis indicated average net returns of ₹2,00,000-₹2,50,000 per cage per cycle (10-12 months farming period), significantly contributing to household income diversification and reducing dependence on capture fisheries. Participation in cage farming strengthened women's technical competence, leadership, and collective decision-making in production and marketing. Women moved beyond traditional practices to active engagement in production, enterprise management, and market interactions, reinforcing their position within the aquaculture value chain. Production variability associated with episodic extreme weather events emphasized the importance of adaptive management and institutional support. The findings establish that women-managed seabass cage farming enhances equity and resilience in coastal aquaculture, offering a scalable pathway for sustainable livelihoods when supported through targeted capacity building and public investment.

Keywords: Asian seabass (*Lates calcarifer*), Coastal agri-food systems, Income diversification, Sustainable livelihoods, Women Self-Help Groups (SHGs)

For correspondence: R. Geetha <geethaeconomist99@gmail.com>

Integrating Women into Coastal Agri-Food Systems through Nursery Rearing of Asian Seabass through Societal Development Programs

R. Jayakumar, R. Geetha, Deboral Vimala, T. Bhuvaneswari, V. Karthik, M. Kailasam, Kuldeep K. Lal

ICAR-Central Institute of Brackishwater Aquaculture (ICAR-CIBA), No. 75, Santhome High Road, MRC Nagar, R.A. Puram, Chennai 600028, Tamil Nadu, India

Women's effective participation is fundamental to building equitable, resilient and sustainable agri-food systems, particularly in climate-vulnerable coastal regions. Under the Scheduled Caste Sub-Plan (SCSP), nursery rearing of Asian seabass (*Lates calcarifer*) was promoted as a women-led livelihood intervention in Kottaikadu and Kolathur villages of Chengalpattu district, Tamil Nadu, with the objective of strengthening women's roles in coastal aquaculture value chains. Hapa-based nursery rearing was undertaken in open brackishwater bodies using hatchery-produced seabass fry, formulated nursery feeds and meticulous grading practices. Averaged across different rearing cycles, the system achieved survival rates of 72-85%, producing stockable-size fingerlings (8-10 cm) suitable for pond and cage farming. The activity generated average gross revenues of ₹80,000-₹1,20,000 per cycle per women's group in 45-60 days of rearing period, providing stable supplementary income during lean fishing periods. Feed utilization and operational costs remained within acceptable limits for small-scale women-managed enterprises. Beyond economic outcomes, the intervention enhanced women's technical skills in live fish seed handling, feeding, grading and basic health management, while reducing dependence on wild seed collection. Women's participation in enterprise-level decision-making improved, strengthening their agency within the agri-food system. Overall, the nursery rearing of seabass demonstrated that women-led a viable and inclusive pathway for strengthening coastal agri-food systems.

Keywords: Asian seabass (*Lates calcarifer*), Coastal agri-food systems, Hapa-based culture, Nursery rearing, Women-led livelihood

For correspondence: R. Jayakumar <jayakumar.ciba@gmail.com>

Empowering Rural Women through KVK-Supported Agri-Entrepreneurship in Northeast India

Bagish Kumar, M. Thoithoi Devi, Jugabrat Sarma, Apurva Baruah, G. Kadirvel

ICAR-Agricultural Technology Application Research Institute (ICAR-ATARI), Zone VI, Guwahati, VIP Airport Road, Kahikuchi, Opposite Arunachal Orchid Guest House, Kampur Town 781015, Assam, India

The feminization of agriculture in Northeast India presents both challenges and opportunities for inclusive rural development. This paper examines the role of Krishi Vigyan Kendra (KVK)-led agri-entrepreneurship interventions in promoting women-centered enterprises and enhancing socio-economic outcomes. Drawing on empirical evidence from 29 successful agricultural enterprises across Assam, Arunachal Pradesh, and Sikkim, the study evaluated financial performance, employment creation, and enterprise sustainability with special reference to women's participation. The analysis highlights that women-managed enterprises particularly in handloom, mushroom cultivation, food processing, organic marketing, and integrated farming demonstrate superior financial efficiency, often achieving higher profit margins than large-scale commodity-oriented enterprises. While collective institutions such as FPOs generate higher turnover and employment, women-led micro and small enterprises excel in value addition, skill utilization, and income per worker. Statistical results indicated a strong association between turnover and profitability, but no significant relationship between scale and employment generation, reinforcing the importance of labor-intensive women-friendly enterprise models. The study concludes that KVKs serve as critical enablers of women's entrepreneurship by providing technical training, institutional support, and market facilitation. Strengthening women-focused extension strategies, access to finance, and value-chain integration is essential for leveraging agri-entrepreneurship as a tool for gender-inclusive rural transformation in Northeast India.

Keywords: Agri-entrepreneurship, Gender-inclusive development, Krishi Vigyan Kendra, Northeast India, Rural women

For correspondence: Bagish Kumar <bagishagri@gmail.com>

Women-Led Agri-Enterprises as Drivers of Socio-Economic Transformation in Northeast India

M. Thoithoi Devi, Bagish Kumar, Jugabrat Sarma, Rajesh Kumar, G. Kadirvel

ICAR-Agricultural Technology Application Research Institute (ATARI), Zone VI, Guwahati, VIP Airport Road, Kahikuchi, Opposite Arunachal Orchid Guest House, Kampur Town 781015, Assam, India

Women play a pivotal role in the agrarian economy of Northeast India, yet their entrepreneurial contributions remain under-documented. This study analyzes the socio-economic impact of women-led and women-intensive agri-enterprises promoted through Krishi Vigyan Kendra (KVK) interventions across the region. Using a mixed-methods approach, data from 29 KVK-supported enterprises including women-managed handloom units, mushroom cultivation, integrated farming systems, food processing, vermicomposting, and Farmer Producer Organizations (FPOs) were examined to assess turnover, profitability, employment generation, and profit margins. The findings reveal that women-centric enterprises exhibit strong economic viability, with several achieving high profit margins (exceeding 70-89%) despite operating at relatively smaller scales. Traditional women-dominated sectors such as handloom and value-added food processing emerged as profitability leaders, while women's participation in integrated farming and organic input enterprises contributed significantly to livelihood diversification and household income stability. Employment generation in women-led enterprises was found to be largely independent of turnover, highlighting their labour-intensive and inclusive nature. The study underscores the transformative potential of KVK-facilitated women entrepreneurship in enhancing rural incomes, generating local employment, preserving traditional skills, and promoting sustainable agriculture. Policy implications emphasize the need for targeted capacity building, market linkage support, access to credit, and gender-responsive institutional mechanisms to scale women-led agri-enterprises in Northeast India.

Keywords: Agri-enterprises, Gender empowerment, KVK interventions, Northeast India, Rural livelihoods, Women entrepreneurship

For correspondence: M. Thoithoi Devi <tboiagri@gmail.com>

Sustainable Rural Livelihood through Milk Processing: Role of KVK Jammu and Convergent Financial Schemes in Strengthening SHG-Led Enterprises

Poonam Abrol¹, Punit Choudhary¹, Ravneet Kour¹, Sheetal Badyal¹, Prem Kumar¹, Muneeshwer Sharma¹, Raju Gupta², Satbir Singh¹

¹Krishi Vigyan Kendra, Jammu, Sher-e-Kashmir University of Agricultural Sciences and Technology (SKUAST-Jammu), FVSC&AH, R.S Pura, Jammu 181102, Jammu and Kashmir, India; ²Krishi Vigyan Kendra, Ramban, Sher-e-Kashmir University of Agricultural Sciences and Technology (SKUAST-Jammu), Jammu and Kashmir, India

Sustainable rural livelihoods are largely dependent on women's economic inclusion through agri-food value chains. The dairy processing sector in Jammu district, Union Territory of Jammu and Kashmir, has emerged as a promising avenue for women's empowerment through entrepreneurship, skill development, and government financial assistance. The study investigated the role of the Holistic Agriculture Development Programme (HADP), in collaboration with UMMED (J&K Rural Livelihoods Mission) and NABARD, in encouraging women-led dairy processing units, with a special emphasis on Krishi Vigyan Kendra (KVK) Jammu's implementation support through value-added trainings.

KVK-level training data indicated that women make up approximately 40-45% of the beneficiaries of dairy-related interventions in the Jammu district. These women are mostly mobilized through Self-Help Groups (SHGs). After obtaining financial assistance from various government schemes and vocational training from KVK Jammu, some 25-30% of these female SHG members have moved from primary milk production to value-added dairy processing enterprises. KVK Jammu has played an important role in organizing hands-on vocational training programs in milk processing, which include the preparation of traditional and market-oriented products such as khoa, milk cake, rabri, flavored milk, badam shake, masala paneer, and some local milk products like kaladi (traditional cheese) and kalakand.

These courses have improved women farmers' technical proficiency, product standardization, basic entrepreneurial traits and hygienic practices while making products. Women participants associated with SHGs under UMMED and supported by NABARD credit facilities successfully accessed HADP financial assistance for small-scale dairy processing units, resulting in a 40-50% increase in household income. The study also highlighted the convergence of financing schemes and vocational training courses organized by KVK, which has enabled women to start sustainable enterprises, establish market linkages, and improve their economic status within the dairy value chain of Jammu district.

Keywords: Financial inclusion, HADP, Sustainable livelihood, Value addition

For correspondence: Poonam Abrol <poonamabrol22@gmail.com>

Economic and Social Impact of Women-Led Dairy Cooperatives: Evidence from Mulkanoor, Telangana

Jesna Jaleel¹, K. Sravanthi², T. Lavanya²

¹Indian Agricultural Research Institute (ICAR-IARI), Pusa, New Delhi 110012, Delhi, India; ²Professor Jayashankar Telangana State Agricultural University (PJTU), Hyderabad, Telangana, India

Despite the significance of the dairy sector in India, the sector continues to face challenges of low productivity, higher production costs and unequal gender dynamics in household labour. Mulkanoor women dairy cooperative (MWDC) in Telangana has been run by women for women since 2002 have been instrumental in addressing these constraints. The present study was undertaken with the objective of assessing the socio-economic impact of MWDC on its members. In order to minimize the biases from comparison, we employed a propensity score matching technique. The economic impact was assessed using indicators such as net cost and income per litre of milk, along with labour, feed, and capital productivity. Social impacts are examined through a composite women empowerment score for assess gender equality and through the Women Perceived Dairy Workload Sharing Index and carrying of weight to assess drudgery. The study leveraged data from 180 women respondents selected through multistage random sampling across three of the four operational districts of MWCD in Telangana.

Findings indicated that members of cooperative have a clear economic advantage of ₹14-16 lower cost per litre of milk and an additional income of ₹6 per litre. Although cooperative members exhibited significantly higher feed and capital productivity-producing about 0.25-0.30 litres more milk per kilogram of feed and generating higher income per unit of dairy capital-no significant gains were observed in labour productivity. Social impact assessments reveal substantially higher levels of women's empowerment among members, with an average 11-point increase in the Women Empowerment Index. Members also experienced more equitable sharing of dairy work within households, reflected in a 2-3 points increase in the work sharing index, indicating reduced individual workload for women members. While cooperative membership improved workload sharing, it did not significantly reduce women's physical drudgery, measured as daily carrying of weight (kg-km). This reflects persistent gendered labour norms and limited adoption of drudgery-reducing technologies, constraining reductions in women's physical workload.

The findings highlight both the benefits of women-led cooperatives and the persistent constraints imposed by gendered divisions of labour. The Mulkanoor experience suggests that access to productivity-enhancing inputs, animal health services, and improved fodder varieties can support dairy outcomes, while reducing women's physical drudgery may require more explicit promotion of labour-saving technologies. Complementary efforts in skill development, financial literacy, equitable work-sharing awareness, and institutional collaboration for technical support may further strengthen welfare and productivity outcomes in cooperative dairy systems.

Keywords: Dairy cooperative, Milk productivity, Propensity score matching, Socio-economic Impact

For correspondence: Jesna Jaleel <jesna_13380@iari.res.in>

Income Generation through Nutrition Garden and Allied Activities (Value Addition/ Button Mushroom)

Pratibha Singh¹, Sudha Jukaria², Deepti Kothari³

¹Krishi Vigyan Kendra, U.S. Nagar, G.B. Pant University of Agriculture and Technology (GBPUAT), Pantnagar, Uttarakhand, Bajpur Road, Kashipur 244713, Uttarakhand, India; ²KVK, Jeolikote, Nainital, G.B. Pant University of Agriculture and Technology (GBPUAT), Pantnagar, Uttarakhand, India; ³KVK, Gwaldam, Chamoli, G.B. Pant University of Agriculture and Technology (GBPUAT), Pantnagar, Uttarakhand, India

Nutrition garden represents the universal subsistence food production components which entails small scale fruit and vegetable production units in relatively confined areas located close to the family dwellings. The nutrition garden is an on-site household production system of fruits and vegetables with the use of low cost local materials and traditional knowledge. It is primarily intended for regular supply of fresh vegetables for family use. Number of fruits and vegetables are grown on small piece of land around dwellings. Cultivation of fruits and vegetables in the backyard plays an important role in the balanced diet by providing energy rich food and vital protective nutrients. Fruits and vegetables are not only enriching the table, but also enrich health from most nutritive aspect. Furthermore, nutrition gardening would be a good means to improve household food security and at the same time could be a source of additional income because the household can sell a portion of the garden's produce and acquire household self-sufficiency. Button mushrooms (*Agaricus bisporus*) are an excellent, high-nutrient addition to a home nutrition garden, offering a sustainable, space-efficient, and year-round food source. Rich in protein, B-vitamins, and unique antioxidants they are often considered a "superfood" Farm women were motivated to generate income, health of the family members through value addition of garden produce and mushroom production. Demonstrations were conducted by Krishi Vigyan Kendra, U.S.Nagar, Nainital and Chamoli to enhance the knowledge of farm women towards nutrition garden. Farm women were given technical guidance towards value addition and income generating allied enterprise. Initially, the detailed survey on existing nutrition garden situations was carried out through focused group discussions, meetings and interactions with the farmers. Annual demand, availability and share of different vegetables were estimated based upon base line survey.

Keywords: Button mushroom, Demonstration, Discussion, Nutrition garden

For correspondence: Pratibha Singh <singhpratibha888@gmail.com>

Bhoomika Chawki Silkworm Rearing Centre: A Dynamic Women Entrepreneur from Northern Karnataka

Akshata Ramannanavar, A.H. Biradar, Basamma Hadimani, Mahesh Kadagi, C.M. Rashmi, K.R. Siddagangamma

Krishi Vigyan Kendra, Haveri, University of Agricultural Sciences (UAS), Dharwad 581115, Ranibennur, Karnataka, India

Sericulture is an ancient and essential agro-based industry focused on the cultivation of silkworms. This traditional practice is a complex multidisciplinary process that includes the cultivation of mulberry, the rearing of silkworms and the processing of cocoons into valuable fiber. Smt. Sujatha Nagaraj Minajage, a woman entrepreneur, holds a BA degree and hails from Ranibennur in the Haveri district of Karnataka. Her husband, a textile engineer with a stable job in Bangalore, chose to leave his position to engage in social service, educating farmers about sericulture. In 2012, he established a Bhoomika Chawki Rearing Center (CRC) in Ranibennur with the support of his wife. Their venture was successful, leading them to supply chawki silkworms on a commercial scale. However, during the COVID-19 pandemic, Sujatha faced significant challenges after losing her husband. Despite the difficulties, she was determined to fulfill her husband's dream. Sujatha took charge of the Bhoomika CRC and drawing on her five years of experience has successfully managed Bhoomika CRC. She provides all necessary inputs for sericulture farming and is only one women in northern Karnataka to operate a CRC. On average she conducts two batches monthly, totaling 24 batches per year, with each batch raising 10,000 DFLs (Disease free Layings). She cultivates mulberry on 11 acres of land utilizing high-quality, high-yielding mulberry variety V-1. She has installed CRC unit with latest equipment's such as humidifiers, heaters, leaf chapping machines and egg incubation chamber with advanced rearing technologies for rearing young silkworms. Additionally, she offers two essential sericulture inputs under her brand, Bhoomika, which are lime and Kraft paper. Her average annual turnover is ₹ 50,00,000/- with a monthly income ranging from 3.5 to 4 lakh. She became a successful entrepreneur by embracing innovative concepts and modern techniques. Additionally, she provides support and guidance to sericulture farmers. As a result, the income and living standards of the farmers in Northern Karnataka have been significantly improved.

Keywords: Chawki Silkworm Rearing Centre, Entrepreneur, Sericulture

For correspondence: Akshata Ramannanavar <kvkbvr@uasd.in>

Women Collectives for Millet-Based Enterprises: Nourishing and Empowering Communities

Sujata Sethy, Khwairakpam Bembem, Renu Balakrishnan

ICAR-Central Institute of Post Harvest Engineering and Technology (CIPHET), Ludhiana, Humbran Road, Opposite Pratap Singh Wala, Ayali Khurd, Ludhiana 141008, Punjab, India

Women collectives engaged in millet-based enterprises play a crucial role in addressing nutrition security, livelihood generation, and community empowerment, particularly in rural and tribal regions. Millets require 30-40% less water than rice and wheat, and are rich in dietary fiber, iron, calcium, and essential micronutrients. These characteristics make them ideal for sustainable food systems and combating malnutrition. The women-led Self-Help Groups (SHGs), Farmer Producer Organizations (FPOs), and cooperatives have successfully developed millet value chains encompassing production, primary processing, value addition, packaging, and marketing. Supported by initiatives such as the Odisha Millets Mission, National Rural Livelihood Mission (NRLM), and Govt. food processing schemes, women collectives have established millet processing units, tiffin centers, bakeries, and ready-to-cook/ready-to-eat product enterprises. Evidence shows that participation in millet enterprises increases women's monthly incomes by ₹3,000-₹6,000, while enhancing financial literacy, leadership, and decision-making power. Millet-based enterprises led by women also contribute directly to community nutrition, especially for women and children, through integration with school mid-day meals, anganwadi nutrition programs, and local markets. Studies indicate improved dietary diversity and reduced anemia where millet consumption is promoted. Furthermore, these enterprises strengthen local economies by reducing migration, reviving traditional crops, and supporting smallholder farmers. Despite demonstrated success, challenges such as limited access to credit, technology, branding, and stable markets remain. Strengthening policy support, capacity building, and market linkages can enhance scalability and sustainability. Overall, women collectives in millet-based enterprises represent a holistic model of nourishing communities while advancing gender equity, economic resilience, and sustainable agriculture.

Keywords: Economic resilience, Gender equity, Millet-based enterprises, Nutritional security, Women collectives

For correspondence: Sujata Sethy <sujata.sethy@gmail.com>

Impact of Training Program on Value Addition of Millets for Livelihood Enterprise in Rural Areas of Jalna District

S.N. Karhale¹, S.V. Sonune²

¹Krishi Vigyan Kendra Jalna-I, Ambad Road, Jalna 431203, Maharashtra, India; ²ICAR–Agricultural Technology Application Research Institute (ATARI), Pune-I, Maharashtra, India

Consumption of millets has increasing day by day because millets have number of health benefits when compared to cereals. Due to lack of awareness on nutritional importance of millets and methods of value addition, the consumption of millets is low among rural areas. Millet is regarded to be five times more nutritious than rice and wheat. Despite the fact that millet contributes to 10% of India's food grain basket and has an annual production of 18 million tonnes, it is not consumed in the same proportion as mainstream cereals (that is rice and wheat). Millets are amazing in their nutrition content each of the merit is 3 to 5 times nutritionally superior to the widely promoted rice and wheat in terms of proteins minerals and vitamins. The millets are highly nutritious and contains important amino acids and also has several health benefits such as Anti Diabetic, anti thermal organic and antioxidants. Millets need very little water for their production and it is not dependent on the use of synthetic fertilizer and pesticides in spite of all the amazing qualities and capacities of millet. The area under millet production and consumption has been decrease over the last five decades. As a result, the study was conducted to see the impact of millet awareness and knowledge programme on farm women in Jalna district.

Krishi Vigyan Kendra, Kharpudi, Jalna, Department of Home Science has conducted training program for farm women about awareness, knowledge, acceptance and cultivation of millets to serve the society regarding health and economic benefits of millets. The aim of this training was millet awareness among farmers. Motivation for millet cultivation on the basis of natural farming system and incorporation of millets in daily diet through various recipes and Value addition of millets. Present research article focuses on various aspects of millet awareness training program among farmers. In view of this, present study was carried out to assess the impact of training program on millet and their value addition among rural areas. The study showed that majority of female respondents showed interest in value addition of millets. Pre-training and post-training assessment was done to observe the level of skill of the respondents. It was observed that increase in the duration of training program gives yields better results among the respondents to gain more knowledge and skill on value addition.

Keywords: Demographic profile, Health benefits, Impact assessment, Small millets, Training, Value addition

For correspondence: S. N. Karhale <sank74@rediffmail.com>

Constraints Affecting the Performance of Self Groups of District SAS Nagar, Punjab

Parul Gupta, Ketan Dogra, B.S. Khadda

Krishi Vigyan Kendra SAS Nagar, Gali No. 4, Ward No. 6, Model Town, Kurali, SAS Nagar, Kurali 140103, Punjab, India

A Self-Help Group (SHG) is a small, homogeneous and voluntary association of individuals, who collectively mobilize financial and social resources to address shared socio-economic challenges. Self Help Groups operate on principles of mutual support, participatory decision-making and self-governance, often engaging in micro-savings, micro credit and skill development activities to enhance livelihood security, social capital and empowerment among members. Despite of having positive outcomes, the group members face many constraints while operating the regular activities of Self Help Groups. So, the present study was carried out in the district SAS Nagar of Punjab State having sample size of 100 members from different Self Help Groups. The major constraints/challenges faced by members of SHGs were personal/psychological constraints (48%), production constraints (55%), social constraints (61%), financial constraints (68%) and marketing constraints (82%). In addition, the members of Self Help Group were asked for suggestions to improve functioning and performance of their groups. The suggested measures included conducting regular need based trainings in the village (56%), providing loans with minimal interest rates to members of SHGs (66%), easy and quick loan approval process (51%) and offering them marketing platforms on regular basis (80%) to support their activities effectively.

Keywords: Constraints, Punjab, Self Help Group, Suggestions, Skill development

For correspondence: Parul Gupta <parulgupta145@gmail.com>

Liroyim Women Entrepreneurs Boosting Income with Banana Chips

Martha Chakruno, Keviletsu Khate

Krishi Vigyan Kendra, Mokokchung, Yisemyong, Mokokchung 798601, Nagaland, India

In Nagaland, women in the villages are mainly homemakers engaged in agriculture. Despite a high overall education rate in the state, job opportunities have shrunk due to rising population and demand for specialized skills, leaving these women with basic education less equipped than the skilled younger generation. The women folk rely on agriculture to sustain their families which sometimes is not sufficient due to the rising price of essentials and commodities. However, a renowned social worker from the area introduced from Kerala an improved variety of banana good for banana chips prompting them to start an income generating enterprise. Over the years through sheer hard work and dedication these women mastered the art of making delicious mouth watering banana chips which is popularly sought after for its unique taste. The average yearly income generated from the banana chips enterprise was found to be ₹ 1,00,000 with a production of about 1000 kg of chips in a year. The banana chips enterprise was found to be profitable and helped the women folk in the village by uplifting their economic status and a shift from homemakers to decision makers in the family.

Keywords: Decision makers, Job oppertunities, Specialized skills, Upliftment

For correspondence: Martha Chakruno <marbachakruno@gmail.com>

Impact of Family Practices, Social Parameters, Capacity Building, Financial Assistance Schemes, Digital Literacy and Market Access on the Growth and Development of Women Entrepreneurs in Agri and Allied Sectors

A. Mathivanan, E. Hino Fernando, V. Senthilkumar, A. Gopalakannan

Krishi Vigyan Kendra Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Sikkal, Nagapattinam 611108, Tamil Nadu, India

Women entrepreneurship in the agri and allied sectors plays a vital role in promoting rural development, income generation, and women empowerment. However, the growth and sustainability of women-led enterprises are influenced by several socio-economic, institutional, and technological factors. The present study examines the impact of family practices, social parameters, capacity-building initiatives, financial assistance schemes, and digital literacy and market access on the growth and development of women entrepreneurs in agri and allied sectors.

The study adopted a descriptive and analytical research design and is based on primary data collected from 50 women entrepreneurs using a structured questionnaire and a five-point Likert scale. Statistical tools such as descriptive statistics, reliability analysis, correlation analysis, and multiple regression analysis were employed. The findings reveal that capacity building, financial assistance schemes, and digital literacy and market access significantly influence the growth and development of women entrepreneurs, while family support plays a crucial enabling role. Social parameters exhibit a moderate influence.

The study emphasizes the need for integrated policy interventions focusing on training, financial inclusion, digital empowerment, and social support systems to promote sustainable women entrepreneurship in agri and allied sectors.

Keywords: Agri and allied sectors, Capacity building, Digital literacy, Financial Assistance, Market Access, Women entrepreneurs

For correspondence: A. Mathivanan <mathivanan@tnfu.ac.in>

Women-Led Ornamental Plant Nurseries for Income Generation and Employment Creation

Rishika Choudhary¹, Gunjan Sanadhya², Nisha Choudhary³

¹Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur 313001, Rajasthan, India; ²Krishi Vigyan Kendra, Kota, Rajasthan 324001, India; ³Punjab Agricultural University, Ludhiana 141004, Punjab, India

Women's participation in floriculture is a key driver of economic empowerment and socio-economic transformation. Women's economic inclusion through nursery rearing and ornamental plant production has emerged as a promising and long-term horticultural livelihood choice. Nursery enterprises offer women possibilities for self-employment, consistent income, and skill development while requiring a cheap initial investment and manageable space. Krishi Vigyan Kendras (KVKs) and self-help groups (SHGs) empower women to enhance nursery procedures, provide high-quality planting materials, and manage resources more efficiently. Participation in nursery-based enterprises not only increases women's financial independence, but it also boosts their decision-making authority, confidence, and social prestige in their households and communities. Thus, women-led ornamental nurseries offer as a compelling paradigm of inclusive growth, integrating economic empowerment with environmental sustainability and green business. Women can capitalize on the increased demand from urban landscaping, personal gardening, and public green spaces by producing attractive plants, flowering seedlings, foliage plants, and landscape materials. The global floriculture market was valued at around USD 55 billion in 2023, with projections of exceeding USD 85 billion by 2028. The floriculture market in India alone has been steadily expanding, with a compound annual growth rate (CAGR) of 12.5% and a projected value of nearly USD 4.5 billion in 2025. As entrepreneurs, women create job opportunities for other women in rural and urban areas. From harvesting flowers to crafting value-added products, women owned businesses contribute to local economies and empower more women through employment and skill development. Women may create successful companies that produce income and promote economic empowerment by utilizing their creativity, developing sustainable methods, and capitalizing on online platforms and specialty markets. By serving as a link between technology, skills, and markets, Krishi Vigyan Kendras (KVKs) are essential in advancing women entrepreneurs. KVKs provide rural women with technical skills in horticultural production, value addition, nursery raising, floriculture, protected cultivation, and post-harvest management through need-based training and capacity-building programs. KVKs increase women's confidence in using better, revenue-generating technology through frontline demonstrations and on-farm trials. Through KVK-facilitated entrepreneurship development initiatives, women take responsibility for enterprise planning, cost management, quality control, packaging, branding, and local marketing.

Keywords: Employment generation, Floriculture, Ornamental nurseries, Rural entrepreneurship, Women empowerment

For correspondence: Rishika Choudhary <rishikatetarwal@gmail.com>

Agritourism for Gender-Inclusive Economic Empowerment and Sustainable Livelihoods: Evidence from the Indian Himalayas

Kawita Bhatt¹, V.L.V. Kameswari², Amardeep²

¹Krishi Vigyan Kendra, Shamli, Directorate of Extension, Sardar Vallabhbhai Patel University of Agriculture and Technology, Shamli 247776, Uttar Pradesh, India; ²Govind Ballabh Pant University of Agriculture and Technology, Pantnagar 263145, Uttarakhand, India

In India, women make a significant contribution in agricultural production, food processing, and preservation of local culinary traditions. But their labour largely remains unnoticed and unpaid within rural economies. This limits women's decision-making power, economic independence and affects their social status. Agritourism is a transformative farm diversification strategy that enables women to monetize their traditional skills, culinary heritage and farm-based skills, thereby securing direct income and active contribution in decision making in agri-food systems. This study has documented two agritourism enterprises from Uttarakhand, India *viz.* Gaurikot agritourism centre (Pauri Garhwal) and Mirai abode homestay (Almora). Qualitative case study approach has been utilised to perform field observations, enterprise profiling, and stakeholder interactions. These case studies highlight the importance of gender-inclusive entrepreneurship models for converting the rural household and farm resources into sustainable livelihood opportunities for women. Gaurikot agritourism centre is collectively managed by 20 women Self Help group members practicing integrated farming, hosting training programs, and offering experiential farm based rural tourism, supported by government schemes such as Deen Dayal Upadhyay National Rural Livelihood Mission and MNREGA. Mirai abode homestay illustrates a family-based agritourism model where women lead food systems and guest services, supported by digital platforms for market access. Together, these cases function as replicable and scalable models for rural women's entrepreneurship. Despite constraints related to infrastructure, water scarcity, and market access, both ventures have enhanced income, social recognition, and community leadership for women. The results of the study provide a policy-relevant roadmap for mainstreaming gender and empowering women economically and technologically through agritourism.

Keywords: Agritourism, Gender-inclusive entrepreneurship, Integrated farming systems, Rural livelihoods, Self help groups (SHG), Sustainable agriculture, Women empowerment

For correspondence: Kawita Bhatt <kawita@svpuat.edu.in>

Role of Farming Systems for Nutrition Model in Nutritional and Livelihood Security of Rural Families

Dipti Patgaonkar, Anita Jinturkar, Ashok Nirwal

Krishi Vigyan Kendra, Chhatrapati Sambhajnagar (Aurangabad), Vasant Rao Naik Marathwada Krishi Vidyapeeth, Aurangabad, 431010, Maharashtra, India

India faces significant nutritional security issues, characterized by malnutrition and food insecurity. Despite being a major food producer, India is home to a large population of undernourished people. The National Family Health Survey (NFHS-5) reveals that nearly 36% of children under five years are stunted, and 19% are wasted. Additionally, a significant portion of the adult population suffers from micronutrient deficiencies, including iron, vitamin A, and iodine. These deficiencies can lead to serious health issues, including impaired cognitive development in children and increased vulnerability to diseases. Hence, Krishi Vigyan Kendra, Chhatrapati Sambhajnagar (Aurangabad) has focused to overcome the nutritional as well as economical security through Farming System for Nutrition (FSN) model.

The Farming Systems for Nutrition (FSN) model plays a crucial role in enhancing nutritional and livelihood security for rural families. The FSN model was designed in consultation with community members, to increase availability of nutrient-dense cereals and pulses, by enhancing production and crop diversification at the farm level, promoting cultivation of nutrient-rich fruits and vegetables in nutrition gardens and supporting interventions to promote access to animal foods. FSN model is an interventional approach that includes a combination of sustainable agricultural remedies involving advanced crop production practices, bio fortification for rendering higher income and better nutrition output. This study was conducted with 30 rural household on an area of 0.20 ha each at village Lakhegaon and revealed that 518.1gm food stuff (cereals, pulses and vegetables) available per capita per day as against RDA recommendation 625 g (75.16%). It was also recorded that FSN model provided 36.43 g protein, 955 kcal energy, 23.1mg iron, 326.7 mg calcium, 88.9 mg vitamin C and 204.0 µg folic acid per day to each adult in the family and also earned ₹94210. It was recommended that replication of this type of FSN model may be very useful to enhance the nutritional security through staple foods and also increased the economic status.

Keywords: Bio-fortified, Farming system for nutrition, Livelihood, Model, Nutritional security

For correspondence: Dipti Patgaonkar <pckvkvmkv@gmail.com>

Empowerment of Rural Women through Adoption of Post-Harvest Technologies Disseminated by (KVK) Fazilka

Rupender Kaur¹, Ramesh Chand Kantwa¹, Arvind Kumar Ahlawat¹, Amit Nath²

¹Krishi Vigyan Kendra, Fazilka, ICAR-Central Institute of Post-Harvest Engineering and Technology (CIPHET), Regional Station (RS), Abohar 152116, Punjab, India; ²ICAR-CIPHET, RS, Abohar 152116, Punjab, India

Post-harvest technologies offer significant opportunities for income generation, reduction of losses, and value addition at the farm and household level. Rural women, who are traditionally involved in post-harvest operations, often lack access to scientific knowledge, processing skills, and organized market support. Krishi Vigyan Kendras (KVKs) act as vital extension institutions for transferring post-harvest technologies to rural women through need-based trainings and demonstrations. The present study evaluates the impact of post-harvest technology dissemination by KVK Fazilka during 2025-26 on empowerment of rural women in terms of knowledge enhancement, technology adoption, strengthening of Self-Help Groups (SHGs), and livelihood generation. Eight Home Science-based post-harvest trainings involving 247 women were analyzed using pre- and post-test knowledge scores, adoption indicators, and enterprise initiation outcomes. Results revealed significant knowledge gains (23-70%), adoption of post-harvest technologies (13.8-100%), formation and strengthening of women-led SHGs, and initiation of micro-enterprises in oil extraction, fruit and vegetable processing, pickle making, green mango products, dairy-based products, and garment construction. The findings clearly establish that KVK-led post-harvest interventions are effective tools for socio-economic empowerment of rural women. Overall, more than one-third of trained women transitioned from subsistence post-harvest roles to income-generating and collective enterprise activities following KVK interventions.

Keywords: Post-harvest technologies, Post-harvest value chains, Rural women empowerment, Technology adoption, Women-led enterprises

For correspondence: Rupender Kaur <ext_rupender@rediffmail.com>

Strengthening Agri-Entrepreneurship through Mental Well-Being of Farm Women

Rajinder Kaur, Pardeep Kumar

Krishi Vigyan Kendra, Langroya, Shaheed Bhagat Singh Nagar, Punjab Agricultural University, Nawanshahr 144516, Punjab, India

Farm women are increasingly recognized as key contributors to agricultural development and agri-entrepreneurship; however, their entrepreneurial potential is strongly influenced by their mental health status. Mental well-being plays a crucial role in shaping confidence, decision-making ability, risk-taking behavior, and resilience all of which are essential for successful agri-entrepreneurship. Farm women often face multiple psychological stressors such as financial insecurity, workload burden, social constraints, climate-related uncertainties, and limited institutional support, which can adversely affect their mental health and entrepreneurial engagement. The present study examines the significance of mental health in promoting agri-entrepreneurship among farm women, based on a sample of 200 rural women engaged in farming and allied activities. The study highlights the relationship between mental well-being and women's participation in income-generating agricultural enterprises. Findings indicate that women with better mental health exhibited higher levels of self-efficacy, motivation, innovation, and enterprise sustainability compared to those experiencing psychological distress. Positive mental health was found to be strongly associated with improved economic decision-making, adaptability to challenges, and long-term commitment to agri-based enterprises. The study further emphasizes the role of capacity-building initiatives, vocational training, and extension support in strengthening both mental health and entrepreneurial outcomes. Interventions delivered through agricultural extension systems, including Krishi Vigyan Kendras, were observed to enhance confidence, stress management, and social support among farm women, thereby facilitating successful enterprise adoption. The paper concludes that integrating mental health support with agri-entrepreneurship development programs is essential for empowering farm women. Addressing mental well-being not only enhances women's economic participation but also contributes to sustainable rural livelihoods, household food security, and inclusive agricultural growth.

Keywords: Agri-entrepreneurship, Farm women, Mental health, Psychological well-being, Rural livelihoods, Women empowerment

For correspondence: Rajinder Kaur <iamrajinderkaur@gmail.com>

Empowering Women through Creating Awareness of Consuming More Conventional Food to Reduce the Prevalence of Iron-Deficiency Anemia

Vinita Singh, Sunil Prajapati, Bonika Pant, Vipin Kumar

Krishi Vigyan Kendra, Gautam Budh Nagar, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Noida, 201301, Uttar Pradesh, India

Currently, one of the most prevalent and intractable nutritional issues, anemia, has severe consequences for human health and for economic and social development in developed and developing nations, affecting almost one-third of the global population. Anemia is commonly the result of inadequate iron intake, poor iron utilization from ingested food, or a combination of the two. Bad eating habits and inadequate intake of foods high in micronutrients are the underlying causes of this disorder. The prevalence is higher among adolescent girls and women of childbearing age, even though it affects in all ages. The Indian Council of Medical Research reported that nearly 85% of pregnant women and more than 90% of adolescent girls in India had anemia in the year 2006. There is no significant change in the scenario as the magnitude of anemia continued to increase during the last sixty years. Increasing the amount of iron and vitamin C-rich fruits and vegetables in their regular diet can help with this. Cost-effective treatments, such as food supplementation, fortification, and nutrition education, can reduce the prevalence of micronutrient deficiencies worldwide and improve the nutritional status of vulnerable groups. In an effort to decrease the prevalence of iron deficiency anemia, this study aims to create a nutrition intervention package that involves an iron-rich food supplement and nutrition education. The findings indicated that the most effective, sustainable, and inexpensive technological approach to combat the battle against iron deficiencies is the inclusion of cheap and easily available fruits and vegetables that maximize the intrinsic and added food iron without any gastrointestinal side-effects. It is essential to judiciously decide the food rich in iron as well as the food vehicles for their bioavailability. The study's findings also showed that vitamin-C insufficiency and iron deficiency are equally responsible for anemia in the impoverished cereal-eating population. The iron status of adolescent girls and women can be improved significantly by providing systematic education on food preparation practices that minimize the consumption of inhibitors of iron absorption. To eventually eradicate this global problem, persistent efforts through mass awareness, primarily elementary education for all women, should be required.

Keywords: Anemia, Iron deficiency, Intervention, Micronutrients, Nutrition education

For correspondence: Vinita Singh <write2vinita1@rediffmail.com>

Empowering Women through Mushroom Production for Livelihood and Income Generation - A Case Study on Arian Mushroom Farm

Udeshna Talukdar, Jasmine Rafi, Manashi Gogoi, Sangita Borah, Dipanjan Kashyap, Pompei Dutta

Assam Agricultural University, Jorhat, 785013 Assam, India

Arian mushroom farm was established in Rajarhat Banekuchi village of Nalbari district, Assam in the year 2016 by Mrs Dali Rani Das Haloi. Depending on the climatic conditions of Assam at present they were producing four varieties of oyster mushroom batch wise. The farm produced four batches per year with an interval of three months and each batch had 4000 bags. They produced highest mushroom 60800 kg in the year 2016 with 16000 bags. The gross income per bag was ₹ 433.83 and with a gross income of ₹ 6941382.48 per year. The benefit cost ratio for the farm was more than one and hence it was found to be economically viable and profitable. The farm produced as many as 15 value added products and the annual revenue from value added products was found at ₹ 297600.00. It was found that mushroom biscuit is the most selling value added product which solely accounts for sale of 1200 units. The study also identified three marketing channels. The study found that there were different production constraint which included non availability of straw, infected spawn, non-availability of labour and non-availability of scientific drying facility. It was also observed that the farms major marketing constraints were lack of local market for fresh and dried mushroom and lack of regular market.

Keywords: Livelihood generation, Mushroom production, Rural entrepreneurship, Value addition, Women empowerment

For correspondence: Udeshna Talukdar <udeshna.talukdar@aau.ac.in>

Natural Farming to Sustainable Earning: Success Story of an Women Agripreneur

I. Rumana Bismi, J. Sukumar, M. Elavarasan, M. Balasubramaniam, C.R. Monikha

Krishi Vigyan Kendra, Urmelalagian Village, Tenkasi 627852, Tamil Nadu, India

Women entrepreneurship in agri-food systems is increasingly recognized as a critical pathway for economic inclusion, sustainability, and rural transformation. However, women farmers often face constraints related to technical knowledge, value addition, certification, and market access. Mrs. Saranya Devi, an aspiring women natural farmer's journey from overcoming many such constraints to serving as an inspiration to fellow women farmers is a testament to the power of women empowerment. Being a B.Sc. Chemistry graduate with a green heart, she chose soil over solvents and sustainability over shortcuts. What began as a personal aspiration has now flourished into a NPOP certified 11 acre solar powered organic farm, nurtured with patience, science-backed traditional wisdom, and relentless effort. Taking her journey a step further, she ventured into value addition, processing farm-fresh produce into wholesome products and launching her own website to directly connect with conscious consumers. Being a first generation women agripreneur transitioning from conventional knowledge domains to field-level practice posed several technical and managerial challenges. To bridge the gap, she attended training programme provided by ICAR-KVK Tirunelveli.

KVK Tirunelveli on knowing her vision provided continuous technical guidance, need-based capacity-building trainings, on-farm demonstrations, value-addition trainings, standardization support, and technical advice on processing, quality control, packaging, and marketing and regular mentoring at every stage. Through KVK's linkage she became beneficiary of PMFME scheme, through which she strengthened her farm operations, Continuous mentoring and handholding enabled successful enterprise stabilization, improved market access, and enhanced income realization, leading to the establishment of the enterprise MMM Organics. Mrs. Saranyadevi emerged as a successful woman agri-entrepreneur operating a natural farming model integrated with value-added enterprises. The intervention demonstrates a scalable and replicable model of women empowerment.

Keywords: End-to-end backstopping, KVK support, Natural farming, Value addition, Women empowerment

For correspondence: I. Rumana Bismi <rumanazarah2707@gmail.com>

Social Participation and Awareness of Entrepreneurial Schemes among Farm Women in North Eastern India

Moloya Gogoi, Mandeep Digra, Nabaneeta Gogoi, Mayuri Bora, Tulika Borah, Pubali Saikia, Pallavi Talukdar

All India Coordinated Research Project on Women in Agriculture (AICRP-WIA), Assam Agricultural University, Jorhat 785013, Assam, India

The present study was conducted under the All India Coordinated Research Project on Women in Agriculture, Assam Agricultural University, Jorhat, to assess social participation and awareness of entrepreneurship-related government schemes among farm women in the north eastern region of India. The study covered two agro-ecological regions, AER 16 (Assam and Arunachal Pradesh) and AER 17 (Nagaland). A total of 960 farm women respondents were selected, comprising 240 respondents each from Assam and Arunachal Pradesh and 480 respondents from Nagaland. Data were collected using a pre-tested structured interview schedule through a multistage sampling technique and analysed using descriptive statistical tools. The findings revealed considerable variation in social participation across the study areas. Participation in Self-Help Groups was highest in Assam (91.66%) and Nagaland (86.66%), whereas it was markedly lower in Arunachal Pradesh (14.16%). Membership in cooperative societies, Mahila Mandals, Zilla Parishads, and other organizations such as NGOs and WFPOs remained limited, with less than 15% participation in most cases across both agro-ecological regions. Awareness of entrepreneurship-oriented government schemes was found to be inadequate. Only 1.25- 15.00% of respondents were partially aware of schemes providing entrepreneurial opportunities, while 78.33-100.00% were not aware of scheme provisions, facilities, or their role in promoting economic empowerment and self-reliance. The findings highlighted the need for strengthened extension efforts, effective convergence with government agencies, and targeted capacity-building interventions to enhance awareness, social participation, and entrepreneurial engagement of farm women in the region.

Keywords: Agro-ecological regions, Entrepreneurship schemes, Farm women, Scheme awareness, Social participation

For correspondence: Mandeep Digra <manudigra30@gmail.com>

Resilience and Entrepreneurial Drive among Rural Farm Women of Assam: A Pathway to *Viksit Bharat*

Toslina Sultana Begum¹, Anadi Ranjan Saikia¹, Mridushmita Borthakur², Porna Sarmah³

¹Assam Agricultural University, Jorhat 785013, Assam, India; ²Krishi Vigyan Kendra Golaghat, Assam Agricultural University, Golaghat 785621, Assam, India; ³KVK, Kokrajhar, Assam Agricultural University, Kokrajhar 783370, Assam, India

Rural farm women are increasingly recognized as vital contributors to India's vision of *Viksit Bharat*. Their entrepreneurial initiatives not only strengthen local economies but also foster social transformation. This study will examine how resilience, personality traits, motivational drivers and support systems collectively shape the successful entrepreneurial journey of rural farm women.

The study aimed to explore the role of resilience alongside personality traits, motivational factors and resource support in influencing entrepreneurial success and sustainability among rural farm women.

Data will be collected using resilience assessment tools and complemented by an exploration of personality traits such as self efficacy, risk taking, creativity and stress tolerance. Motivational factors including autonomy, self fulfillment and economic independence will be analyzed in relation to entrepreneurial intent. Skills in agri-food value chain, financial literacy, digital awareness, leadership and communication will be considered as enabling conditions for scaling enterprises. By highlighting resilience, personality traits, motivation and skills, this study will underscore the transformative potential of rural farm women in advancing inclusive development. Strengthening these dimensions will be essential for accelerating India's progress toward *Viksit Bharat*.

Keywords: Entrepreneurship, Personality traits, Resilience, Rural women, Skills

For correspondence: Toslina Sultana Begum <toslima.begum@aaau.ac.in>

Empowering Tribal Women through Piggery Farmer Field Schools: Evidence from Assam

M. Misha Madhavan¹, N.H. Mohan², V.K. Gupta³

¹ICAR-Indian Agricultural Research Institute, New Delhi, 110012, India; ²ICAR-National Bureau of Animal Genetic Resources, Karnal 132001, Haryana, India; ³ICAR-National Research Centre on Pig, Guwahati 781131, Assam, India

Pig farming is deeply embedded in the socio-economic lives of rural women in the North-Eastern region of India, which accounts for nearly 47% of the country's pig population. In Assam, backyard pig production systems rely heavily on women's labour; however, despite their substantial contribution, women have limited participation in decision-making, minimal control over benefits, and restricted access to markets dominated by intermediaries. Against this backdrop, a Piggery Farmer Field School (FFS) was implemented as a pioneering intervention in the piggery sector to strengthen the capacities of 25 selected tribal women from Barmura village, Kamrup (Rural) district of Assam, following Food and Agriculture Organization (FAO) guidelines. Participants' knowledge levels were assessed before and after the programme using a structured knowledge test. The results indicated a significant improvement in knowledge related to scientific pig rearing, following participation in the FFS. Beyond knowledge enhancement, the FFS facilitated collective action and enterprise development, leading to the establishment of an integrated pig-fish farming unit that emphasized efficient pig waste management and generated additional income through fisheries. The programme also fostered an entrepreneurial mindset among the participants, who began planning value-addition activities such as pork processing enterprises. Overall, the FFS contributed to women's empowerment by enhancing technical competence, economic returns, self-confidence, and participation in farm-level decision-making. The findings highlight the potential of Farmer Field Schools as an effective gender-responsive extension approach in the piggery sector. Integrating women centric FFS models into livestock development programmes, coupled with support for collective enterprises, value addition, and market linkages, can improve women's role, reduce intermediary dominance, and promote sustainable livelihoods in the North-Eastern region of India.

Keywords: Farmer field school, Livestock-based livelihoods, Piggery, Tribal women, Women empowerment

For correspondence: M. Misha Madhavan <mishamadhavanmsy4@gmail.com>

Women's Livelihoods and Empowerment Under the National Rural Livelihoods Mission: Evidence from a Mixed-Methods Study in Punjab

Sukhvir Singh, Sanjay Kumar, Amit Guleria

Punjab Agricultural University, Ludhiana 141004, Punjab, India

Punjab's relatively developed agrarian economy continues to face persistent rural poverty and limited economic participation of women, underscoring the need for effective, women-centred livelihood interventions. This study examines the impact of the Deen Dayal Antyodaya Yojana-National Rural Livelihoods Mission (DAY-NRLM) on women's livelihoods and empowerment in Punjab using primary data collected from 80 women members of Self-Help Groups (SHGs). Adopting a mixed-methods approach within a retrospective pre-post framework, the analysis combines descriptive statistics with econometric techniques, including ordinary least squares regression, principal component analysis, and Tobit regression.

The findings reveal substantial post-NRLM improvements in household income, savings, employment generation, asset accumulation, and access to formal credit, indicating a marked strengthening of women's economic position. Initiation of income-generating activities emerges as the most significant driver of income growth, with the largest gains observed among previously unemployed and less-educated women, reflecting effective pro-poor targeting. While training interventions significantly enhance women's empowerment, captured through improvements in skills, knowledge, agency, and access to institutions, their association with weaker short-term income gains highlights implementation and design challenges in translating training into immediate economic returns. Additionally, longer SHG membership is negatively associated with economic gains, pointing to retention issues linked to passive participation and the exit of successful entrepreneurs.

Overall, the study confirms NRLM's effectiveness as an institutional pathway for promoting women's economic inclusion and empowerment at the grassroots level. The findings underscore the need for locally tailored training, strengthened post-training handholding, and differentiated engagement strategies to sustain women-led livelihoods and enhance the long-term impact of SHGs within rural agri-linked livelihood systems.

Keywords: Economic inclusion, Gender-responsive policies, Rural development, Self-Help Groups (SHGs), Women's empowerment

For correspondence: Sukhvir Singh <sukhvir-2359002@pau.edu>

Digital Marketplaces and E-Commerce Innovations Empowering Rural Women Entrepreneurs of Punjab

Prerna Kapila, Gurupdesh Kaur

Punjab Agricultural University, Ludhiana 141003, Punjab, India

Digital marketplaces and e-commerce innovations are emerging as powerful tools for advancing the economic inclusion of rural women entrepreneurs in Punjab, India. This study explores how digitally enabled market platforms enhance women's participation in agri-food value chains by improving market access, income generation, and enterprise sustainability. Using a mixed-method approach that combines field insights, case studies, and primary data collected from two districts of Punjab, the research examines women-led micro and small enterprises engaged in agri-processing, handicrafts, and value-added food products. The findings reveal that access to e-commerce platforms, social media marketing, and mobile-based payment systems has enabled rural women to overcome geographical isolation, reduce dependence on intermediaries, and secure better price realization. Digital capacity-building initiatives and linkages with self-help groups, cooperatives, and microfinance institutions further strengthen women's entrepreneurial confidence and financial resilience. However, challenges such as limited digital literacy, infrastructure gaps, and access to working capital persist. The study highlights scalable models that integrate digital skills training, financial inclusion, and cooperative market linkages to support women's entrepreneurship. Aligned with SDGs 5 (Gender Equality), 8 (Decent Work and Economic Growth), and 9 (Industry, Innovation, and Infrastructure), the paper underscores the potential of digital ecosystems to transform rural women from marginal producers into competitive market participants, contributing to inclusive and sustainable agri-food systems.

Keywords: Agri-food value chains, Digital marketplaces, E-commerce, Economic Inclusion, Rural women entrepreneurs

For correspondence: Prerna Kapila <prernaats@pau.edu>

Empowering livelihood of Women Farmers through Agriculture: A case study in Sikkim

Ram Singh, M. Victoria Devi, Kh. Romio

College of Agriculture, Central Agricultural University(Imphal)-Kyrdemkulai, Manipur, India

A case study on empowering women farmers in Sikkim, India's first fully organic state through targeted agricultural interventions was conducted. Despite women's significant role in agriculture comprising around 80% of the economically active workforce in India and performing over 70% of livestock related work, women face persistent barriers such as limited land ownership, lack of decision-making power, restricted access to credit and markets, and heavy unpaid care responsibilities. The study, conducted in East and South Sikkim districts, began with a baseline survey of 40 farm women, revealing of active age groups ranges (20–50 years), low education levels, small landholdings (<2.47 acres for 92.5%), annual incomes of Rs. 50,000–1 lakh (85%), reliance on traditional methods of farming. The Women showed strong interest in agriculture and allied sector including livestock rearing, capacity building, and leadership development. The intervention identified four potential women leaders via Focus Group Discussions and selected 16 SC/ST beneficiary farm women. Four Farming models were implemented using local seeds/inputs viz., (1) Crop base: Millets + turmeric + seasonal vegetables with processing/value addition; (2) Climate-smart practices + livestock; (3) Integrated farming system (crops + livestock); and (4) crop base: Ginger + buckwheat + Dalle chilli. Support included farmer-scientist-extension interface meetings, skill training in scientific livestock rearing (piggery, poultry, beekeeping), organic cultivation practices, input distribution, and a WhatsApp group created for coordination. The project aims to enhance income, build self-sustainability over three years, promote local resources, and foster leadership for economic independence and decision-making power. By addressing structural constraints through collective action, knowledge sharing, and gender-responsive approaches, it seeks to boost women's socio-economic and psychological empowerment, aligning with broader goals of gender equality and sustainable rural development in Sikkim.

Keywords: Agriculture, Empowerment, Livelihood, Women farmers, Potential women leader

For correspondence: Ram Singh <ramsingh.cau@gmail.com> / <deancoakyrdemkulai@gmail.com>

Livestock, Women's Empowerment, and Nutrition in South Asia

Jaya Jumrani, Kanishk Dutta, Saniya Mohan

ICAR-National Institute of Agricultural Economics and Policy Research, DPS Marg, Pusa, New Delhi 110012, India

Livestock plays a central role in rural livelihoods and food systems across South Asia. Women fulfil the main responsibility for taking care of animals while they also handle all tasks related to their daily operations. The livestock sector needs their expertise because they help manage animals, yet their work remains unrecognised due to ongoing gender bias and restricted access to resources and cultural obstacles.

To address this gap, this scoping review brings together the existing literature to examine how women's participation in livestock-related activities influences intra-household economic agency, decision-making power and nutritional outcomes across South Asia. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) framework and focused on eight countries: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. A comprehensive search of major academic databases and grey literature was conducted for studies published between 1989 and 2024. Following removal of duplicate records, a two-stage screening process was applied, which included title-abstract screening and full-text review with journal quality appraisal assessment. This process ultimately resulted in 110 peer-reviewed studies being included in the final synthesis.

In addition to its substantive findings, the review highlights clear patterns in the evidence base. Since 2015, the research output has increased dramatically, though the evidence is geographically uneven, with India contributing the most (42 studies). The literature is broadly organized into three groups: women's social empowerment (30 studies), nutritional outcomes for women and children (30 studies), and intra-household economic agency (6 studies). These groups are not mutually exclusive, as there exists some overlap. Most studies appear in high-impact interdisciplinary journals, notably *Maternal and Child Nutrition* and *Food and Nutrition Bulletin*.

The synthesis demonstrates that women managing livestock experience higher family income, financial independence, dietary diversity, and better nutritional outcomes both for themselves and their children. However, men largely retain control over decisions regarding high-value assets and income, while women face significant systemic barriers to financing, formal market linkages, veterinary training, etc. Overall, the results highlight the transformative potential of livestock as a tool for gender empowerment and improved nutritional well-being. Productivity-focused policies alone could make gender inequalities worse. Gender-sensitive livestock interventions that strengthen women's control over resources, decision-making authority, and access to services and markets are essential for translating their participation into sustained empowerment and improved nutrition.

Keywords: Agricultural policy Livestock, Nutritional outcomes, South Asia, Women

For correspondence: Jaya Jumrani <jaya.jumrani@icar.org.in>

Development of Value-Added Buns Using Amaranth Flour

Manisha Gahlot, Kalplata Pant , Beenu Singh, Anil Kumar

All India Coordinated Research Project on Women in Agriculture, Govind Ballabh Pant University of Agriculture and Technology (GBPUAT), Rudrapur 263145, Uttarakhand, India

Amaranth is an ancient pseudo-cereal well known for its high nutritional value and useful functional properties. It is also called super grain because it contains a high amount of protein and essential amino acids particularly lysine. Amaranth is naturally gluten-free and suitable for people who have gluten intolerance or celiac disease. In recent years, amaranth has been used in bakery products to improve their nutritional quality. One such product is buns. Buns prepared with amaranth flour can provide more protein and essential amino acids fiber. To achieve proper texture of buns amaranth flour is mixed with all-purpose flour in different proportions. In this study, buns were prepared by mixing amaranth flour with all-purpose flour in various proportions with the objective to find appropriate texture and its nutritional value. The prepared buns were tested for textural properties such as softness and firmness. Sensory evaluation was also carried out to assess color, flavor, taste, texture and overall acceptability. Skill-based trainings were also given to farm women on the preparation of value-added buns using amaranth flour, focusing on flour blending, bun preparation, texture optimization, and quality improvement. The trainings enhanced their skills in nutritious product development, sensory evaluation and small-scale income generation through bakery-based entrepreneurship.

Keywords: Amaranth, Entrepreneurship development, Farm women, Gluten-free, Income generation, Pseudo-cereal, Skill-based training, Super grain

For correspondence: Manisha Gahlot <manishagahlot25@yahoo.co.in>

Impact on Nutri Garden on Nutritional Health of Rural Farm Families of Uttarakhand

Manisha Gahlot, Kalplata Pant, Beenu Singh

All India Coordinated Research Project on Women in Agriculture, Govind Ballabh Pant University of Agriculture and Technology (GBPUAT), Pantnagar, Rudrapur 263145, Uttarakhand, India

Vegetable based nutri-garden is the richest source of nutrition and can play an active role in eradicating under-nutrition. Nutri-garden is advanced form of kitchen garden in which vegetables are grown as a source of food and income in a more scientific way. For small and marginal farmers, nutri-garden can contribute to the family diet and provide several other benefits, particularly for women. *Poshan vaticas* or Nutri-gardens provide easy and affordable access to fruits, vegetables, medicinal plants and herbs. It ensures a regular supply of fresh fruits, vegetables and medicinal plants to women and children. It plays an important role in improving dietary variety by supplying key micronutrients through local fruits and vegetables. Usually a Nutri-garden can be established in the backyard of house where there is enough water availability. In context to Uttarakhand, nutri-gardens are maintained near houses so that it can be protected from animal damage which is a major problem associated with large scale farming in hills. Layout and crop allotment in nutri-garden can be modified depending on climatic and seasonal changes. Nutrition related agricultural interventions implemented under the AICRP-WIA, GBPUAT Pantnagar in five different villages of Uttarakhand in which 103 nutri-gardens were established with active participation of women farmers. Seasonal seeds were distributed to upgrade the Nutri gardens. A database of 103 Nutri-gardens was developed and the income of farm women increased through the sale of surplus produce, contributing to improved livelihood security and economic empowerment.

Keywords: Backyard gardening, Food and nutritional security, Fruits and medicinal plants, Micronutrients, Nutri-garden, Seasonal vegetables, Sustainable Nutrition

For correspondence: Manisha Gahlot<manishagahlot25@yahoo.co.in>

Gender Dynamics in Market Access

Chetna Pathak, Sonam Agrawal, Abhijeet Kuderiya

Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur, Suhagi, Adhartal, Jabalpur 482004, Madhya Pradesh, India

Gender dynamics encompass the relationships and interactions between men, women, boys, and girls, influenced by sociocultural notions of gender and power. In India, gender roles are often seen as 'natural,' with women expected to prioritize household duties over education or careers. Market access is a critical determinant of livelihood security and economic empowerment, yet gender dynamics continue to shape who participates, how benefits are distributed, and what barriers persist. With a focus on marginalized populations, this research investigates the relationship between gender and market access in rural and agrarian settings. Structural barriers, such as restricted land ownership, unequal financing availability, and exclusion from decision-making processes, frequently affect female farmers. Their capacity to interact with markets, negotiate prices, and build networks is further constrained by social norms and mobility limitations. On the other hand, men are usually more visible and possess greater negotiating power, which perpetuates gendered disparities. Studies demonstrate how women's involvement in cooperatives, producer organizations, and self-help groups can lessen these obstacles by generating shared resources and collective bargaining power. Although digital literacy and infrastructure limitations continue to be major impediments, digital platforms and e-commerce initiatives also offer women new ways to bypass traditional middlemen. This study argues that mainstreaming gender in market policies requires more than token participation. It calls for targeted interventions, such as gender-responsive extension services and initiatives to increase capacity that acknowledge women's roles beyond subsistence farming. By addressing both structural and cultural constraints, market systems can become more egalitarian and improve resilience and sustainability. Ultimately, creating inclusive economic frameworks that support household incomes, empower women, and promote wider social change requires an understanding of gender dynamics in market access."

Keywords: Gender dynamics, Market access, Sustainability

For correspondence: Chetna Pathak<csapathak@gmail.com>

Impact of Scientific Livestock Farming Training by Krishi Vigyan Kendra on Rural Women Behaviour

Soma Banerjee

Krishi Vigyan Kendra, West Bengal University of Animal and Fishery Sciences (WBUAFS), Ramsai, Jalpaiguri 735219, West Bengal, India

Rural women from the Dhugguri and Maynaguri blocks of Jalpaiguri district participated in scientific livestock farming training conducted by the Krishi Vigyan Kendra (KVK) during 2021 and 2022. The study was carried out in the year 2024-25 on 120 respondents selected randomly. Information was collected using pre-structured questionnaires administered before and after the training to assess women's participation, decision-making capacity, market and resource access, and communication skills related to livestock farming. The findings revealed that prior to the training, only 5% of the women were involved in decision-making, 2% had access to markets and resources, and 8% actively participated in communication related to livestock farming. After four years, decision-making capacity, market and resource access, and communication skills increased to 32%, 24%, and 50%, respectively. Thus, training and capacity-building programs significantly enhanced the confidence of rural women. Exposure to scientific livestock farming practices brought about a positive change in mindset, leading to a 27% increase in decision-making capacity. Communication skills improved by 42%, while participation in market and resource access related to livestock product sales, purchase, and financial management increased by 22%. Overall, the scientific livestock farming training conducted by KVK proved to be need-based and effective for rural women, enhancing their participation in livestock farming activities ranging from daily management to financial management and decision-making.

Keywords: Capacity building, Communication, Decision making, Empowerment, Entrepreneurship, Extension, Livestock, Market linkage, Participation, Skill development

For correspondence: Soma Banerjee<dr.soma@rediffmail.com>

An Assessment Study on the Use of Spring Brake Rake for Drudgery Reduction Amongst Women Dairy Farmers of Uttarakhand

Deepti Kothari¹, Pratibha Singh¹, Seema Kwatra², Preeti Mamgain³, Nivedita⁴, Sudha Jukaria⁵, Rashmi Limbu⁶, Gaytri Devi⁷, Sanskriti Singh⁸, Lalita Shukla⁹

¹Krishi Vigyan Kendra Udham Singh Nagar, Govind Ballabh Pant University of Agriculture and Technology (GBPUA&T), Pantnagar, Uttarakhand, India; ²College of Community Science, GBPUA&T, Pantnagar, Uttarakhand, India; ³ICAR-Agricultural Technology Application Research Institute (ATARI), Zone-I, Ludhiana, Punjab, India; ⁴KVK-Rudraprayag, GBPUA&T, Pantnagar, Uttarakhand, India; ⁵KVK-Nainital, GBPUA&T, Pantnagar, Uttarakhand, India; ⁶KVK-Pauri Garhwal, Veer Chandra Singh Garhwal Uttarakhand University of Horticulture and Forestry (VCSG UHF), Bharsar, Uttarakhand, India; ⁷KVK-Champawat, GBPUA&T, Pantnagar, Uttarakhand, India; ⁸KVK-Bageshwar, ICAR-VPKAS, Almora, Uttarakhand, India; ⁹KVK-Dehradun, GBPUA&T, Pantnagar, Uttarakhand, India

Dairy farming is a very crucial economic activity, in agrarian ecosystem of India. In a hilly state like Uttarakhand, most of the dairy management tasks are done predominantly by women. While getting engaged with dairy animals women adopt inconvenient posture, resulting in postural defects and long-term implications on health. The assessment study aims to popularise the use of spring brake rake through various extension activities, such as training, demonstrations, and field visits, to reduce the drudgery involved in dairy management activities. Technology on leaf collector/fork developed by the G.B. Pant University of Agriculture and Technology, Pantnagar has been assessed by the Krishi Vigyan Kendra of eight districts during the year 2024. A representative sample of 80 dairy women farmers was taken as a control group for studying the critical observations as well as ergonomic assessment of dairy management activities using the traditional method. Similarly, 80 respondents were selected as experiment group, for assessment of ergonomics and critical observations of dairy management activities using improved technology, *viz.*, Long-handle Spring brake rake. Structured questionnaire was the tool used and group discussions, field demonstrations and training techniques were employed for assessing the ease of operation, reduction in perceived physiological stress, opinion on drudgery related aspects of technology, increase in knowledge and awareness regarding dairy management activities for the present study. The weighted mean scores for the parameters such as bio-mechanical, physical stress, work output, tool factor and field acceptability were 4.60, 4.51, 4.61, 4.44, 4.54 for the experiment group, and 1.94, 1.93, 1.96, 1.68, 1.85, respectively, for the control group. The scores of the technology parameters stated that experiment group found improved technology relevant, whereas control group stated that the traditional technology was irrelevant. The percentage change in knowledge for the control group was 13.26%, and for the experiment group it was 75.28%. Regarding change in awareness level, it was reported to be 11.10% and 70.30%, for the control and experimental group respectively. Improved technology was highly acceptable and relevant for reducing drudgery and stress among dairy women farmers. Introduction of such technologies and their popularization amongst practicing dairy farmers can led to increase in efficiency and productivity of the system.

Keywords: Biomechanics, Dairying, Drudgery, Ergonomics, Extension, Technology, Women

For correspondence: Deepti Kothari <deeptikothari15@gmail.com>

Post-Harvest Losses in Fisheries: An Analysis of Economic and Social Impacts on Fish Farmers

Angadi Rupa Sowjanya¹, M. Preethi¹, R. Neela Rani², B. Jamuna Rani³, T. Supraja⁴, D. Srinivasa Chary⁵

¹Professor Jayashankar Telangana State Agricultural University (PJTSAU), Guntur 522006, Andhra Pradesh, India; ²All India Coordinated Research Project on Women in Agriculture (AICRP on WIA), PJTSAU, Hyderabad 500030, Telangana, Andhra Pradesh, India; ³College of Community Science, PJTSAU, Saifabad 500004, Andhra Pradesh, India; ⁴Krishi Vigyan Kendra, PJTSAU, Rudur, Nizamabad 503188, Andhra Pradesh, India; ⁵College of Agricultural Engineering, PJTSAU, Kandi, Sangareddy 502001, Andhra Pradesh, India

Post-harvest losses adversely affect not only the quality of fish but also the economic stability and social well-being of fish farmers, thereby threatening the sustainability of fisheries-based livelihoods. In order to assess the economic and social impacts of post-harvest losses, an ex post facto research design was used and data was collected from 31 fish farmers through personal interviews using a structured schedule. Information related to income levels, market pricing, credit access, social challenges, and training exposure was analyzed using descriptive statistical tools such as frequencies and percentages. The results indicated that fish farming was entirely commercial in nature and provided moderate income levels; however, 38.70% of farmers experienced reduced prices due to quality deterioration. A majority of the respondents (61.29%) reported unfair weight measurement and pricing practices by wholesalers, reflecting limited bargaining power in the market. Although banks served as the primary source of credit, a considerable proportion of farmers (38.70%) continued to depend on money lenders, indicating persistent financial stress. Socially, market price fluctuations and climate variability emerged as the most frequently reported community-level challenges. Furthermore, more than half (51.61%) of the respondents lacked formal training in fish handling, which restricted income enhancement and adaptive capacity. The study highlights that post-harvest losses have direct economic repercussions and indirectly intensify social vulnerability among fish farmers. Strengthening institutional support systems, improving market transparency, expanding financial inclusion, and enhancing capacity-building initiatives are essential for improving livelihood security.

Key words: Economic impact, Fish, Fish farmers, Fish farming, Post-harvest lossess, Social impact

For correspondence: Angadi Rupa Sowjanya <arsbs12345@gmail.com>



Extended Summary



Pre-Conference Event I: GCWAS Ingenious Idea Innovation Contest (International)

First position: She-Shroom - ICAR-IARI, India

Technology: Aero-Shroom - Performance-Optimized Fungal Growth Platform

Fathima Shima N. A.¹, Konala Akhila², Anantha Ganjoo³ and Veda Krishnan¹

¹ICAR-Indian Agricultural Research Institute, New Delhi; ²Indian Institute of Technology-Hyderabad; ³Shroomery, India

She-Shroom has developed an advanced mushroom cultivation system addressing sustainable protein production and women-inclusive agri-enterprise models. Mushrooms provide 18-30% protein (dry weight basis), along with vitamin D₂, β -glucans, essential minerals, antioxidants and other bioactive compounds supporting immune and metabolic health.

The innovation uses an ultra-light aerogel substrate composed of wheat straw, wheat bran and bacterial cellulose nanofibrils, pre-colonized with a spore-less oyster mushroom strain (DMRP-395). Modified Atmosphere Packaging (MAP) with microfilters ensures portability and optimized growth conditions. The ready-to-use block reduces watering frequency, minimizes physical strain and enables controlled fruiting through selective cutting. The system lowers labour intensity, improves cultivation efficiency, reduces allergenic risks and makes mushroom production more accessible for women-led SHGs, FPOs and urban farmers. The compact and efficient design also presents potential for controlled-environment and space-based food production systems.

Second Position: LOWI - Lean On Women Community-Based Organization, Kenya

Carren Katenya¹, Emily Bwalei², Lilian Bisase³ and Lilian Songok⁴

¹Entrepreneur, ²Student, ³Project Fellow, ⁴Scientist

LOWI (Lean On Women Community-Based Organization) presented a women-centric agri-enterprise model focused on strengthening economic resilience through decentralized agricultural production and structured capacity building. The initiative operates at the intersection of community mobilization, skill development and localized agri-value chain development. It empowers women farmers and youth through structured training programs, collective production models and aggregation-based marketing systems that enhance bargaining power and reduce post-harvest losses.

The proposed model emphasizes:

- » Decentralized micro-production units led by women
- » Community-level aggregation and structured market linkage
- » Skill enhancement and entrepreneurship development
- » Income diversification within agri-food systems

During the mentoring phase under Pusa Krishi, the team refined its scalability strategy, institutional partnerships and financial structuring to strengthen long-term sustainability. The model demonstrates potential for replication across rural and peri-urban regions, particularly in contexts where women face limited access to capital, markets

and structured agri-training. By combining grassroots mobilization with structured enterprise planning, LOWI contributes to women-led livelihood enhancement, food security and inclusive rural development - aligning strongly with the objectives of GCWAS in promoting gender-responsive agri-food systems transformation.

Third Postion: Ecovion - IIT Roorkee, India

Nishi Gandha¹, Abhinav K. Singh¹, Gaurav Manik¹ and Madhuparna Ray²

Technology: Smart Root-Zone Targeted Fertilizer Delivery Platform

¹Indian Insitute of Technology Roorkee, Uttarakhand, India; ²Entrepreneur-Ecovion

Ecovion is developing a next-generation smart delivery system for fertilizers and crop-protection inputs aimed at addressing low nutrient-use efficiency, rising input costs, soil degradation and climate stress.

The innovation consists of a biodegradable, root-zone targeted granule platform that synchronizes nutrient release with plant demand. This precision-based delivery mechanism reduces chemical losses, improves nutrient uptake efficiency and enhances soil health. The solution aims to reduce input costs per acre, stabilize yields, improve crop quality and enhance farmer profitability. By reducing financial risks associated with repeated chemical applications, Ecovion supports long-term soil sustainability and economic resilience among small and marginal farmers. The long-term vision is to build a scalable, climate-resilient agri-input platform that integrates environmental sustainability with inclusive rural prosperity.

Third Postion: Zelbytes Pvt. Ltd., India

Kripa Mary Spencer¹, Geetha Radhakrishnan¹ and Gourish G Pillai²

Technology: ZelAI-She: AI-Enabled Autonomous Micro-Farming Platform

¹Regional Agricultural Research Station, Kerala Agricultural University, Vellayani, Thiruvananthapuram, Kerala, India; ²Entrepreneur-Zelbytes Pvt Ltd

Zelbytes Pvt. Ltd. presented ZelAI-She, an AI-driven autonomous climate control and precision farming platform designed for decentralized, high-density cultivation.

The system integrates Physical AI through a structured Sense-Compute-Verify feedback loop, enabling automated climate regulation, pH/EC-based nutrient dosing and visual validation via gantry-mounted imaging systems. The design supports up to 25 plants per square meter while reducing manual labour by nearly 90%. The model is structured as a Farming-as-a-Service (FaaS) platform, particularly targeted toward women entrepreneurs and small-space farming units. It enables backyard and peri-urban farming through modular deployment while aggregating decentralized production through a virtual supply system. By improving productivity, reducing operational risks and enabling technology-enabled women entrepreneurship, ZelAI-She demonstrates strong potential for scalable impact in climate-resilient agri-food systems.

Pre-Conference Event II: National Agricultural Research, Education and Extension System HEIs Students Elocution Contest

Theme: “Agri-Food Systems of 2050- Youth Perspectives on Role of Women”

PG/Ph.D. category

First position

Kaustabh Mohanty

ICAR-Indian Agricultural Research Institute, New Delhi, India

Title: From Gender Gap to Growth Engine: Women Transforming Global Agriculture

Climate change, declining land resources, water scarcity, and soil degradation will make it necessary to feed about 10 billion people by 2050. Under these circumstances, achieving sustainable food security calls for both inclusive engagement and cutting-edge technology. Building resilient agri-food systems will depend heavily on women, who are already the backbone of agriculture. Approximately 43% of agricultural workers worldwide are women. Agriculture and related industries employ between 75-80% of economically active rural women in India. In spite of this, only about 13% of Indian landholdings are run by women. Their full potential is still not realized owing to limited access to land, loans, extension services, and digital tools. Research indicates that reducing this gender disparity in access to productive resources could result in a 20–30% increase in farm yields and a 150 million reduction in world hunger. By 2050, agriculture will need to be resource-efficient, climate-smart, and accurate. The resource management techniques that women utilize on a daily basis in homes and farms are reflected in precision farming—the right input, at right time, and in right quantity. Drones, agri-tech projects, and AI-based advisories can empower women digitally so they can manage automation, lead data-driven decision-making, protect biodiversity, and create value chains that are sensitive to nutrition. Therefore, investing in women is not only an issue of equity but also a strategic imperative for building inclusive, resilient, and sustainable agri-food systems that can feed the future.

Second position

Keerthana Nayak N

University of Agricultural Sciences, Bengaluru, Karnataka, India

Title: Women-From Invisible Backbone to Institutional Leadership

By 2050, agri-food systems will face climate volatility, population growth, and rising nutrition demands. In such a high-pressure future, inefficiency will be unaffordable. Women already form the backbone of today’s food systems contributing extensively to farm labour, seed conservation, livestock care, food processing, and household nutrition management. Yet their authority remains disproportionately low compared to their responsibility. This mismatch is not merely a social concern; it is a structural design flaw. When women lack secure land rights, equal access to credit, technology, and governance platforms, productivity losses and weaker climate adaptation follow. Youth perspectives therefore frame women’s empowerment not as symbolic inclusion, but as system optimisation. Three structural transitions are critical for 2050. First, gender-disaggregated data must guide policies so that women’s contributions



become visible and measurable. Second, agriculture must expand beyond subsistence to include processing, value addition, and entrepreneurship, enabling resilient livelihoods. Third, women must move from being scheme beneficiaries to institutional decision-makers through representation, joint land ownership, and leadership in producer organisations. Agri-food systems connect farms, families, markets, and governance. Women already stand at the centre of each link. Institutionalising their leadership is not charity it is strategic necessity. The resilience of 2050 will depend on whether food systems are built on equity, efficiency, and shared authority.

Pre-Conference Event III: National Agricultural Research, Education and Extension System HEIs Students Elocution Contest

Theme: “Agri-Food Systems of 2050- Youth Perspectives on Role of Women”

**UG Category
First position**

Divanshi Saini

ICAR- Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

Title: Women-Led Agrifood Systems- Powering Sustainable India 2050

With the global population projected to reach 9.7 billion by 2050 and India approaching 1.66 billion, challenges such as climate change, water scarcity, and unequal food access demand urgent transformation of agrifood systems. Women, who contribute nearly 70% of rural farming activities, remain underrepresented in decision-making despite their immense potential. Studies suggest that equal access to resources could significantly reduce global hunger. As agrifood systems become technology-driven by 2050, women must be equipped with professional training in AI-based farming, agritech entrepreneurship, fintech tools, digital marketing, and financial literacy. Encouraging trends such as rising female enrollment in veterinary and agricultural sciences indicate that the future of agriculture will increasingly be shaped by women. Women are natural custodians of biodiversity and leaders in sustainable practices, from climate-resilient cropping to water management and organic farming. By breaking gender stereotypes, strengthening digital literacy, and promoting women in research and policymaking, India can shift from women’s development to women-led development. This transformation is not merely about equality it is smart economics and a crucial step toward building a resilient and Viksit Bharat.

Second position

Isha Shreyasi

Bihar Veterinary College, Bihar Animal Sciences University (BASU), Patna, Bihar, India

Title: Empowering Women for Resilient and Food-Secure Futures

The global agri-food system today extends beyond crop production to livestock, fisheries, processing, markets, and circular waste economies. As the world’s population is projected to rise from 8.3 billion to nearly 10 billion by 2050, food production must increase by 60–70% under intensifying climate stress. Achieving this transformation requires recognizing women as central economic actors. Women constitute nearly 48% of the agricultural workforce in many low-income economies and contribute significantly to allied sectors. In India, animal husbandry accounts for approximately 30% of agricultural output, with women performing nearly 70% of livestock-related labor. Despite this, they face structural constraints—limited land ownership, restricted access to credit and technology, unpaid care burdens resulting in time poverty, and heightened climate vulnerability. Evidence indicates that closing gender gaps in agriculture could increase productivity by up to 20%, raise overall agricultural output by 4%, boost GDP by around 1%, and reduce food insecurity for up to 45 million people. Livestock-based empowerment, circular waste models such as the GOBARdhan initiative, cooperative frameworks like the Amul dairy model, and enhanced participation in fisheries illustrate scalable pathways for inclusive growth. Empowering women across the agri-food system is not a welfare intervention; it is a strategic imperative for economic resilience, climate adaptation, and global food security.

Pre-Conference Event IV: Innovative Entrepreneur Speakers

Successful Start-up and innovative women/farmer

Smt. Bharti Bhoria

Precision Vertical Farming Pioneer (Himachal Pradesh)

Smt. Bharti Bhoria is a progressive agripreneur from Kangra district with strong academic credentials and experience in research and consultancy. Managing 3 hectares of irrigated land, she has developed a soil-based precision vertical farming system integrated with IoT-enabled automation, real-time environmental monitoring, and modular infrastructure tailored for small and marginal farmers in hill regions.

Her farming model emphasizes diversification and high-value crop production, including vegetables, berries (strawberry and blueberry), kiwi, specialty herbs such as stevia, rosemary, and oregano, turmeric processing, and Kangra tea cultivation. By combining automation with organic and sustainable cultivation practices, she has achieved nearly 75% reduction in operational costs and approximately 20% increase in productivity. Her vertical farming system utilizes only about 10% of land and water compared to conventional farming methods, significantly conserving natural resources while reducing chemical runoff and carbon footprint.

Her enterprise, “Hill Sprouts,” demonstrates strong economic viability and scalability. The turnover has increased from ₹8.9 lakh in 2022 to ₹45 lakh in 2024–25, with projected revenue of ₹80 lakh in 2025–26. Beyond financial growth, her work has generated direct and indirect employment opportunities and strengthened rural livelihoods. She has trained over 540 farmers, promoting knowledge transfer in precision agriculture, protected cultivation, and resource-efficient farming systems.

Smt. Bhoria’s model presents a replicable framework for climate-resilient agriculture in ecologically sensitive hill regions. Her future plans include scaling satellite vertical farming units, integrating AI-driven decision-support systems, strengthening direct-to-consumer marketing channels, and establishing a research and training hub for sustainable agri-technologies. Her work exemplifies technology-driven agricultural transformation with measurable economic, social, and environmental impact.

Dr. Pooja Gaur

Market-Led Cooperative Farming Innovator (Uttarakhand)

Dr. Pooja Gaur, a PhD-qualified professional, transitioned from a career in the IT sector to lead grassroots agricultural transformation in the high-altitude tribal region of Jaunsar, Dehradun. Managing 10 hectares of irrigated land, she has developed an integrated farming system combining maize, diversified horticulture, aromatic crops, and dairy, creating a resilient and income-diversified agricultural model suited to mountain ecosystems.

Her flagship innovation, “Market on Wheels,” is a mobile aggregation and marketing platform designed to overcome market access constraints faced by hill farmers. Operating through a hub-and-spoke cooperative model supported by a 4,000 sq. ft. warehouse facility, the system aggregates produce from scattered villages, ensures grading and scientific storage, and facilitates direct linkage with organized buyers. This intervention has reduced post-harvest losses, improved price realization, and strengthened value chain efficiency.

The initiative has generated approximately ₹90 lakh in revenue for local farmers. In 2025 alone, collective vegetable marketing surpassed 607 metric tonnes of tomato and 244 metric tonnes of capsicum, demonstrating scalability

and strong market integration. Dr. Gaur actively works with around 4,600 women through Self-Help Groups and supports over 1,500 farmers, enhancing financial literacy, income stability, and collective bargaining capacity.

Her approach integrates precision irrigation, rainwater harvesting, crop rotation, and organic waste recycling, promoting ecological sustainability in fragile mountain regions. Recognized through multiple state and national awards, her vision focuses on expanding cooperative aggregation systems to other tribal areas, integrating solar and smart technologies, and building a climate-resilient, women-led mountain agricultural economy.

Dr. Himani Kaushik

Co-founder Director, Compute Genomics Pvt. Ltd.

Agriculture is increasingly affected by climate stress such as heat, drought, salinity and emerging pests and diseases, making crop productivity unpredictable and threatening farmer income stability. While modern genomics offers powerful tools to understand the genetic blueprint of crops and livestock, converting the vast volumes of genomic data into actionable breeding insights remains complex and time-consuming. Agricultural research institutions, breeding programs, seed companies and livestock genetics programs often struggle with fragmented analysis tools, dependence on specialized bioinformatics expertise and outsourcing, which slows research progress. As a result, improved crop varieties and superior animal lines take longer to reach farmers. To address this challenge, **SMART-One™**, an innovative NGS analysis technology platform, has been developed to convert complex sequencing outputs into decision-ready genomic insights for crop and livestock improvement programs. The platform provides a biologist-friendly interface that generates standardized outputs such as sample quality dashboards, curated variant and marker lists, identification of trait-linked genomic regions and diversity analysis across breeding lines. By simplifying genomic data analysis without requiring heavy computational infrastructure and maintaining data sovereignty, SMART-One™ accelerates genomic discovery and breeding decisions. Faster genomic insights can strengthen breeding pipelines, enabling improved crop varieties and livestock lines to reach farmers sooner, ultimately supporting higher productivity, climate resilience and more stable farm incomes.

GLOBAL CONFERENCE ON WOMEN IN AGRI-FOOD SYSTEMS (GCWAS-2026)

March 12-14, 2026



Global Conference on Women in Agri-Food Systems (GCWAS-2026)

Conference Secretariat
Trust for Advancement of Agricultural Sciences (TAAS)
and
ICAR-Indian Agricultural Research Institute (IARI)
Pusa Campus, New Delhi 110 012, INDIA
Cell: +91-8130111237
Email: taasiari@gmail.com; gcwas2026@gmail.com
Website: www.gcwas.taas.in

