



Annual Report 2011-12

कृषिरत महिला अनुसंधान निदेशालय
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2011-12



Directorate of Research on Women in Agriculture
(Indian Council of Agricultural Research)
Bhubaneswar



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Director, Directorate of Research on Women in Agriculture,
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Preface



For DRWA the XI Plan concluded with two landmark events including the first Global Conference on Women in Agriculture and a National Consultation on Gender Perspective in Agriculture. The GCWA deliberated on themes including women empowerment, drudgery reduction, linking women to markets, nutrition security, access to resources, policies and services and climate change and also policy fora on research education and extension. The Conference provided an opportunity to DRWA to be known at global level for the concept and approaches in research on women in agriculture. The National Consultation recognized the role of DRWA in the overall development of agriculture and suggested further strengthening of the institution. The subject Home Science has great social relevance and scientific and developmental orientation. Therefore, the National Consultation stressed the need to factor home science into the macro-level programmes such as RKVY, NHM and NFSM. These schemes should make provisions to employ home science graduates in suitable capacities so that sustainability of farm-home continuum is achieved.

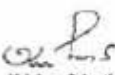
The network projects undertaken by DRWA with the partnership of 26 institutions including ICAR institutes and agricultural universities yielded approaches and methodologies such as expert system for agriculture and animal husbandry validated with the participation of farmwomen and other stakeholders, public-private partnership in crop production, market linkages, sustainable agriculture, refined horticultural practices for farmwomen, improving a nutrition in rice based farming systems and capacity building of coastal fisherwomen supported with infrastructure for hygienic production of dry fish in six locations of the country. The Gender Information System under DRWA was strengthened with primary and secondary data on areas including gender related publications in selected journals and gender related Ph.D and M.Sc dissertations in agriculture universities and gender issues in labour and migration. Capacity building and migration. Capacity building programmes were undertaken in gender sensitization, gender mainstreaming and technological empowerment.

Under the AICRP on Home Science gender disaggregated data of about 10,000 farm families were collected, compiled and processed which threw light on the roles, responsibilities, access to and control over resources from 56 agro-climatic zones which is a sizeable contribution. The AICRP continued to work on food and nutritional aspects, development of life skills among rural youth and children, utilization of degradable and non-degradable farm waste, drudgery reducing technologies and occupational health hazards. Gender friendly technologies such as improved model of briquette stove, ergonomically designed weaving chair, rotary oscillating disk for bead string making, bamboo strip smoothening tool for bamboo handicraft and ergonomically designed tailoring table were developed.

I am grateful to Dr S. Ayyappa, Secretary (DARE) & Director General (ICAR) for his deep concern in the development of the Directorate and highlighting the institution at the Global level. I thank Dr K.D. Kokate, Deputy Director General (Agricultural Extension) for the day-to-day guidance and support in carrying out the mandated activities of the Directorate.

I appreciate the members of the Editorial Board for their hard work in bringing out the DRWA Annual Report 2011-12.

Bhubaneswar
14 July 2012


Krishna Srinath
Director
Directorate of Research on Women in Agriculture



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Global Conference on Women in Agriculture



The first ever Global Conference on Women in Agriculture (GCWA) was jointly organized by the Indian Council of Agricultural Research (ICAR) and Asia Pacific Association of Agricultural Research Institutions (APAAARI) with the support of the World Bank, GFAR, UK-Aid, CGIAR, TAAS, USAID, ADB, Australian Government, ACIAR, IDRC-Canada and RAGA on 13-15, March, 2012 at the NASC Complex. About 450 delegates including researchers, academicians, research and development manager, experts and women innovators from more than 50 foreign countries representing national and international organizations attended the three-day Global Conference.

Smt. Pratibha Devisingh Patil, Her Excellency the President of India while delivering valedictory address emphasized the need to empower women with new knowledge and skills to bring women into the mainstream of agricultural development and reduce gender disparity. Today, much of the scientific knowledge and technologies does not reach rural women for various reasons. This needs rectification. Research systems must also seek the inputs of women, as they have historically been the source of much traditional knowledge and innovations at the grassroots level, she said. While appreciating the efforts of the National Agricultural Research System for bringing women in the fore front of agricultural research and development, President of India suggested forming of *Mahila Kisan Mandals* in every village

to educate women on different aspects of agriculture and related activities. She further put emphasis on tapping of potential of rainfed and dry land farming and role of women in water management. Excellency hoped that the outcomes of this Conference would contribute to enhancing agricultural production, and in bringing a transformation in the lives of women engaged in the sector. She also conferred three best poster award and two best exhibition stall award to participating women delegates and released publications brought out on the occasion.

Innovative Market Place cum Exhibition was also organized to showcase the technological interventions in the field of agriculture by various organizations which was visited and appreciated by the Smt. Pratibha Devisingh Patil Her Excellency President of India and Sri Sharad Pawar Hon'ble Union Minister for Agriculture and Food Processing Industries. Sri Sharad Pawar, expressed satisfaction over the increasing participation of women in agriculture but was concerned that only 11 per cent women have access to land holdings, that too, mostly as small and marginal farmers. He opined that assertive interventions by the various governments are required to ensure that more and more women get access to the land holdings. 'A Gender in Agriculture Platform for Gender in Agriculture Partnership (GAP)' is required to be set up with hubs in different countries to work in



this direction. He further told that the ICAR should take lead and address gender concerns through such a platform. He appreciated the role of ICAR in technological empowerment of women in agriculture which has enabled the policy makers to take high level policy initiatives in this sector. The research efforts at the ICAR Institutes have focused on relieving women's drudgery in agriculture by providing time and labour saving tools. Vocational trainings are also being conducted, to impart skills to undertake different vocations. In extension activities the women is now the centre point and activities are being planned keeping her in view.

The mega event was inaugurated by Smt. Shiela Dixit, Hon'ble Chief Minister, Delhi. In her inaugural address she highlighted the role of women in agriculture and said that there is a need to revisit and redesign agriculture education, research and extension policies and programmes. She appreciated women centered Self-Help Groups and put emphasis on harnessing potential of the SHGs by channelizing all agricultural support services such as training, extension, information, credit, inputs, marketing etc. She told that women development must be viewed as part of the development of the total community, and it must be provided with adequate resources at all levels. Smt. Margaret Alva Her Excellency, the Governor of Uttarakhand, felt the need of specially focused capacity building programmes for women in agriculture that may be initiated to refine skills with appropriate technologies. Agricultural tools and machines should be ergonomically designed to reduce drudgery of farm women and they should be empowered with farm knowledge through distance education, community radio and other effective means, she added. She suggested that women should be acknowledged as the core food producers and processors and banks should recognize them as entrepreneurs. She said that this global conference is a forum that can set the tone for change by empowering women for inclusive growth in agriculture.

Prof. M. S. Swaminathan, noted Agriculturist said that there is need for in-depth analysis of the problems related with farm women and their urgent solution through appropriate action. Suitable technologies must be delivered to the farm women for change and empowerment, he added. He suggested a special fund at national level to address gender specific issues. Prof. Monty Jones, Chair, Global Forum on Agricultural Research emphasized the need of gender equality in agriculture to bridge the prevailing gender gap. He said that gender equality is on global agenda and we need to design a gender policy for empowering women in agriculture as a means towards improving the livelihoods for all.

Dr R.S. Paroda, Executive Secretary, APPARI and Co-Chair, International Organizing Committee elaborated on the theme, objective and agenda of the conference which has the overarching goal of 'Empowering Women for Inclusive Growth in Agriculture'. He suggested sequential approach starting from empowerment of farm women, attaining inclusive growth and achieving sustainable development in agriculture. He said that there is a need to build a network of global initiatives to address gender issues. He presented the glimpse of synthesis report based on the deliberations in the valedictory function of the Conference. He elaborated upon the five action points for full empowerment of women in agriculture which include enhanced

visibility for role of women, generation of knowledge and evidence for support and contextualization of global issues to suit local needs. More policy support and institutional mechanisms are required to achieve desired results. He said that collective action for empowerment of women is required so that they come together on a single platform to march further. He informed the house that second GCWA will be held in 2015 in Africa.

Dr S. Ayyappan, Secretary, DARE and Director General, ICAR and Chair-IOC welcomed the guests, dignitaries and participants and elaborated upon the important role of women in agriculture and allied professions. He also highlighted initiatives of the ICAR for women in agriculture. He hoped that the output of this Conference will be instrumental for all stakeholders to design and implement the suitable action plan in the years to come. While elaborating upon key initiatives of the ICAR for empowerment of women in agriculture, he informed that 36 per cent girl students are studying in various courses of State Agricultural Universities. Women have made a difference in agriculture and the time has now come that agriculture should make a difference in the lives of women, he added.

Dr K. D. Kokate, Chair, National Organizing Committee proposed vote of thanks in the inaugural and valedictory sessions of the conference and expressed his gratitude to esteemed guests and dignitaries for gracing the occasion.

Dr Krishna Srinath, Director, DRWA and Organizing Secretary, GCWA, who was a speaker in the session on Assessing Women's Empowerment in Agriculture, highlighted the pioneering role of ICAR in institutionalizing gender research in agriculture and the contribution of DRWA in technological empowerment of farm women. The conference deliberated at length under different technical sessions and come out with following key issues.

- There is a need to provide information and evidence through disaggregated data and convincing evidence on specific needs of farm women.
- There is urgency for developing collective action and leadership at various levels so as to ensure enabling environment for improved, efficient and higher productivity.
- Establishing rights to land ownership, equal pay/wages, access to credit, technology, knowledge, ICT, markets, services, etc. would enable inclusive growth and development in rural India.
- Appropriate institutional mechanism is required to have effective mechanism of coordination and convergence between institutions at the national, regional and global levels.

At the end, the conference decided to have a way forward and in the context of continuity, it was decided that the Global Conference on Women in Agriculture will be organized once in three years and facilitated by different regional fora. Dr. Krishna Srinath, Director, DRWA was the Organizing Secretary of the Global Conference and in her lecture she highlighted the importance of gender mainstreaming in agriculture development.





Smt. Pratibha Devi Singh Patil,
the President of India



Sri Sharad Pawar,
Union Minister for Agriculture and Food Processing Industries.



Smt. Shiela Dixit,
Chief Minister, Delhi



Prof. M. S. Swaminathan,
Chairman, M.S. Swaminathan Research Foundation



Dr R.S. Paroo,
Executive Secretary, APPRI



Dr S. Ayyappa,
Secretary, DARE and Director General, ICAR



Dr K.D. Kolate,
DOG, Agricultural Extension



Dr Krishna Srinath,
Director, DRWA



National Consultation on Gender Perspective in Agriculture



Globally, gender mainstreaming and women empowerment are being increasingly recognized as areas of great importance in agricultural research and development. In order to understand the stakeholders' perspective on importance of gender research for agriculture and economic development in India, a two-day National Consultation on Gender Perspectives in Agriculture was organized at NASC Complex, New Delhi on 8-9 August 2011. The Consultation had six sessions- inaugural session, four technical sessions and a plenary. Deliberations under technical sessions were held on different theme areas; envisioning agricultural research in agriculture, setting research priorities for DRWA, role of Home science in changing agricultural scenario and employment opportunities in Home Science stream. The National Consultation was inaugurated by the Chief Guest Dr D.Purandeswari, Hon'ble Minister of state for HRD, Govt. of India who in her address underlined the need for revisiting all the

agricultural programmes and policies to give more prominence to women in 12th Five Year Plan and focus agricultural research on the problems faced by the women.

Dr. S. Ayyappan, Secretary, DARE & DG, ICAR welcomed the Chief Guest and the dignitaries and the delegates of the National Consultation. He gave a brief background of the national consultation and its importance in changing agricultural scenario and for XII plan. Amongst the dignitaries who spoke on the occasion were Dr R.S.Paroda, Chairman TAAS, Dr Rita Sharma, Secretary, NAC, Govt. of India, Dr Manju Sharma, former secretary DST, Dr V.V.Sadamate, Advisor Planning commission and Deputy Director-Generals of ICAR. The National Consultation brought out several recommendations to strengthen gender research in agriculture and make Home Science more competitive and job oriented.



EXECUTIVE SUMMARY

Participatory action research has been the focus in different thematic areas of DRWA programmes. The Directorate catalyzed and facilitated the R & D institutions to bring in farm women perspective in their programmes. A brief of progress made during 2011-12 under different programmes is as follows.

Study conducted to understand the pattern of migration, profile of women migrants and their livelihood conducted at four locations (slums) of Bhubaneswar under the project Visioning, policy analysis and gender revealed that the major cause of migration was the shrinking of agriculture base and diminishing livelihood activities from the dry land areas and that at the migrated site they were employed mainly construction work which involved more drudgery.

Gender work studied based on the Census India 2001 indicated that the State of Mizoram had the most equitable gender work participation scenario followed by Manipur, Nagaland and Himachal Pradesh. The pattern of publication of articles published in the Economic and Political Weekly showed that the proportion of articles on gender was found negligible and out of 140 articles published in a year, only 2 per cent articles were gender related and only 0.75 per cent of articles were on gender in agriculture.

Research on public private partnership for gender mainstreaming in agriculture was undertaken at six network Centres where existing PPP models from 22 states of India were collected and categorized the impact of models on gender mainstreaming in agriculture and analyzed the strengths and weaknesses of the models followed by action research. DRWA tested model pertaining to crop production, Avinashilingam University for Women, undertook an action research on empowering women vegetable growers for market linkage, KAU and MPUAT on entrepreneurship development, Assam Agricultural University on promoting commercial bio fertilizer and CCS Haryana Agriculture University undertaken on value addition of fruits and vegetables and in bead making.

Network project on Gender issues in rice based production system was implemented at DRWA, Bhubaneswar; CRRI, Cuttack; DRR, Hyderabad; KAU, Trissur and G.B.P.U.A.T., Pantnagar under took action research to address the important gender issues. Cropping systems were evaluated to improve availability of pulses and efficient management of irrigation and rain water, improving working efficiency and reducing work load in transplanting, nursery raising, weeding and threshing.

The storage pest management techniques were addressed by testing different locally available indigenous storage practices viz; use of Begunia leaf powder, neem leaf powder and chili powder at different doses along with standard check. It was found that the pigeon pea could be stored up to one year at 10.95 per cent damage from pulse beetle *Callosobruchus chinensis* with the use of sand and wood ash, respectively. Whereas the damage was 38.35 per cent in the control.

Identification of gaps in the management of horticulture production practices at the farmers' field and interventions including raising seedlings in portrays inside protected structures; planting on raised beds for better survival, introduction of high yielding varieties of brinjal, bitter gourd, cucumber and pumpkin; nursery raising under protected structures with 50% agro-shed net, cultivation of off-season and high value vegetables were undertaken empower farm women with gender friendly practices were taken up under network project on Assessment of gender issues identification and refinement of selected women specific technologies in horticultural crops implemented at DRWA, Bhubaneswar, CISH, Lucknow, CIPHET, Abohar, CITH, Mukteswar, CTCRI, Thiruvananthapuram and IIHR, Bangalore.

In view of the constraints in the availability of planting material of pointed gourd p rotocol for tissue culture was developed using nodal portion of gourd vine as explants. Sterilized explants were cultured on solidified MS medium supplemented with various combinations of Kinetin (2 to 10 mg/l) with and without NAA. In vitro rooting was optimized with 0.4 mg/l NAA which gave the highest per cent of root initiation and number of roots. Sterilized explants of pine apple were cultured on solidified MS medium supplemented with various combinations of BAP (2.5 to 10.0 mg/l) and NAA (1 to 4 mg/l) hormones. The best initial micro-shoot response was obtained when the explants were cultured on the medium containing BAP 2.5 mg/l and NAA 1.0 mg/l.

Trials conducted on various organic farming practices revealed that seed treatment with *Rhizobium culture* @ 20g/kg seed of cowpea and application of *Trichoderma viride* @ 5 kg/ha mixed with 50 kg of FYM and applied at the time of transplanting increased the yield (green pods) by 15 per cent.

In the mango based cropping model maximum estimated net return of 32260/ha with B: C ratio of 2.24 was obtained in mango+ cowpea intercropping. Mulching with black polythene in mango cv Mallika and Amrapali showed better response to high moisture content in the soil near the feeding root zone compared to farm based materials. In the custard apple maximum number of flower/b Twig, fruit set and canopy volume was recorded in plants pruned with 50% intensity.

Action research on enhancing livelihood of rural women through livestock production involving goats, pigs, backyard poultry and area specific mineral mixture at different network centres led to enhancing the skills and livelihoods of farm women with and income of



Rs 10,000-12000 per year from a unit of five adult female and one male goat Similarly and Rs 7000 per animal per year from pigs. For reducing drudgery revolving stool (*pirhi*) for milking animals was introduced. There was a general lack of awareness regarding use of chaff cutter and feeding trough for feeding the animals which resulted in loss of animal feed.

For capacity building of coastal fisherwomen in post harvest technologies in fisheries with the financial support from NFDB, six demonstration units were constructed at each network centre to demonstrate the hygienic production of dry fish to fisherwomen. The protocol for drying of fish was developed and a low cost drying rack was designed and fabricated for hygienic drying of fish and fisherwomen were trained in the improved drying method.

Television and radio continued to be the main source of communication for farmwomen and mobile phones was gaining popularity among them suggesting the need to strengthen these media for information communication to farm women.

Anthropometric measurements of men and women in the rice based farming systems in Madhya Pradesh revealed highest gender gap in rice-rice cropping system due to less choice of food stuff followed by rice-millet whereas rice-wheat cropping system showed no gap. Hemoglobin estimates showed wider gap in the rice-rice cropping system of Odisha whereas, negligible gap was recorded in rice-millet cropping pattern in Uttarakhand.

Study conducted on occupational health hazards of farm women revealed that a farm woman, spent on average, 11.6 h per day for various activities including house hold, farm and animal rearing. One of the major hazards faced by farm women in the cooking activity was accumulation of smoke generated by burning of bio-mass fuel in un-ventilated and less illuminated workplace. Hazard faced by farm women in the farm related activities were identified and occupational health hazard and stress indices were developed and refinement in the workplace suggested.

The focus of the AICRP on Home Science was in on development of gender specific database and training modules for farm women, technology interventions for drudgery reduction in agriculture, nutritional security and health promotion of farm families, promoting vocational skills among adolescent girls, value addition to under-utilized natural fiber resources, utilization of degradable and non-degradable farm waste and empowerment of rural women. To study the gender participation in agriculture data pertaining to 8875 households from 46 agro-climatic zones were analyzed through selected indicators. For economic empowerment of women, nine training modules were developed for establishment of micro-enterprises. In the areas of drudgery reduction in agriculture 19 technologies were field validated and trainings/demonstrations were imparted to the women of self help groups. To combat micro nutrient deficiencies among rural families 510 nutrition gardens were established in *rabi* and *kharif* season. For promotion of vocational skills among adolescent girls and young mothers, needs were identified and 55 skill oriented training programmes were organized for 1351 adolescent girls/mothers and Anganwadi workers. Underutilized local available fibers were selected to produce value added products for income generation and disseminated to farmwomen in adopted villages for economic empowerment of farmwomen. Protective garments were designed and developed to protect farmwomen from the health hazards faced by them during pesticide application.

The DRWA coordinated and actively participated in two major events including the Global Conference on Women in Agriculture held on 13-15, March, 2012 and National Consultation on Gender Perspective in Agriculture held on 8-9, August 2011 at NASC Complex, New Delhi. The 12th meeting of Research Advisory Committee, 11th and the 12th meetings of Institute Research Council were held as scheduled. Media Meet, National Workshop on Gender Dimensions To Manpower Planning In Agriculture, Hindi Chetna Mas, Consultation on



INTRODUCTION

Brief history

On the recommendation of the Working Group on Agricultural Research and Education constituted by the Planning Commission for the formulation of the Eighth Five Year Plan (1992-97), National Research Centre for Women in Agriculture was established at Bhubaneswar with a sub-centre located at the campus of CIAE, Bhopal in 1996. Further, the Institute was upgraded to the Directorate of Research on Women in Agriculture during XI Plan. Since its inception, DRWA has been in the forefront undertaking research on issues affecting women and the opportunities in agriculture. It has focused on participatory action research in different technology based theme areas involving rural women to test suitability of technologies for women and suggest for their refinement. The Directorate is also working to catalyze and facilitates R & D institutions to bring in farm women perspectives in their programmes.

Mandate

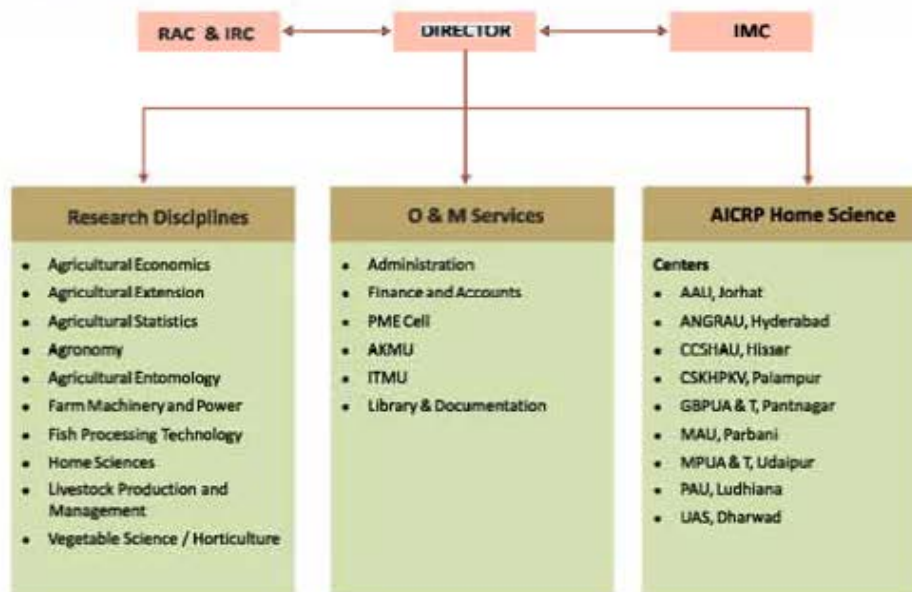
Carry out basic, strategic and applied research to identify gender issues and test appropriateness of available farm-technologies/ programmes/ policies with women perspective; undertake

training and consultancy for promoting gender mainstreaming in research and extension for empowerment of farmwomen and capacity building of scientists, planners and policy makers to respond to the needs of the farm women.

Objectives

1. Undertake studies to assess farm technologies, programmes, institutions and policies with gender perspective
2. Characterize the farmwomen and their farming environment and study their roles in different agro-ecological and production/ farming systems,
3. Identify and understand drudgery related issues and other constraints among farmwomen for increasing work efficiency
4. Develop gender focused S & T based innovations for livelihood security
5. Create and maintain a database on gender in agriculture to meet information needs of stakeholders
6. Capacity building of R & D professionals for addressing gender issues in agriculture
7. Documentation and dissemination of gender based knowledge among stakeholders

Organogram of DRWA



Budget & expenditure of DRWA for the year 2011-12

(Rs in lakhs)

S. no.	Head of A/C	Plan			Non-Plan		
		BE	RE	Exp.	BE	RE	Exp.
A. Recurring							
1	Establishment Charges	7.5	12	11.28	206.0	229.00	216.68
2	OTA	0.00	0.00	0.00	0.00	0.00	0.00
3	TA	9	9	8.94	1	5.00	4.95
4	Contingency	34.13	170.88	141.02	23.00	23.82	23.81
5	H.R.D.	8	8	7.96			
6	Minor Works				5	5.81	5.82
Sub Total (A)		58.63	199.88	169.2	0.00	320.24	305.82
B. Non-Recurring							
7	Equipment	67.42	83.42	11.42	1.00	3.00	3.00
8	Furniture / others	4.71	4.71	4.71	0.00	0.00	0.00
9	Works	12.14	12.14	80.58	0.00	0.00	0.00
10	Library	15.42	15.42	6	0.00	0.00	0.00
11	Minor Works	0.00	0.00	0.00	0.00	5.00	4.99
Sub Total (B)		99.69	115.69	102.71	0.00	8.00	7.99
Grand Total (A) + (B)		158.32	315.57	271.91	0.00	328.24	313.81

AICRP on Home Science

(Rs in lakhs)

S. no.	Head	BE	RE	Exp.
1	Establishment Charges	1398.90	1108.56	1107.98
2	TA	28.15	28.15	28.10
3	Recurring Contingencies	158.19	158.19	158.05
4	Non-recurring Contingencies	0.00	0.00	0.00
5	Sub Total	1585.24	1294.90	1294.13
6	Grand Total	1743.56	1610.47	1566.04

Cadre Strength

Category	Sanctioned	Filled	Vacant
Director	01	01	00
Scientific	20	16	04
Technical	13	06	07
Administrative	11	08	03
Supporting	01	01	00
Total	46	32	14

Scientific staff (Existing and sanctioned as per revised cadre strength)

S.no.	Discipline	Scientist		Sr. Scientist		Pr. Scientist	
		Sanctioned	Existing	Sanctioned	Existing	Sanctioned	Existing
1.	Agricultural Economics	0	1	1	0	0	0
2.	Agricultural Entomology	0	0	1	1	0	0
3.	Agricultural Extension	1	0	2	1	1	1
4.	Agricultural Statistics	0	0	1	0	0	0
5.	Agronomy	0	0	0	0	1	1
6.	Farm Machinery & Power	2	0	1	1	0	0
7.	Fish Processing Technology	0	1	1	0	0	0
8.	Home Science	2	2	2	1	1	1
9.	Livestock Production Management	0	0	0	0	1	1
10.	Vegetable Science/ Horticulture	1	2	0	1	1	1
Total		6	6	9	5	5	5

*Two scientists are additional as per revised cadre strength

Technical staff

S. no.	Category	Sanctioned	Existing
1.	T-6	1	0
2.	T-3	11	5
3.	T-1	1	1
TOTAL		13	6

Administrative staff including supporting

Designation	Sanctioned	Existing
Administrative Officer	1	1
Asstt. Administrative Officer	1	1
Asstt. Finance and Accounts Officer / Junior Accounts Officer	1	1
Private Secretary	1	1
Personal Assistant	1	1
Assistant	2	1
Senior Clerk	1	0
Stenographer, Gr-II	1	1
Junior Clerk	2	1
S.S.S. I	1	1
Total	12	9



RESEARCH ACHIEVEMENTS

Visioning, policy analysis and gender

Krishna Srinath, H.K.Dash, K.Ponnusamy

Labour migration, agriculture and gender issues

Migration is a universal phenomenon and has gender implications too. Considering the significance of migration in the life and livelihood of people, a study was conducted at four locations (slums) of Bhubaneswar to understand the pattern of migration, profile of women migrants and their livelihood. The study revealed that women migrant labourers mainly originated from five districts viz. Ganjam, Nayagarh, Cuttack, Khurda and Balangir. Findings indicated that Ganjam district contributing 64 per cent of the total women migrants followed by Nayagarh (22%), Cuttack (8%), Khurda (4%) and Balangir districts. About half (50%) of the migrants permanently shifted to the city along with their family, while the other half had some members left behind in the villages.

Occupational profile of women labour migrants indicated that 92 per cent were engaged as wage labourers in construction sector. About 51.5 per cent of women migrants had their male counterparts engaged as wage labourers in construction sector. 22 per cent had their male counterparts engaged as mason, stone cutter, shopkeeper, rickshaw or trolley puller etc. An estimated 48 per cent of women migrants went back to their villages during the lean months in Bhubaneswar (rainy and autumn season) that coincided with important agricultural seasons in their places of origin. About 32 per cent of total migrant women labourers in Bhubaneswar went back to their native places during rainy and autumn season for wage labour in agriculture, particularly in rice and vegetable farming in their own localities, while about 12 per cent for farming either in their own land that varied between 1 and 2 acres. This suggests that the phenomenon of circular migration exists which is an important livelihood diversification strategy.

An analysis of the reasons of migration suggests that non-availability of job opportunities for most part of the year and low wages were the two factors that created conditions for migration. But there were some immediate factors that triggered the migration of women and their family members. About 34 per cent of the migrant labour families reported family disputes as an immediate factor for migrating to Bhubaneswar, while 30 per cent and 22 per cent of women reported natural calamities and debt burden as the factors that led to their migration. Study of migration profile of the respondents revealed a sharp increase in number of migrants during last decade. Analysis suggests that 52 per cent of total women labour migrants came during 2000 and 2010 while 40 per cent came during 1990s.

The study identified farm level constraints that have abetted migration and problems including gender issues in the place of destination. Women were found suffering from drudgery and health hazards in their occupation and poor nutrition and social security despite increase in income in the place of destination. The incidence of women headed families was high at 12 per cent.

Gender work participation disparity across Indian states and regions of the world

A study on changes in gender work participation scenario in India and in the world was conducted using census India and FAO data. The study aimed to assess changing structure of gender work participation in India and across countries and regions of the world and map the changes in gender gap in work participation. In this study, Gender Work Participation Disparity Index (GWPI) was developed using both male and female work participation rate to compare the states according to level and difference in male and female work participation rate. The value of GWPI varies between 0 and 1. The greater the index value, more is the disparity in gender work participation, and lower value indicates more equitable gender work participation.



Based on the values the states and regions were grouped into low (upto 0.15), moderate 0.15-0.299 and high (0.30 and above) gender work participation disparity category. Based on the values of the index for different states calculated based on census India 2001 data, Mizoram with value 0.093 had the most equitable gender work participation scenario followed by Manipur (0.094), Nagaland (0.10) and HP (0.11). States with high gender work participation disparity include UP, Bihar, Punjab, Kerala, West Bengal and Odisha. The GWPI value for India was 0.397 in 1991 and 0.338 in 2001. The results indicate that the work participation gap between men and women has narrowed down.

GWPI values for the world as a whole, different regions and countries were computed to understand the changing gender work participation scenario. The value for the world as a whole that was 0.232 in 1980 came down to 0.182 in 2010 indicating considerable reduction in gender work participation disparity. The GWPI values for Africa (0.174), Southern Asia (0.384), South Eastern Asia (0.172), West Asia (0.464) Europe (0.106),

Northern (0.088) and Southern America (0.140) in 2010 suggest that Europe, Northern and Southern America are some of the regions with low gender work participation disparity, while Africa, Southern Asia, South Eastern Asia and West Asia have high gender work participation disparity.

Development of gender information system in agriculture

H.K.Dash and Sabita Mishra

Gender reference system which is a database on studies and references from various sources has been further strengthened during the year. The reference system would cater three types of information; (1) Only references that would help researcher with title, source and year of publication, (2) References with available abstract on the study, (3) References with full paper. 400 additional references have collected during the year taking total references to 3400 and 200 have been added to reference system. Through online access to digital library of EPW, articles in various issues of EPW published during 1991 and 2011 have been screened for gender related articles in the domain of agriculture & development.

Analysis of articles published in EPW indicated that out of an average of 140 articles published in year, only 2 per cent articles are gender related and 0.75 per cent of articles are on gender in agriculture and development. Thus the proportion of gender based articles is really insignificant given the total coverage of articles in EPW. The issue calls for more attention in terms of greater focus on gender based studies.

Av. no. of articles published in a year	1480
Av. no. of gender related articles per year	31
Av. no. of gender related articles in agriculture & Development	11

Network project on public private partnership for gender mainstreaming in agriculture

Krishna Srinath, K. Ponnusamy and Sabita Mishra

The project is in operation at Directorate of Research on Women in Agriculture, Kerala Agricultural University, CCS Haryana Agriculture University, Avinashilingam Deemed University for Women, Assam Agriculture University and Maharana Pratap University of Agriculture and Technology. Network partners collected existing PPP models from 22 states of India and categorized the impact of models on gender mainstreaming in agriculture. Each network partner undertook detailed investigation of five available PPP models and analysed the strengths and weaknesses of the models followed by action research project for demonstrating the effectiveness of PPP model for gender mainstreaming on a identified farm commodity.

DRWA, Bhubaneswar

Gender mainstreaming in crop production

DRWA Bhubaneswar designed and implemented a PPP model for gender mainstreaming in agriculture through cultivation of

quality protein maize (OPM) in 2011-12 by involving both public and private agencies. A stakeholder meeting was organized on November 2010 at DRWA to work out a plan for implementing the project. Bantla village of Khurda district in Odisha was selected for implementing the project targeting the poor tribal farm households in a fragile agro-eco system.



Farm women under going training on the operation of chaf cutter

Roles and responsibilities of public and private agencies in PPP

DRWA undertook the planning, implementation and monitoring the project and capacity building of farm women. APICOL, ATMA and Dept. of Agriculture, Govt. of Odisha facilitated provision of fund under ISOPAM scheme. Bantla Maize producers group cultivated the maize as per the technical guidance and earned a remunerative price for their produce.

Process of building partnership

DRWA scientists held several rounds of meeting with both men and women farmers and farm women of Bantla village during April and May 2011 for sensitizing them on importance of group dynamics and economic benefits of Quality Protein Maize (OPM) cultivation. A maize producers group was formed through participatory process by electing a woman as president and man as secretary. During the interactions, villagers informed about unsold stock of maize of previous season.

Later a Memorandum of Understanding (MoU) was signed by the participating agencies specifying terms and conditions and roles and responsibilities for each partner. Department of Agriculture, Government of Odisha transferred Rs. 1,20,000/- to DRWA for procuring and supplying quality input under ISOPAM Scheme.



The QPM seed of 250 kg was procured from a reputed agency to ensure the seed quality. Before sowing, soil test was conducted and results were communicated to all farmers. A pre-season Kharif training was organized in August 2011 for 50 farm men and women in the selected village. The farm implements such as seed cum fertilizer drill, improved sickle, maize sheller and chaff cutter are provided in order to reduce the drudgery of farmwomen in maize cultivation and effective use of the biomass as fodder. A field day was organized in October 2011 at the project site with the participation of project partners. Farm women could sell the harvested maize to a local poultry farm @ Rs. 10.80/kg which is more than the price of Minimum Support Price (MSP) of Rs. 9.80/kg offered by government during 2011-2012 as against the MSP offered by the project partner. The private partner originally associated with the project delayed the procurement and hence the farm women preferred to sell for the trader who had shown interest to procure the produce at a higher price.

As the source of irrigation was suddenly disrupted due to a litigation and in the second phase the farming activities had to be shifted to the adjacent location.

Impact on gender mainstreaming

A preliminary assessment of the short term gains of the project activities indicated that:

- Women, though a few in number could be motivated to give leadership to the farming activities which were hitherto managed by men alone. Women voluntarily participated in various activities and shared the revenue generated through farming.
- Women could be mobilized and capacitated for implementing the package of practices of QPM maize cultivation
- The partners of the project could be sensitized to the needs and constraints involved in mainstreaming women
- Women could be familiarized with drudgery reducing tools and equipment
- The introduction of on-farm model of maize dehusker-cum-sheller developed by DRWA helped in considerably reducing the drudgery of shelling maize and get remunerative price for the produce.
- The use of the biomass as fodder generated interest among them
- Though the location of the intervention had to be shifted to the nearby village, the acceptance by the villagers was positive due to the demonstration effect in the previous location
- The constraints faced were mainly in the cut off of the water supply and procedural constraints in establishing a bore well for which the government department has initially shown interest.

Avinashilingam University for Women, Coimbatore

Empowerment for market linkages

Avinashilingam University for Women, Coimbatore undertook an action research on Empowerment for market linkage involving women vegetable growers in a PPP mode. The project was implemented in Ikkarapoluvampatti village, Thondamuthur Block of Coimbatore District. Ikkarapoluvampatti Farmwomen Marketing Society, Thondamuthur, comprising 40 vegetable growing farmwomen and M/s. Sree Annapoorna Sree Gowrishankar Group of Hotels P. Ltd, a leading enterprise in the hotel industry, was the private partner in the project. Frequent meetings and motivation trainings were conducted for the farmwomen and they established a Farmwomen Marketing Society which was registered under the Tamil Nadu Societies Registration Act, 1985.

Capacity building of farmwomen

Capacity building programme for farmwomen was undertaken on various themes such as improved agricultural practices including soil testing, drip irrigation, vermi composting, Azolla cultivation and application of micro organisms. Training was also imparted on stress management, farm based income generation, value addition and marketing management.

Supply of vegetables

A trial supply was done to design a supply model to be adopted for PPP project for testing its practical applicability. After three months of trial supply, public and private partners were satisfied with the supply and services provided; and based on the operational modalities signed an MoU. The details of vegetables supplied during the project period are given in Table 1 & Figure 1.

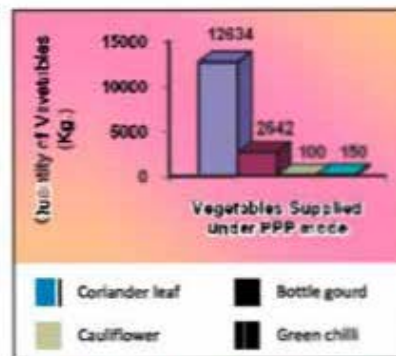


Fig. 1. Details of supply of vegetables under model PPP project

Benefits realized by farmwomen

- Participation level of the farmwomen in social activities improved due to linkages with development departments who provided technology support for production and post harvest operations



- The formation of the Society and direct dealing with the market helped to increase the confidence level of women in managing the fund flow, account keeping and savings.
- The Society made excellent profit through by direct market linkage, avoiding middlemen, collective transportation by sharing the cost and differential pricing of vegetables between procurement from producers and supplying to the partner.
- Higher price than the whole sale market could be obtained due to the good quality graded vegetables.

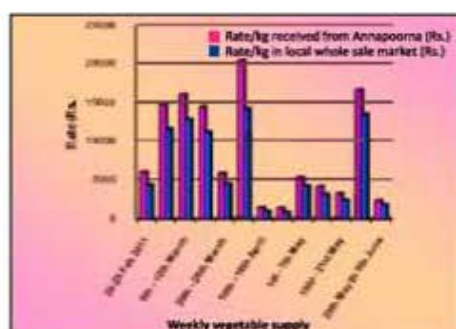


Fig. 2. Weekly supply details of vegetables with comparison of rates of Annapoorna and local wholesale market

Profit analysis using differential data on rate of vegetables in Annapoorna and local whole sale market

The difference between the rates fixed by Annapoorna Hotels and local whole sale market in a given day was recorded for profit analysis. A significant difference between the two rates was observed, which determined the profit for the farmers for the whole vegetable supply.

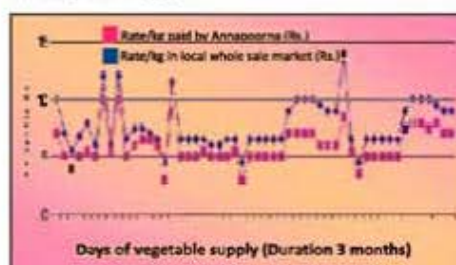


Fig. 3. Profit analysis in PPP model

Lessons learnt

- Implementing the project with the help of local governance will give more effective outcome

- Long term projects will bring a significant change in adaptation level of farm technologies
- Continuous motivations and follow up activities are very important to increase the participation of farmwomen in the project

Kerala Agricultural University, Trissur

Entrepreneurship development

Five models of PPP for women empowerment were selected and analyzed at KAU, Trissur in order to assess the gender mainstreaming efforts in these projects. The weighted score for each model was obtained by multiplying the no. of activities taken up under the model for gender mainstreaming to its coverage [Score for Coverage of PPP Block Level-1, District Level-2, State Level-3, National Level-4]. Based on the scores obtained, Cadbury-KAU Cooperative Cocoa Research Project (CCRP) with a score 28, Subicsha Coconut Produce Company Ltd for facilitating backward and forward linkages in entrepreneurship development and self employment with a score 28, Samagra Project for capacity building and skill development in Nendran Banana production and processing with a score 32, Thirumadhuram Pineapple Project for market support and buy back of agriculture products with a score 26. Sevashram for promotion of organic products with a score 26 were selected for detailed study.

Based on the qualitative data on value creation and value appropriation strategies of the selected models two categories of women entrepreneurship development (PPP) models could be identified viz. Public dominated welfare models (e.g. Samagra, Thirumadhuram) and Private dominated employment models (e.g. Subicsha, Uravu and Sevashram). The categorization was based on the identified tradeoffs in terms of the emphasis they place on value creation and value appropriation strategies.

Strength and weakness of public dominated welfare models

Strengths

Value creation using local resources was given more emphasis than the value appropriation. High level of community partnership through Panchayathi Raj institutions, farmer organizations and women self help groups helped in better resource mobilization and conflict resolutions. These partnerships had no formal agreements or MOU but functioned mostly on mutually agreed principles. The programmes were focused on overall capacity development and empowerment through non-formal education strategies. Risk minimization through profit and resource optimization was stressed.

Weakness

Public dominated welfare models had less sustainability as the value appropriation strategies mostly depended on public funds. These were mostly not based on the felt needs of the beneficiaries. Once the project period was over there were not



many backup programmes for the continuation/ diversification of the activities under the project and lost direction and relevance.

Strength and weakness of private dominated economic models

Strengths

Functional economic partnership between public and private partners as the funding of the programmes was done by the Government and implementation of the private partner. These projects were developed based on local need assessments and as such termed as pull-driven models. Higher level of sustainability of the projects could be observed as they tried to stress on value appropriation objectives that focused on profit maximization at critical levels of value creation.

Weakness

The public domain community partners' participation in the private dominated models was limited to social mobilization and legitimization. Social mobilization followed the blanket method of selection of participants and no aptitude tests were conducted for the selection of participants even for skilled enterprises like bamboo crafts. The lack of skill among the members often created problems in meeting the breakeven point in a given period. Moreover, there was no provision for hand holding support for tiding the initial phase of skill development in the project funding leading to wage employment status of projects like Sevashram.

Determinants of value creation in ppp models

The process of value creation, an embedded characteristic in all the selected models has been assumed as a critical factor facilitating women empowerment. Value in this context involved the fulfilment of basic long standing needs of the groups and included empowerment and economic value as it contributed to utility and welfare to its members in the long frame work with suitable modifications based on academic consultations and literature review to suit women group dimensions. Accordingly centrality, visibility, proactivity, appropriability and voluntarism expressed by the women enterprise members were evaluated as the determinants of value created by these models. Results of correlation analysis used to bring out the possible association between the selected variables with women empowerment are represented as Table-1.

Table 1. Correlation between women empowerment and dimensions of value creation

S.no.	Variable	r value (n=150)
1	Centrality	0.23*
2	Appropriability	0.21*
3	Proactivity	0.14
4	Visibility	0.31**
5	Voluntarism	-0.78**

**Significant at 1% level; * Significant at 5% level

Assam Agricultural University, Jorhat

Agriculture sustainability

Assam Agricultural University identified and screened five PPP models from Assam and West Bengal for gender mainstreaming in agriculture by using a check list and a questionnaire. Data were collected from 100 respondents from villages in each of the 5 selected models. Based on primary and secondary data, SWOT analysis of the each model and regional level seminar with all stakeholders were carried out to throw light on planning and execution of the logistic model. An action research PPP model was designed and implemented to promote commercial bio fertilizer production in Jorhat district of Assam. The programme was implemented in four blocks of Jorhat district in consultation with an NGO. twelve representative villages, three in each block of the district were selected and five SHGs from each village have were identified covering 12 villages and five SHGs each. Ten training programmes and four exposure visits and 10 follow-up trainings were organised. Farmer participatory evaluation of the project was carried out.



A view of vermi-compost pit under construction

The implementation of the PPP project got the much publicity and importance in the Public sector (State Dept of Agriculture and DRDA) and Private sector (NGOs, Tea Industries and Agri Business firms) through adequate mass media coverage. Faculty members of the Department of Extension Education, Home Science and Faculty of Agriculture discussed about the activities and success of the model in various training programmes attended by public and private functionaries from all development sectors of different districts in the State.

Thus contribution of pilot project towards creation of awareness about PPP in gender mainstreaming in agriculture was significant. The model gave valuable lessons which could be used in future for formulating strategies and devising Extension policy framework. PPP model is gradually bringing changes in the extension system at University level, District level and below. Joint planning, implementation as well as monitoring and evaluation brought private partners into mainstream extension. Public extension was able to provide the necessary financial resources to reach out more farmers in less time to disseminate

more technologies. Although visualising tangible benefits will take longer time, PPP project made significant positive overall changes for growth of socio economic uplift of the farmers of the Districts as well as agriculture sustainability in the region .

CCSMAU, Misar

Value addition

An action research PPP model was undertaken on Value addition and diversification in Bead making. A self Help group has been formulated in collaboration with Haryana Psychological Health welfare society in Mangali village in Hissar. The public partners of the project included College of Home Science, CCSMAU, Haryana, Department of Medicinal Plants and NABARD and the private partner was Psychological Health welfare society, an NGO. Linkage was developed between the NGO and the women SHG for production and commercialization of Aloe Vera, vermi compost and bead making. The responsibility of public partner included training on bead making, training on bead making machine and dying of beads and demonstration on vermi composting and established liaison with industry for inputs and marketing and NABARD for funds for machinery and trainings. The private sector facilitated establishment of training unit on bead making. Self Help Group has provided raw material, land and manpower.

MPUAT, Udaipur

Capacity building

The model on capacity building of farm women in agro based entrepreneurship development through PPP on dalia making, badi making and mehandi cone making were identified and training imparted to farm women.

Technology application and gender mainstreaming in agriculture for developing a model village

K.Ponnusamy, M.P.S.Arya, A.K.Shukla, Anil Kumar, Sabita Mishra, H.K.Dash, Jyoti Nayak and Gayatri Moharana

With the objectives of developing models for gender mainstreaming in the adopted village through need assessment, capacity building, convergence of various departments and schemes, entrepreneurship development and facilitation of access to resources, skills, knowledge and power, bench mark survey and need based intervention were initiated in Giringaput village of Khurda district (Odisha).

Social fabric of the village household

Out of two hamlets, one is dominated by general caste people with 200 households where most of the population belongs to Khandayata caste. Another hamlet with about 100 households belonged to Scheduled Caste communities. Different castes co-exist and maintain very good relationship among them in both the hamlets. Since this village is located near by the main road and there is pucca and kachha road inside the village, therefore village have good communication facility. There are various socio-

cultural institutes which included temples, library, community hall, Bhagawata hall, festival ground, playground, primary school, anganwadi centre, common grain storage place, grocery shops etc. The people are very simple and they follow their traditional practices to preserve their culture. The people who belong to SC community are generally poor as compared to the general caste people. Most of them do not possess land and they cultivate in the land of general caste people be taking in lease. The water source is very limited for personal consumption. There are five bore wells, four wells and two ponds for daily use.



Women preparing cow dung cakes as fuel

Agriculture in the village

The source of irrigation for cultivation is a small canal. Farmers use the water from canal which is discharged from a dam situated nearby this village throughout the year. They also depend on rainwater for cultivating paddy and vegetable. They cultivate paddy on more than 400 acres of land in Kharif and Rabi season and vegetables like brinjal, potato, pumpkin, bitter gourd, green leaves, beans, cowpea, green chillies, cucumber cauliflower, cabbage etc. throughout the year. They apply different fertilizers in their field and also use chemicals or pesticides to protect their crops and vegetables. The village is



A household view of Giringaput village

also rich in plant resources, different trees like mango, coconut, custard apple, subabul, neem, moringa, papaya, banyan, palm, dates, cashew nut etc are available in the village. The total animal population is about 1000 among half of them are goats. The rest of them are cattle and poultry birds. All of the animals are of local breeds.

Training on vegetable and fruit preservation

As part of convergence of efforts for empowering village women, Community Food and Nutrition Extension Unit of Ministry of Women and Child Development, Bhubaneswar was involved to organize a five days training programme on Domestic method of fruits and vegetable preservation at Giringaput village. About 30 village women benefited and five of them started preparing value added products depicting a clear road map for entrepreneurship at village level.

Issues of concern

The major issues identified for gender mainstreaming were low level of technical knowledge and skill, poor, sanitary and hygienic conditions and underemployment.

Scope for intervention

- Non adoption of improved farming practices
- Every year they prefer for growing one crop i.e. paddy
- There is a scope for growing pulses and vegetable in large areas but vegetable cultivation was found in limited area
- Lack of knowledge and awareness on better management practices.
- Lack of vaccination, prevalence of FMD & adoption of ND breeds in goat farming

Network project on Development of expert system for crop and animal enterprises

K.Ponnusamy

Network partners

DRWA, Bhubaneswar, TNAU, Coimbatore, TANUVAS, Chennai and ZPD-8, Bangalore

DRWA, Bhubaneswar

An opinion survey about the usefulness of expert system in agriculture was carried out. The research was done among researchers and academicians and from different ICAR Institute and agricultural university in Bhubaneswar. The sample size was 30, out of which half of the respondents were female. The study focused on various issues related to the usage of expert system in agriculture. A structured questionnaire consisting of 40 questions was circulated to respondents. The major areas focused during the survey were awareness of expert system, usefulness to farmers, content design and process, accessibility to farmwomen, limitations in using expert system, strategies for popularization and gender friendliness.

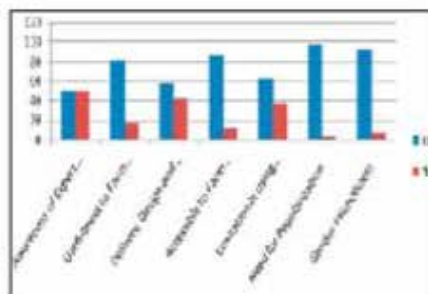


Fig. 4. Perceived utility of expert system (%)

The study revealed that out of 30 respondents, 18 per cent were not aware of expert system. Vast majority was exposed to its usefulness and 78 per cent felt that it can improve technical literacy of farm women if made user friendly by using local languages and images. About 85 per cent of respondent felt that an expert system can be used anywhere anytime for diagnosis of crop and animal problems. From this study, it is concluded that sensitizing the people on expert system will make transfer of technology to farm women easier.

TNAU centre, Coimbatore

The validity of the expert system contents was done with help of SMS of KVKs in Zone VIII. Knowledge base in the form of contents was collected from the SAUs, ICAR institutes, Research Station, KVKs and innovative farmers. The series of interactive meetings was also organized to know the farmers need on the identified subject domain and frequently asked questions. The stage by stage symptoms and growth of plants were also documented in the form of image, video and audio formats. The collected contents were organized and validated with help of concerned scientists. Expert System is designed in Image Based Expert System. Farmers can have a look and feel, by viewing the photos in form of slideshows and video clippings. It helps them in comparing with their field symptoms and they will get a single point decision.

The home page of the expert system has three important components such as information system dealing A to Z about the particular enterprise, decision support system facilitating to take best possible decision and diagnosing system (Crop Doctor) for automatic diagnosing of pest, disease, nematode and nutrient deficiency. The expert systems were completed for paddy, banana, sugarcane, finger millet and coconut in English and Tamil language and is in progress for Malayalam and Kannada language.

The validity workshops and meetings were organised at Kerala Agricultural University, Thrissur for Malayalam, TNAU, Coimbatore for English and Tamil, sugarcane expert system for cane officers at TNAU, Coimbatore and presentation of expert system to IFPRI team.



Fig. 6. Expert system on paddy - A screen shot

TANUVAS, Chennai

The specific activities undertaken during the year included data generation and content digitization for management of important diseases and nutritional disorder of dairy cow, sheep, goat and poultry followed by expert system development and testing validity and reliability of expert systems. Animal Disease Surveillance Bulletins of the State Department of Animal Husbandry were collected for the last six years. Disease outbreak status was assessed to identify location specific knowledge needs of farmers in Tamil Nadu for incorporation into expert system.

Decision Support System (DSS) was designed to get best possible options and decisions for various management practice by the farmer themselves. It was user friendly, image and video based information with demonstration of important management practices. It facilitated instant decision support for key information of livestock production technologies like automatic calculation of nutrient and floor space requirements for different categories of animals etc. In Disease Diagnosis System (DDS), the farmers could identify the animal disease problems by themselves by representing their animal's symptoms in terms of picture / images and gives the possible remedies and control measures. Information System (IS) covers all information necessary for managing a livestock farm successfully namely important breeds, breeding management, housing management, feeding management, general care and management, production technology and management, disease prevention and control management, young stock management, farm machineries, insuring the farm animals, institutions and schemes and marketing management with image based and video based information. It is a web page design model.

Involvement of tribal women in marketing of selected agricultural and important non-timber forest produces (NTFPs) in Odisha

Sabita Mishra and H. K. Dash

To develop strategies for strengthening the existing marketing mechanism in tribal zones of Odisha, different stakeholders like

the tribal women as well as traders and various district departments as agriculture, horticulture, fishery, forestry, animal husbandry, Orissa Tribal Empowerment Livelihood Project (OTLEP), Orissa Rural Development and Marketing Society (ORMAS) and NGO were consulted for suggestions.

Table 2. Suggestions for strengthening marketing mechanism

Suggestion	Traders (n = 20)	Tribal Women (n = 100)	District Officials (n = 66)	Average
Creating transport facility	45.00	31.00	37.50	37.83
Training on marketing	22.00	-	37.50	36.50
Creating storage facility	42.00	25.00	25.00	30.66
Creating market	-	52.00	37.50	29.83
Direct selling to consumers	34.00	37.00	-	23.66
Linking credit agencies	-	-	25.00	8.33
Fixing minimum support price	-	7.00	-	2.33
Creating shelter for night halt	-	2.00	-	0.66

The analysis of differential suggestions given by three categories of respondents like traders, tribal women and district officials reveals that on an average 37.83 per cent of them suggested for facility of better transport, 36.50 per cent for training for enhancing knowledge of tribal women in marketing system,



Women participating in marketing activities

30.66 per cent for creation of storage facility, 29.83 per cent for creation of market in nearby places and 23.66 per cent viewed for direct selling to avoid middlemen while least importance was given for linkage development with credit agency (8.33%), minimum rate fixing by government agencies (2.33%) and creation of shelter place for night halt (0.66%). Creation of local markets in proximity to home was the most important suggestion by the tribal women (52.00%), who actually face the constraints of leaving houses for a long time for faraway places. The stakeholders from various departments very strongly

suggested for capacity building of tribal women in marketing (87.50%) while the most vulnerable women did not show interest for it as they were not sensitized for it. Therefore, training should be imparted along with awareness and motivational programmes. Implementing most of the suggestions are beyond the capacity of individuals; therefore, these suggestions have to be taken up as policy matters by the respective Governments for creating facilities of transport, storage, nearby markets and shelter for night halt and training of farmwomen on marketing.

Network project on Gender issues in rice based production system and refinement of selected technologies in women perspective

M. P. S. Arya, S. K. Srivastava and S. P. Singh

An Annual Workshop of all the Network partners was organized on 27-28th May, 2011 at Directorate of Research on Women in Agriculture, Bhubaneswar to discuss the survey results and develop a research frame work for implementation during Kharif 2011 by each of the net-work partner. The results of survey report revealed that the higher workload in nursery raising, transplanting, weeding and parboiling and need of raising pulses and vegetables for house hold consumption were the important issues to be addressed. Accordingly research activities were taken up at each of the Centres.



Scientists at Annual Workshop

The Centre wise results are presented below:

DRWA, Bhubaneswar

Improving pulses and vegetable availability for household consumption

The availability of pulses which found lacking in survey report, was addressed by taking interventions related to suitability of cropping pattern and IPM in rice, red gram + soy bean, red gram + cowpea and red gram + maize in Aanchalkheda village of Hoshangabad district in Madhya Pradesh. Awareness training programme on Good Agricultural Practices (GAP) and IPM was organized on 17.06.2011 in the village for selected framers/farmwomen. During training programme it was observed that application of chemical insecticides was not accepted by farm women due to knowledge gap and fear of pesticidal hazards to children and pets, while men were using pesticides frequently and unjudiciously without knowing the



Scientists and farmers at field visit in Aanchalkheda village (MP)

proper dose and preparation of spray solution. Therefore, trials on Good Agricultural Practices (GAP) and IPM related to pulses and vegetable crops were conducted in the fields of 15 farmers in Aanchalkheda village of Hoshangabad district in Madhya Pradesh by DRWA, Bhubaneswar.

Cropping patterns on pulses and vegetable crops were evaluated with the involvement of 15 farmwomen in different combinations as inter crop in the traditional rice-wheat and soy bean-wheat crop rotations. Cowpea + red gram, maize + red gram and soy bean + red gram in inter cropping patterns were planted on 2000 m² (half acre) area by each of the participating women farmers.

Both Men and women took part in raising the intercrops. Results revealed that the women participation was higher and more than men in harvesting (73.67%) followed by intercropping operations (72.33%) post harvest operations (60.00%) and seed sowing (56.33).

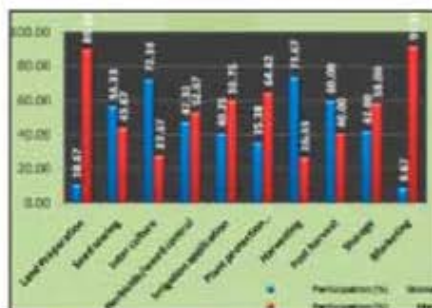


Fig. 7. Men & women participation in different agricultural activities

Red gram as intercrop played an important role in ensuring food and nutritional security. Even though all the crops were severely damaged by heavy rains in Kharif 2011, it came up as a successful intercrop with an average estimated yield of

3122kg/ha. The farmwomen retained about 20 per cent of total red gram for their family consumption.

Observations of the farm women about introduction of pulses and vegetables in intercropping

On the completion of the field trials the opinion of women was recorded on the outcome of the research interventions. They viewed that there was a bumper crop of red gram which survived well even under high rain fall received during the crop season (Kharif 2011). The incorporation of pulses in rice based production system thus may satisfy the family requirement of pulses to some extent. The major constraints faced by the farmers while undertaking the technical programme were (i) continuous rains during sowing resulting poor germination; (ii) cowpea damage due to improper drainage facility in field, (iii) late sowing of crop, (iv) attack of leaf folder in maize, (v) attack of leaf folder and pod borer in red gram and cowpea and (vi) incidence of root rot in soybean.

Evaluation of IPM in intercropping

A participatory trial was conducted on the use of pheromone trap in Aanchalkheda village of Hosangabad district of MP with the involvement of Farmers/farmwomen. A total number of 50 Pheromone traps, 200 Heli Lure, 50 Scirpo Lure and 5 litre Neem oil were evaluated under action research. The cost of use of pheromone trap was ₹ 3410 / ha which was less in comparison to application of Monocrotophos, Chlorpyrifos and Neem oil which was estimated as ₹ 10000, ₹ 7840 and ₹ 6,950 / ha, respectively including labour charges. Installation of Pheromone trap was found effective to save the time as it required 64 man hours / ha, where as spraying of insecticides/ neem oil required 160 man hours / ha. Therefore, use of pheromone trap was found effective to save the money, time, labour of farmwomen and as one of the alternative to reduce the health hazards among farm families. Farm women showed their interest in the adoption of the new intervention in their localities.

Evaluation of moisture use efficient cropping systems for family needs

Experiments were undertaken during rabi season at the DRWA farm to evaluate different intercropping pattern with combination crops of daily needs such as pulses, oilseeds and

vegetables besides their staple food crops of rice and maize planted in ridge and furrow method. Intercropping patterns included rice (variety-Naveen), maize (Ganga-5), black gram (variety-PDU-1), sunflower (variety-J.K.Chitra) and toria (variety-Agrani) and were tested under Factorial Randomized Block Design with four replications. For efficient utilization of irrigation water, rice and maize, which have high moisture requirement, were planted in one metre wide furrows, while sunflower and toria the drought tolerant crops were planted in the middle of the ridge and black gram 15 cm. inside the edge of one metre wide ridge.

Table 3. Moisture per cent under different crops planted in ridge and furrow system

Crop	Before irrigation	After irrigation
Furrow		
Rice	15.30	23.32
Maize	17.16	24.68
Mean	16.23	24.00
Edge of ridge		
Black gram	7.66	12.59
Centre of ridge		
Sunflower	5.70	7.43
Toria	5.65	7.84
Mean	5.67	7.63

Lime at 4 per cent water solution was also applied as foliar application. The crops on the ridge were aimed to grow on the residual moisture. The average moisture recorded before and after each irrigation was 16.23% and 24.00% in the root zone of rice and maize planted in the furrows, 7.66% and 12.59% in black gram sown 15 cm. inside the edge of ridge and 5.67% and 7.63% in sunflower and toria planted in the middle of ridge, respectively. The yield of crops recorded under different intercropping combinations revealed that combination of maize-sunflower- black gram recorded the highest mean Rice Equivalent (4279 kg/ha).

The same combination also responded more to lime application with 4662kg/ha Rice-Equivalent. Results also revealed that maize based combinations recorded more Rice-Equivalent (4324 kg/ha) than rice based (3953 kg/ha).



Inter cropping in ridge and furrow planting for water budgeting

Table 4. Grain yield (kg/ha) of different crops and Rice-Equivalent (kg/ha) under varying intercrop combinations and lime application (Rabi 2010-11)

Treatment	Rice		Maize		Sunflower		Torla		Black gram		Total
	Yield	Rice-Eq	Yield	Rice-Eq	Yield	Rice-Eq	Yield	Rice-Eq	Yield	Rice-Eq	
RSBC	1894	1894	000	000	000	000	000	000	033	095	1989
RTBC	1960	1960	000	000	000	000	164	292	053	154	2406
MSBC	000	000	3937	3307	231	543	000	000	016	045	3896
MTBC	000	000	3187	2677	313	734	203	361	082	238	4011
Mean	1927	1927	3562	2992	272	639	184	327	046	133	3075
RSBL	2067	2067	000	000	324	760	000	000	092	266	3093
RTBL	2024	2024	000	000	000	000	213	378	066	192	2595
MSBL	000	000	4442	3731	312	734	000	000	068	198	4662
MTBL	000	000	4052	3404	000	000	212	378	071	206	3987
Mean	2046	2046	4247	3567	318	747	212	378	074	215	3584

Minimum Support price (₹/q): Rice 1000, Maize 840, Sunflower 2350, Torla 1780, Black gram (Urd) 2900 (As per GOI notification) R=Rice, M=Maize, S=Sunflower, T=Torla, B=Black gram, C= Check (without lime), L=Lime application

During Kharif 2011, maize (hybrid-902), red gram (UPAS-120) and cowpea (Sardar Falguni) were planted in six combinations i.e. (1) maize (sole crop), (2) red gram (sole crop), (3) cowpea (sole crop), (4) maize +red gram, (5) maize+cowpea and (6) red gram +cowpea. The data presented in Table 6 revealed that the red

gram - cow pea recorded the highest Maize-Equivalent (8077.5 kg/ha) and thus found better than other combinations of maize-cow pea and red gram- maize. Out of red gram- cow pea combinations, their planting in 2:4 row ratio found better and recorded the highest (8633.86) Maize-Equivalent.

Table 5. Yield (kg/ha) of different crops and Maize-Equivalent (kg/ha) under varying intercropping combinations (Kharif 2011)

Treatment	Maize		Red gram		Cow pea		Total Maize Equivalent
	Grain yield	Maize Equivalent	Grain yield	Maize Equivalent	Grain yield	Maize Equivalent	
Maize-cow pea row ratio							
MC 2:6	1527.8	1527.8	-	-	1588.0	5233.1	6760.8
MC 2:4	833.3	833.3	-	-	1360.0	4481.7	5315.0
MC 2:2	1203.7	1203.7	-	-	1212.2	3994.7	5198.4
Mean	5758.1						
Red gram-maize row ratio							
RM 1:1	763.89	763.89	758.1	2584.4	-	-	3348.3
RM 2:2	1631.9	1631.9	570.0	1943.3	-	-	3575.2
RM 2:4	1458.3	1458.3	380.0	1295.5	-	-	2753.8
Mean	5758.1						
Red gram -cow pea row ratio							
RC 2:6	-	-	305.56	1041.67	1966.20	6479.53	7521.20
RC 2:4	-	-	625.00	2130.68	1973.38	6503.18	8633.86
Mean							8077.53

Minimum Support price (₹/q): Maize 880, Red gram 3000, Cow pea 2900. (As per GOI notification)

M= Maize, R = Red gram, C= Cow pea

CRR, Cuttack

Improving working efficiency and reducing work load in transplanting, weeding and threshing

Transplanting, weeding and threshing were found important field activities in rice with women participation of over 60 per cent. Therefore on-farm trials were conducted by incorporating

interventions that could improve the working efficiency and reduce the work load without compromising on yield of the crop.

Field trials were conducted on the fields of five selected families and data were collected on working hours and cost of technology. Response was also recorded on implications of technology applied. Analysis of data in Table 5 revealed that the use of CRR two transplanter reduced the women work load by



303.4 hours/ha and cost of transplanting by ₹ 3000.00/ha. The use of finger weeder reduced the work load by 75.2 hours/ha and cost weeding by ₹ 940.00/ha. Use of pedal thresher reduced work load by 323.2 hours/ha and cost of threshing by ₹ 2990.00/ha. The women rated traditional practices more tiring and prone to

drudgery. Regarding use of transplanter, they expressed their opinion that as they usually wear Saree, it was difficult to operate the transplanter. They were also fearful of meeting any accident while operating pedal thresher.

Table 6. Response of farmwomen on different interventions

Issue related to farmwomen	Intervention mode	Women participation hours/ha	Cost of Intervention(₹)	Observation of women on interventions
Drudgery in uprooting of seedlings	Farmer's practice	1632	2040	Laborious, tired, pressure on waist, Pressure on hand, pressure on finger
High workload in transplanting	Farmer's practice	366.4	4580	More laborious, tired, pressure on hand, pressure on waist, more time taken, pressure on finger.
	CRRD two-row Transplanter	63.0	1580	Farmers (farm women) are not fully aware with running of mat type seedlings. They generally grow root with seedlings. Ladies wear Saree. Therefore, it is difficult to operate manual rice transplanter while wearing Saree. Remarks are subjected to validate because they are using for the first time and may not be feeling comfortable.
High workload in weeding	Farmer's practice	288.0	3600	Hard work, tired, pressure on hand, pressure on waist, time consuming
	Finger weeder	212.8	2660	
High workload in threshing	1. Farmer's practice	491.2	6140	Hard work, pressure on legs, more time consuming
	2. Pedal thresher	168.0	3150	Fear of accident

DRR, Hyderabad

In the Annual Workshop Higher workload/participation in weeding was identified as an important issue to be addressed. As the application of herbicide is an effective method of weed control, a field trial was conducted to find out optimum package of weed control so as to reduce workload of women in this operation in village Mirzapur, Pudur Mandal, Rangareddy Dist (A.P) using rice variety RP Bio. 226 with four treatments laid out in Randomized Block Design and four replications.

T1: Farmers practice (Random transplanting of 4-5 seedling of 30 days old/hill + 150: 120: 0 kg N: P: K/ha + 1 time weeding (20 DAT) + plant protection).

T2: Improved practice (line transplanting of 2 seedling of 25 days old/hill + 100: 60: 40 kg N: P: K/ha + 2 times weeding (20 and 40 Days after transplanting + Need based plant protection).

T3: Farmers practice + herbicide (Butachlor @ 1.5 kg a.i/ha applied at 5 DAT + one hand weeding).

T4: Improved practice + herbicide (Butachlor @ 1.5 kg a.i/ha applied at 5 DAT + one hand weeding).

Yield and yield attributes were recorded at the time of harvest. Economic returns were worked out by considering cost of

cultivation of each treatments (T1= ₹ 30620/ha, T2= ₹ 31220/ha, T3= ₹ 30020/ha and T4= ₹ 28370/ha) and selling rate of paddy grain (₹ 10000/ton) and paddy straw (₹ 1000/ton).

Grain yield differed significantly among different treatments. The mean maximum grain yield was recorded by improved practice + herbicide application (5.39 t/ha) and significantly superior over all other treatments (4.70 to 5.22 t/ha). Improved practice was also significantly superior over farmer's practice (4.70 t/ha) as well as farmers practice + herbicide (4.96 t/ha). Farmer's practice + herbicide application was significantly superior over farmers practice. Straw production followed the same trend as that of grain yield. The reason for maximum grain yield under herbicide application treatments might be due to timely control of weeds and maximum utilization of applied nutrients by rice crop at critical stages of crop growth.

The mean maximum net returns and B: C ratio (Table 6) of ₹ 31030 / ha and 2.09, respectively was recorded under improved practice + herbicide application followed by improved practice (₹ 26250 / ha and 1.84), farmer's practice + herbicide application (₹ 24630/ha and 1.82) and farmer's practice (₹ 21130 / ha and 1.69). Application of herbicide was cheaper in terms of cost of



weeding and reduce women labour requirement for weeding. Therefore, intervention of herbicide resulted in reduced cost of cultivation and more net returns with higher Benefit Cost ratio.

On the basis of these findings it was concluded that the use of herbicide reduced work load on women drudgery with higher rice production and more economic returns.

Table 7. Economic returns (₹/ha) under transplanted rice.

Treatment	Grain yield (kg/ha)	Straw yield (kg/ha)	Grain returns (₹/ha)			Cost of Cultivation (₹/ha)	Net returns (₹/ha)	B:C ratio (₹/ha)
			Grain	Straw	Total			
T1	470	475	47000	4750	51750	30620	21130	1.69
T2	522	547	52000	5470	57470	31220	26250	1.84
T3	496	505	49600	5050	54650	30020	24630	1.82
T4	539	550	53900	5500	59400	28370	31030	2.09

Important ITKs prevailing in the rice growing area of Andhra Pradesh

- Ash is dusted on the germinated paddy nursery before the occurrence of heavy rain. This practice prevents toppling of seedlings and also accumulation of seedlings on one side. This is being practiced by paddy growing farmers of Gooty region of Andhra Pradesh.
- Farm waste and trash are burnt on the nursery beds. The heat that is generated by burning, sterilizes the soil and some nutrients like potash is added. It is practiced in nearby villages of Jammikunta in Karimnagar district of Andhra Pradesh.
- Intercropping of rice (BPT-5204) and red gram (LRG-30 in 11:1 ratio) during rainy season, acts as an insurance against failure of rain. During heavy rains even if red gram fail and rice gives good yield, and economic returns from both crops are obtained during normal years in rainfed black and red soils. This practice is followed by the rice farmers of Telengana region of Andhra Pradesh.
- Application of tobacco plant powder at 7-10 days after transplanting of rice in kharif effectively controls the stem borer and leaf folder as it contains nicotine Sulphate, which acts as a repellent. This practice is prevalent in Andhra Pradesh.
- Erecting fishtail palm branches, *jeeluga* @ 25-30kg/ acre, scattered once in the rice in rainfed uplands control the leaf folder and stem borer. This contains an alkaloid which acts as a repellent.
- Rice farmers in Andhra Pradesh use plant materials like fish tail palm leaves (*Corypha urens*) and *jeelugu* for the control of leaf folder and stem borer in paddy. They spread/ scatter 25-30 leaves per acre in the paddy field. This fish tail leaves exudes alkaloids, which prevents pests.
- Musidi leaves (*Nux vomica*) are broadcasted in the field if termite attack is observed in paddy.

- Wood apple (Velaga fruit) is made into powder and used to broadcast in field to reduce tella chitta (leaves turning white) in paddy by the farmers in Andhra Pradesh
- When paddy is infested with leaf folder and gall midge farmers of Andhra Pradesh drag thorny bushes in field to shed the insects and pests.
- In rice fields, farmers erect nine feet stick or coconut stalk in reverse position. This acts as a bird perch. At night time, owl or other nocturnal birds will sit and prey on the rats. This one of the cost effective measures of rat control followed by rice farmers.

KAU, Trissur

Drudgery reducing practices in transplanted rice

Transplanting and weeding of rice are among the most drudgery prone activities. A field trial using Uma variety of rice was conducted in RBD to find out a suitable option to reduce operational drudgery in transplanting. The treatments included

- T₁ Conventional transplanting and hand weeding
- T₂ Conventional transplanting and weed control by herbicide
- T₃ Line transplanting and hand weeding
- T₄ Line transplanting and weed control by herbicide
- T₅ Dapog transplanting and hand weeding
- T₆ Dapog transplanting and weed control by herbicide
- T₇ Transplanting with 2-row manual transplanter and hand weeding
- T₈ Transplanting with 2-row manual transplanter and weed control by herbicide
- T₉ Transplanting with 4-row manual transplanter and hand weeding
- T₁₀ Transplanting with 4-row manual transplanter and weed control by herbicide
- T₁₁ Mechanical transplanting and hand weeding and
- T₁₂ Mechanical transplanting and weed control by herbicide



The drudgery was rated under four levels- very low, low, moderate and heavy. During the nursery preparation the physical exertion was the least in the case of dapog method. However, in conventional as well as mat nurseries used for normal random planting and machine transplanting, respectively, the drudgery felt by women labourers were moderate.



Dapog nursery raising



A view of large scale participation of farmwomen in rice transplanting

Table 8. Response of farm women on intensity of drudgery under different methods of nursery raising

Particular	Transplanting method					
	Conventional nursery & random planting	Conventional al nursery & line planting	Dapog nursery & line planting	2-row manual transplanter	4-row manual transplanter	Machine transplanter
Nursery preparation	Moderate	Moderate	Low	Moderate	Moderate	Moderate
Pulling out seedlings, bundling & spreading	Moderate	Moderate	Low	NA	NA	NA
Transporting and loading nursery	NA	NA	NA	Heavy	Heavy	Heavy

Compared to the conventional nursery, dapog nursery was very easy for the labourers to carry the rolled seedling mats into the field and they have rated it involving least drudgery. The transporting and loading of the mat nursery both in the mechanical transplanter and manual transplanters were rated as heavy.

A comparison of the drudgery felt by the women operators of 2-row, 4-row and machine transplanters are given in table 9. The skilled women labourers who operated the machine transplanter have rated the different operations with the 4-row manual transplanter as heavy and 2-row manual transplanter as moderate. The drudgery felt was very low while using the machine transplanter. On turning at the corners, 2-row manual transplanter was rated moderately heavy whereas 4-row manual transplanter was rated heavy. Table 9 shows the stress and strain felt by women labourers during the transplanting. The stress and strain to the body parts were the least with the machine transplanter since the operator was in a sitting position.

Table 9. Intensity of drudgery during operation of manual and machine transplanters

Particulars	Transplanting method		
	2-row manual transplanter	4-row manual transplanter	Machine transplanter
During operation	Moderate	Heavy	Very low
Crossing bunds	Moderate	Heavy	Heavy
Turning at corners	Moderate	Heavy	Low

Majority of these factors were moderate with 2 and 4 row manual transplanters since the transplanting was in a standing posture. The random planting was having low to high stress for various body parts however less than that of the line planting. The line planting does not give enough freedom for the natural movements of the labourers while at random planting the labourers are free to have convenient movements and short rest whenever they feel, which reduces the stress and strain.

Table 10. Perceived stress and strain by women during transplanting

Body part	Transplanting method					
	Conventional nursery & Random planting	Conventional nursery & line planting	Dapog nursery & line planting	2-row manual transplanter	4-row manual transplanter	Machine transplanter
Knee	Moderate	High	High	Low	Moderate	Very low
Back	High	High	High	Moderate	Moderate	Low
Hip	Low	Low	Low	Moderate	Moderate	Very low
Wrist	Moderate	Moderate	Low	Moderate	High	Very low
Shoulders	High	High	High	Moderate	High	Very low
Elbow	Moderate	Moderate	Moderate	Moderate	Moderate	Low
Neck	High	High	High	Moderate	Moderate	Very low
Chest	Very low	Very low	Very low	Moderate	High	Very low

The rice yield and the B : C ratio as influenced by different transplanting methods is given in Table 6. The line planting with herbicidal control has given the highest yield and B:C ratio. Though line planting involved more drudgery than the conventional transplanting the yield advantage was maximum in the former case mainly due to an enhanced plant population of 50 hills per m compared to 32 to 35 hills observed in the random planting (data not shown). The yield in the dapog transplanted treatment was at par with the line planting, the drudgery involved

was the least in the case of dapog nursery preparation. The rice yield and the B:C ratio were at the lower range in the case of manually operated mechanical transplanters. It didn't reduce the drudgery during the transplanting also. The low yield is attributed to the lower plant population (35 hills/m). There was operational difficulty due to the poor quality of fabrication for both the manually operated transplanters. On an average there was 40 to 50 per cent unplanted hills which were gap filled manually.

Table 11. Yield of rice as influenced by different transplanting methods

Treatment	Yield (kg/ha)		Cost of cultivation (₹/ha)	Total income (₹/ha)	B:C Ratio
	Grain	Straw			
Conventional transplanting and hand weeding	637	747	50450	104145	2.06
Conventional transplanting and weed control by herbicide	693	732	46450	111605	2.40
Line transplanting and hand weeding	768	1056	52050	128636	2.47
Line transplanting and weed control by herbicide	793	1041	48050	145821	3.03
Dapog transplanting and hand weeding	741	1185	48550	127420	2.62
Dapog transplanting and weed control by herbicide	735	1153	44550	125992	2.83
Transplanting with 2-row manual transplanter and hand weeding	654	776	50900	107049	2.10
Transplanting with 2-row manual transplanter and weed control by herbicide	596	716	46900	97784	2.08
Transplanting with 4-row manual transplanter and hand weeding	644	774	49400	105651	2.14
Transplanting with 4-row manual transplanter and weed control by herbicide	619	729	45400	101167	2.23
Mechanical transplanting and hand weeding	774	983	48650	128070	2.63
Mechanical transplanting and weed control by herbicide	728	973	43900	121401	2.77
CD (0.05)	97	140.0			
CV per cent	822	915.0			

From the field trial it can be seen that the highest yield and B:C ratio is resulted from line transplanting followed by herbicidal weed control. However the drudgery involved is higher than the random transplanting. The 2-row or 4-row transplanter did not reduce drudgery much and the yield and B:C ratio were also low. The machine transplanting was most efficient in terms of drudgery reduction, yield and B: C ratio.

G.B.P.U.A.T., Pantnagar

Evaluation trials were conducted with a view to estimate the work load required for raising nursery to transplant one hectare of rice crop. The field observations were made on eleven activities of nursery growing. The data presented in Table 13 revealed that by adopting Mat method of nursery raising, 64 per cent of men or women workload could be saved over recommended or farmers' method of nursery raising.



Table 12. Assessment of work load in various operations of nursery raising

Operation/Particular	Mat nursery	Recommended raised bed nursery	Farmers practice
Area for nursery (for one ha transplanting)	250m	1000m	500m
Seed rate for one ha transplanting by SRI	10 kg	40 kg	50 kg
Seed rate broadcasted per m ²	40	40	100
Age of the nursery (days)	15	25	30
Time taken for each operation (minutes)			
Ploughing (twice) time in minutes	60	240	120
Field preparation i.e. bunding and leveling	480	1920	960
Removing of stubbles	30	120	60
Manuring & fertilization	60	240	120
Puddling	180	720	360
Seed treatment	20	80	40
Sowing of seed	30	120	60
Weeding	40	160	80
Watering	900	4800	3000
Bird watching @ 2 hrs/day	1800	3000	3600
Required time for uprooting of seedlings	480*(1 woman)	5760(12 women)	2880(6 women)
Total working hours	4080	11260	11280
Total men/women working days	8.5	23.45	23.50

* The seedlings of Mat nursery are not need to uproot and can transport mat as such by one man or woman in 8 hrs.

Refinement of storage pest management techniques in selected cereals, pulses, condiments and spices with gender perspective.

S.K. Srivastava, Suman Agarwal and Naresh Babu

Based on the data collected from 10 centres viz: Himachal Pradesh, Maharashtra, Karnataka, Haryana, Andhra Pradesh, Punjab, Rajasthan, Odisha, Assam and Uttarakhand, refinement of pest management techniques for maize, red gram, chili and coriander was initiated. Refinement of storage pest management techniques in pigeon pea (*Cajanus cajan*) with gender concern is completed. Different locally available indigenous storage techniques viz: Use of Begunia leaf powder, Neem leaf powder, Chilli powder at different doses along with standard check Neem oil and control were evaluated in CRD in 3 replications.



Begunia leaf, Neem leaf and Chilli

Observations were recorded on parameters such as number of eggs /grain, number of damaged seed, seed weight and germination. Results revealed that Begunia leaf powder at higher dose and medium dose of Neem leaf powder was found at par with standard check in reducing the damage due to pulse beetle *Callosobruchus chinensis* in pigeon pea (*Cajanus cajan*). Different stakeholders, farm women extension functionaries were oriented during their exposure visits to the Directorate.



Effect of Neem oil on germination



Effect of treatments on germination

In another set of refinement it was found that pigeon pea could be stored up to one year with 19.17 per cent and 10.95 per cent damage from pulse beetle *Callosobruchus chinensis* with the use of sand and wood ash, respectively. Maximum damage of 38.35 per cent was recorded in control. Wood ash and sand were found cost effective options for farm women and preferred, as it is easily available to them.

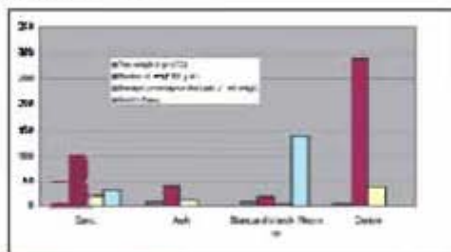


Fig. 8. Pulse beetle *Callosobruchus chinensis* damage and cost analysis in pigeon pea under various treatments

Network Project on Assessment of gender issues identification and refinement of selected women specific technologies in horticultural crops.

A.K. Shukla, Naresh Babu, Kundan Kishore

The Network Project has been operational at six different institutes; DRWA, Bhubaneswar (Lead centre), CIPHET, Abohar, CITH, Mukteswar, CTCRI, Thiruvananthapuram, CISH, Lucknow and IIHR, Bangalore to conduct comprehensive study on women in horticulture development of gender related horticultural technologies. The achievements of each partner are presented as under.

DRWA, Bhubaneswar

Gender participation in horticultural activities

Data of Keonjhar district on gender disaggregated participation and aspects of production system revealed that most of the farm activities were carried out by men whereas women were involved in cultivation of intercrops, intercultural operations, harvesting, marketing and grading of horticultural crops. The involvement of

women in basin preparation, fertilizer application and pest management may be enhanced with the introduction of improved farm tools. The availability of inputs including seeds, labour, farm tools were major constraint in carrying out horticultural operations. Furthermore, crop productivity was greatly affected by biotic and abiotic factors and technological gap. It was perceived that availability of input alone can improve the production substantially.

Table 13. Gender participation in horticultural activities

Activity	Men	Women
Basin preparation	Yes	No
Cultivation of intercrops	Yes	Yes
Fertilizer/Manure application	Yes	No
Pest management	Yes	No
Intercultural operation	Yes	Yes
Selection of intercrops	Yes	Yes
Harvesting	Yes	Yes
Marketing	Yes	Yes
Grading	Yes	Yes

Table 14. Ranking of constraints with respect to farm activities

Constraint	Men	Women
Availability of quality seed and other inputs	1	1
Availability of farm machinery/ implement	3	3
Credit/investment	2	2
Migration	5	4
Crop loss due to biotic and abiotic factors	4	4
Labour	3	3
Transportation	5	4
Marketing	4	3

Access to and control over resources

Resources are very critical for higher crop productivity. Access to resources and control over by men and women both assume great significance for making horticultural production system profitable. The findings showed significantly low access to and control over farm land, credit, etc (Table 16). Additionally, women had poor sharing of profits from sale of produce. Similarly use of family labour and engagement of hired labour were also highly influenced by male members of the family. Whereas women had better access to farm tools, inputs and produce. Hence attention needs to be focused on enhancing the accessibility of women to important inputs for making production system economically viable.

Action research

Based on the identified problems action research was taken up at Kandhmal and Giringaput (Khurda). Both the areas have good potential of vegetable crops; however technological support and timely access to inputs limit the profitability. Considering the importance of vegetables in improving the income of farm women following interventions were taken up.

Table 15. Details of action research at Kandhmal and Giringaput

Problem Identified	Interventions Initiated	Outcome
Poor quality seedlings due to improper raising technique	Seedling raising in protrays inside protected structures	Healthy and quality seedling production
Planting of seedlings (tomato and cabbage) in furrows	Planting on raised beds for better survival	Infestation of diseases was less when planted at raised beds
Planting of multiple seedlings of tomato per hill	Planting of single seedling/hill	Health of the plants was good and cost of cultivation was reduced
Use of local undescript varieties	Improved high yielding varieties of brinjal – Pusa Hry., bittergourd – Sadabahar, cucumber – Green long, pumpkin – Pusa Vishwas	Better yield and quality of produce
Round the year unavailability of seedlings	Nursery raising under protected structures with 50 per cent agroshed net.	Round the year production of seedlings
Cultivation of only seasonal vegetables	Off season cultivation of high value vegetables under protected structures	High return from off season produce
Crop loss of brinjal due to wilt/nematode	Crop rotation with beans, cabbage, cucumber	Reduction in disease intensity
Crop loss of cucurbits/tomato due to improper training system	Proper staking/training of cucurbits with existing resources	Improve in quality of produce



View of different field activities under taken at Khandhmal and Khurda districts

Trainings/exposure visits/research-extension-farmers interface meet/stakeholders' meetings

Capacity building programmes of farm women on different aspects mainly on fruit and vegetable production technology, organic farming and post harvest management were organized under the project in Raika of Kandhmal and Giringaput village of Khurda districts. DRWA highlighted the role of women in horticulture and importance of horticulture in enhancing livelihood security of farm women. Participants were well exposed to many technological interventions like nursery raising

techniques, canopy management in guava, pruning in custard apple, harvesting techniques of tomato and grading of tomato and radish, crop rotation for minimizing pest infestation and value addition at field level for getting more market price of produce. In addition, they were also got acquainted with the importance of intercrops in fruit orchard and their impact on the profitability of the production system.

Annual workshop

Annual Workshop of network project entitled Assessment of gender issues and identification and refinement of selected



women specific technologies in horticultural crops was held on July 6, 2011 at DRWA, Bhubaneswar. The gender disaggregated data and progress made under network project were presented by the PI/CoPIs of different centres including DRWA, Bhubaneswar CISH, Lucknow, IIHR, Bangalore, CTCRI, Thiruvananthapuram, CITH, Mukteswar and CIPHET, Abohar.



Scientists at Annual Workshop

Stakeholders' meeting

Stakeholders' meeting was organized on July 7, 2011 at DRWA. Network partners shared their views about the gender related activities and technological interventions for the benefit of farm women in their respective states.

CITH, Regional Station, Mukteswar

Initiation of action research

Two SHGs viz., Unnati Swayam Sahayak Samuh, Satkhol and Mahila Jagriti Samuh, Bhadoti in Nainital have been identified for refinement of selected women specific technologies in Horticultural crops in low cost playhouses. Low cost playhouses have been constructed in the respective villages and the groups started vegetable cultivation and flower nurseries.

IIHR, Bengaluru

Decision making pattern in the different activities

Data collected on mango, grapes, cabbage, tomato, chrysanthemum and China aster from four districts of Karnataka revealed that women had not taken part in decision making in activities like land preparation, removal of crop residues, stubble collection. Men and women had taken jointly decision in manure/ fertilizer application, irrigation, pesticide application and sorting. Therefore, intervention is required to encourage decision making. Women need to be encouraged to take action and to become economically independent; this will consequently lead to gender mainstreaming.

Participation in the activities of horticultural crops

Higher participation of women was observed in land preparation, planting, intercultural operations and harvesting as compared to men. It has been observed that most of the drudgery related operations are done by women, whereas, men were carried out mechanized operations which involved lesser drudgery.

Constraints

Major constraints such as non-availability of quality seeds, irrigation, financial and infrastructural facility including electricity were faced by the farmers.

CTCRI, Thiruvananthapuram

Role and responsibility in post harvest cultivation of crops

The analysis of data in post harvest cultivation of cassava from Thiruvananthapuram revealed that the role and responsibility in general was almost dominated by the men. Women had independent role in the activities such as retention for consumption (14%), grading (3%), marketing of produce (1%), retention for seed (1%), whereas with men they had role in grading (2%), curing (5%) retention for consumption (29%), retention for sale (2%), processing commercial level (1%), processing household level (1%), marketing of produce (1%). Women in Kollam had independent role in activities such as retention for consumption (14%), grading (3%), marketing of produce (1%), retention for seed (1%). Women had less participation in post harvesting operations of banana. They had independent roles in retention for consumption (23%), retention for sale (1%), marketing of produce (1%). Men took full responsibility in all activities whereas women have only partial responsibilities. This may be because females do not get enough opportunity to take the full responsibilities.

Role and responsibility in post harvest activities of vegetable crops

Women in Thiruvananthapuram had independent roles in activities such as retention for consumption (25%), retention for sale (3%), retention for seed (2%) and processing for house hold



Banana based intercropping model

level (4%), grading (2%), marketing of produce (3%) in vegetable. Women also assisted men in curing (1%), grading (22%), cleaning (13%), processing of commercial level (7%), retention for consumption (45%), retention for seed (5%), retention for sale (3%), storage (1%), and marketing of produce (32%). Women in Salem have independent roles and significantly participated in cleaning (2%), drying (2%), peeling (2%), packing

(4%), labeling (2%), processing household level (2%), processing commercial level (2%), retention for consumption (2%) in cassava and helped the men in curing (58%), grading (78%), cleaning (79%), drying (54%), peeling (34%), cutting (60%), packing (63%), labeling (62%), retention for seed (61%), storage (36%) and marketing of produce (32%). Results of coconut based inter cropping with aroids showed that women have minor participation with men in retention for consumption (1%), retention for seeds (1%) and marketing of produce (3%) and in other activities their participation was less.

Role and responsibility in post harvesting of flower in Salem District

Women had partial responsibility in harvesting (56%), grading (77%), cleaning (64%), cutting (1%), packing (50%), labeling (48%), processing commercial level (1%), retention for seed (7%), retention for sale (11%), storage (2%) and marketing of produce (31%) in flowers.

Training organized

One day farm women training was organized on soil sampling; planting method and fertilizer application in cassava on 23rd August 2011. 18 farm women from Chenkal were attended. A training on value added products of tuber crops were also conducted for 2 batches on 24th, 25th October 2011 and 15th November 2011. Demonstration classes as well as practical oriented classes were given for making wide varieties of products using tuber crops.



Training on value added products of tuber crops

CIPHET, Abohar

One day training programmer for women on Post Harvest Management and Value Addition of Horticultural crops under Network Project on Assessment of gender issues and identification and refinement of selected women specific technologies in horticultural crops held on date 18th October, 2011 at CIPHET, Abohar. In this training programme the 30 village female farmer participants from the near village of Nihal Khara under block of Khuia Sarwer tehsil Fazilka district Fazilka. After training programme the feedback/discussion do by participants. All female participants were interested to use machine of aonla processing plants because in this area production of aonla high but high production no beneficial to farmer because the lack of

aonla product developments technologies and machine. At village level they develop the product with less self life with the use of traditional method.



Women attending training and working with Aonla Shradar machine

CISH, Lucknow

CISH has developed a machine called aonla destoning machine for removing the stones from aonla fruits. This has potential to solve the problem of drudgery in processing of aonla. Keeping this in view, four machines were got fabricated under the project taking the help of engineers from the Institute. These machines were provided to a group of women in Kanar village, around 3 km from the Institute. A group of 20 women used the machine and shared gave their feedback. The feedback given by them is as under.

- The machine was found suitable for removing stones from large sized aonla fruits as it takes on an average fifteen minutes to remove the stones from one kg aonla fruits.

Constraints and suggestions

- The present model requires two persons, one for putting the fruits in proper place and another to press the handle like a hand pump. There is scope to reduce the size of machine in such a way that it is easy to operate by one person.



- The machine is good for large sized aonla fruits with less fibre content in case of smaller and fibrous fruits the stone gets choked in the blade resulting in damage to other fruits. There is scope for developing different size of blades and also making provision for putting different size fruits in proper position to ensure the stone removal.
- At present, more than 50 per cent fruits were damaged due to stone choking in the blade. Splitting of fruits during the process of stone removal and choking of cylindrical blade with stones are the major problems associated with the machine because of which the machine needs refinement by the developer.

Refinement of vegetable based organic farming practices with gender perspective

Naresh Babu, SK Srivastava and MPS Arya

Cowpea

Cow pea variety Utikal Manik was sown and different manures such as farmyard manure, neem cake and vermicompost alone and in combinations were applied as per treatment 10 day prior to the seed sowing. The data recorded on various parameters revealed that maximum estimated green pods yield (5.56 t/ha) was recorded under FYM @ 5 tonnes/ha + vermicompost at 3 tonnes/ha followed by FYM @ 2.5 tonnes/ha + neem cake @ 1 tonnes/ha, whereas the lowest yield (3.28 t/ha) was under control. Highest net return (₹. 24340) and benefit cost ratio (1.67) was recorded with FYM application @ 20 tonnes per hectare. No aphid incidence was recorded when the plots treated with neem cake 2 tonnes/ha, vermicompost 6 tonnes/ha and FYM (10 t/ha) + neem cake (1t). FYM (10t/ha) + neem cake (1t/ha) and neem cake (1t/ha) + vermicompost 3 tonnes /ha found equally effective to minimize the incidence of rust in cow pea. However application of vermicompost @ 6 tonnes/ha was also found effective against the rust incidence. Seed treatment with *Rhizobium culture* @ 20g/kg seed of cowpea enhanced yield (green pods) by 15 per cent over non-treatment of seeds.



Production of organic cowpea

Tomato

Trial comprising eight treatments involving three sources of organic manures viz. farmyard manure, neem cake and vermicompost was laid out in randomized block design with three replications. FYM, neem cake and vermicompost were applied separately and in combinations as per treatment 10 days prior to the transplanting. The results revealed that maximum fruit yield (28.18 tonnes per hectare) and highest net return (₹. 80100) and benefit cost ratio (2.40) was recorded under the application of FYM @ 20 tonnes per hectare. Thus it can be concluded that application of FYM @ 20 tonnes per hectare may be more economical for tomato production in Odisha conditions. Besides, nursery treatment with *Trichoderma viride* was found beneficial for tomato seedlings. Soil treatment with *Trichoderma viride* at 5 kg/ha was mixed with 50 kg of FYM and applied at the time of transplanting was also found effective in increasing fruit yield of tomato by 12 per cent as compared to untreated plot.



Production of organic tomato

Participation of men and women in different activities of tomato and cowpea vegetable production (hour/ha)

A study was conducted to perform various activities by men and women in cow pea and tomato crops. Data revealed that as much as of field leveling was done by 167 man hours, the same amount of field leveling was done by 208 women hours. Women took 225 hours in application and mixing of manure in one hectare of land while men took 183 hours for the same work. However, men and women took 83 hours for spraying of NSKE solution to control insect pest like aphid, leaf eating caterpillar and pod borer in cowpea. Study also revealed that women took more time (1300 hours) for harvesting of cowpea as compared to men (1260 hours). In case of tomato women spent more time (125 hours) in preparation of nursery bed and sowing of seeds as compared to men (80 hours).

In vitro multiplication of pointed gourd and pineapple for income enhancement of farm women

Kundan Kishore and A K Shukla

Tissue culture technology is an important tool not only to meet the requirement of quality planting materials for farmwomen but also for their capacity building.

Optimization of *in vitro* propagation of pineapple

The *in vitro* regeneration protocol was developed for important pineapple varieties by optimization of culture condition through manipulation of BAP and NAA to produce elite plantlets efficiently and rapidly to meet the requirement of quality planting material. The optimization of *in vitro* culture of pineapple was done by direct organogenesis. Sterilized explants were cultured on solidified MS medium supplemented with various combinations of BAP (2.5 to 10.0 mg/l) and NAA (1 to 4 mg/l) hormones. The best initial micro-shoot response was obtained when the explants were cultured on the medium containing BAP 2.5 mg/l and NAA 1.0 mg/l. In addition, sub-cultured medium with similar combination of BAP and NAA produced highest number of regenerated shoots and maximum shoot growth. The *in vitro* rooting was optimized with 0.4 mg/l NAA which gave the highest per cent of root initiation (54.3%) and number of roots (8.6). The optimization of *in vitro* plantlet development of pineapple will act as a tool for large scale propagation and conservation of elite germplasm. However further standardization of medium for getting better results is still under progress.



In vitro plantlets of pineapple variety

In vitro propagation of pointed gourd

The *in vitro* regeneration protocol was developed for pointed gourd by optimization of culture condition through manipulation of Kinetin to produce elite plantlets rapidly to meet the requirement of quality planting material. The nodal portion of vine was taken as explants. Sterilized explants were cultured on solidified MS medium supplemented with various combinations of Kinetin (2 to 10 mg/l) with and without NAA.

The best initial micro-shoot response was obtained when the explants were cultured on the medium containing Kinetin 8.0 mg/l without NAA. In addition, sub-cultured medium with half concentration of BAP produced highest number of regenerated shoots and maximum shoot growth. The *in vitro* rooting was optimized with 0.4 mg/l NAA which gave the highest per cent of root initiation and number of roots (3.6). The optimization of *in vitro* plantlet development of pineapple will act as a tool for large scale propagation and conservation of elite germplasm. However

further standardization of medium for getting better results is still under progress.



In vitro plantlets of pointed gourd

Refinement and development of horticulture based cropping models for gender mainstreaming

Naresh Babu, Kundan Kishore and A K Shukla



Intercropping in mango

Four intercrops including cowpea, radish, okra, and French bean were evaluated in mango based model with 5 varieties viz. Dashehari, Langra, Gulabkhas, Mallika, Amrapali to address the yield and family sustenance. Radish was the best intercrop and recorded highest yield (54.30t/ha). Maximum net return ₹ 32260/ha and B: C ratio of 2.24 was obtained in mango + cowpea intercropping. Mango + French bean system was found next profitable. Fodder generation was higher (160.62t/ha) in sole crop of cowpea.

Mulching in mango

An experiment was conducted on different types of locally available mulching along with black polythene in mango variety Mallika and Amrapali and found that black polythene mulching



recorded high moisture content in the soil near feeding root zone as compared to other treatments (33.36% and 34.91%) in both varieties of mango.



Mulching in mango

Table 16. Effect of mulching on moisture conservation and soil temperature

Treatment	Malika		Amrapali	
	Soil moisture (%)	Soil temp (°C)	Soil moisture (%)	Temp (°C)
Cowpea biomass	19.65	31.23	23.83	31.66
Cashew leaf	18.51	31.50	33.73	31.66
Dry grass	21.13	30.63	25.32	31.66
Glyrecedia leaf	23.77	31.43	28.38	31.70
Paddy straw	25.58	31.00	30.88	31.86
Banana trash	22.40	31.80	23.84	31.83
Black polythene	33.36	31.26	34.91	31.70
Control	18.04	31.55	19.84	31.65

Underutilized fruit based cropping model

Work efficiency of women vis-a-vis men in orchard activities

Preliminary studies were conducted to assess the efficiency of women in different field operations of fruit crops at DRWA research farm. More than 20 different activities were considered for study. Men and women were employed for these activities as per their normal routine work. The physical strength of men and women was not taken into account. It was observed that the efficiency of women was about 2/3rd of men in basin making, training and pruning of plants, pit digging, spraying and pasting of trunk. However the efficiency of women was at par with men in other activities.

Studies on pruning intensity in custard apple

Pruning and pollination studies have been taken up to improve the production system of custard apple so that its cultivation can be taken by women. The pruning of custard apple plants was done in the first week of December 2011 with an aim to maintain productive canopy at manageable height so that women could easily manage the plants. There were three pruning intensities viz. 25 per cent, 50 per cent and 75 per cent, whereas unpruned trees were considered as control. The maximum number of flower/twig (12.6), fruit set (4.7) and canopy volume was

recorded in the plants pruned with 50 per cent intensity followed by 75 per cent pruning. Whereas the minimum flowers/twig and fruit set was recorded in control trees.



Pruned plants of custard apple



Flowering in custard apple

Pollination studies in custard apple

The pollination studies are directly concerned with the production and fruit quality as pollination is the major limitation in custard apple production. Studies on pollination aspect of custard apple proved that insufficient pollination by beetles is the major cause of poor fruit set hence hand pollination is instrumental in enhancing yield and quality of fruits. Hence the present investigation will be helpful for farm women in adopting custard apple as one of the components of fruit production system.



Canopy management in guava

There are various limiting factors related to production and productivity of the guava and one of them is poorly managed declining old and senile orchards. Thickly shaded, wilt affected and stem borer infested guava orchards are commonly seen in different parts of Odisha. Due attention is required for developing and deploying appropriate technology to manage such senile orchards in order to attain the competitive edge in commercial production and to meet the quality standards of the conscious consumers. In view of this an experiment has been started at DRWA during 2011 with three levels of pruning and three cultural practices. Study revealed that 50 per cent thinning of the shoots was superior to the rest of cultural practices and control in respect to growth i.e. diameter of the shoot (11.40 mm), canopy volume (370.35m³), relative growth of shoot at 75th, 105th and 135th days (41.90%, 34.23% and 14.25% respectively), fruit yield (13.28 kg/plant), lowest number of the seeds (163.22), TSS (14%), total sugar (7.46%) and vitamin C content (238.33mg/100g pulp). Further, bending of some erect growing shoots results increased flower bud formation beyond the bend as the bend restricts the movement of carbohydrates. It increases fruit yield and encouraging fruit set on lower part of tree and control vegetative shoot growth and also increase physico-chemical characteristics of guava fruits.



Women involved in guava canopy management

Physicochemical studies of fruits and vegetables

The physicochemical properties of mango, custard apple, lime and tomato was studied. Moreover, the seasonal variation in the physicochemical attributes of guava was also studied.

Table 17. Physico-chemical studies of different fruits

Variety	Fruit wt.(g)	Juice (%)	Pulp (%)	Peel (%)	TSS* Brix	Acidity (%)	Total sugar (%)
Mango							
Amrapali	244.0	50.6	69.6	16.9	23.0	0.33	16.5
Mallika	436.8	48.6	65.7	18.6	20.0	0.35	15.9
Langra	281.2	49.2	69.2	16.6	21.2	0.3	15.9
Dashehari	185.7	46.8	64.2	18.6	21.4	0.4	15.7
Custard apple							
Balanagar	112.4	10.4	36.0	58.0	22.0	0.67	17.6
Arka Sahan	164.3	12.6	38.2	50.2	23.0	0.64	17.9
Lime							
Pant lemon -1	27.8	24.6	-	32.8	4.6	3.8	2.7
Guava							
L-49	95.1	-	-	-	14.0	1.4	9.6
Allahabad Safeda	92.3	-	-	-	14.0	1.3	9.7
Arka Mridula	82.0	-	-	-	17.0	1.0	9.7
Arka Amulya	90.2	-	-	-	14.0	1.4	8.6
Tomato							
BT-10	56.5	58.7	-	-	5.2	1.2	3.2

Enhancing livelihood of rural women through livestock production

Anil Kumar

DRWA, Bhubaneswar

Analysis of gender disaggregated data on various accepts such as socio-economic profile, livestock programme and extension services, access and control over resources, livestock production and livestock productivity and management systems were completed. Of the 262 household surveyed, 63 per cent reported agriculture as their main occupation and 32 per cent as livestock rearing. Sixty two per cent of the household were members of SHGs of which 40 per cent were men and 23 per cent women. Forty five 45 per cent of the families lives in kutcha houses followed by 31 per cent in thatched and 12.6 per cent in pucca houses. Eighty eight 87.8 per cent of animal houses were made of kutcha or thatched and only 5 per cent were housed in asbestos sheds. Survey of farm implements revealed that only 4 villages out of 9 surveyed had chaff cutter which indicated the lack of awareness about the use of chaff cutter for livestock feeding. Over 80 per cent of the respondents reported that veterinary officer and village level extension worker visited their villages one or the other time. Twenty one 21.4 per cent of the respondents had experience in dairying followed by 17.2 per cent in goat keeping, 8.8 per cent in poultry and 2.3 per cent in sheep rearing. Sixty eight per cent of the respondents reported that because of non availability of timely services they could not avail the benefits from extension services of the various government schemes. Regarding sources of information, neighbours, friends and relatives, progressive farmers, kisan goshi and radio were the main source from where people shared information among each other.

Role of women in different livestock rearing activities such as role in breeding, feeding, health care, processing and marketing were also studied and are depicted in figures 9 to 12.

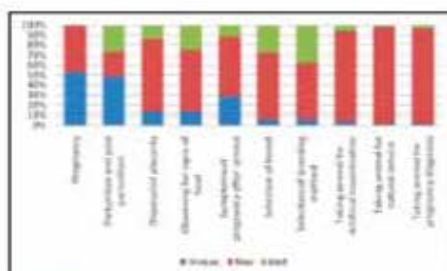


Fig. 9. Gender roles in breeding activities of dairy animals

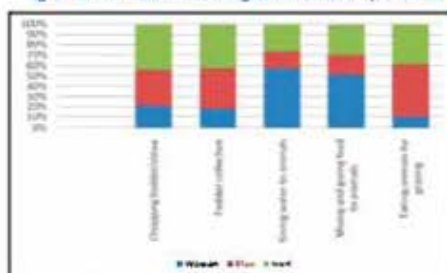


Fig. 10. Gender roles in feeding of animals

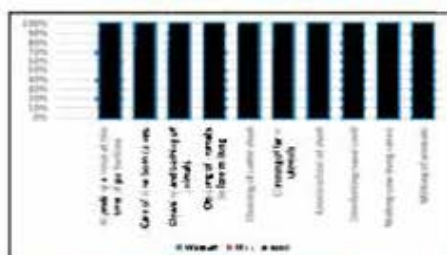


Fig. 11. Gender roles in management of livestock

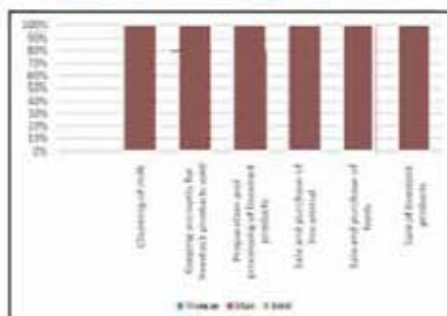


Fig. 12. Gender roles in processing and marketing of livestock and livestock products

Studies on adoption of livestock technologies by women were studied by undertaking action research on backyard poultry in Jaypur village in Puri district. Day old *CARI Devendra* poultry birds (120 nos.) were reared for 25 days at the Institute and distributed to twelve landless women of the village giving 10 birds each. The women were trained on making poultry feed with locally available feed ingredients. At the end of four months, the average weight of the birds was 825 g. The observation on the rearing of birds by women is under progress.

IVRI, Izatnagar

The study on 720 respondents revealed that the landless and marginal families mostly reared goats, cattle and buffaloes. Poultry was reared mainly for domestic purpose and eggs produced by birds were used for family consumption as well as for sale. The birds were disposed off whenever the families needed money to meet the emergency expenses. None of the family reared poultry for commercial purpose. Pigs were reared by a few schedule caste families for breeding purpose and generating income through sale of meat and the piglets. Cattle and buffaloes were reared for domestic use and sale of milk. The scale of production and productivity of livestock was low and followed low input and low output production system.

Role of women was found to be predominant in most of the livestock production activities, with low adoption of scientific animal husbandry practices, thus spending lot of energy and time, physical strain and muscular stress etc. leading to low livestock production and low income. In spite of their huge contributions, they were not paid properly and their services were not acknowledged. They also had low access to extension services, credit and market, animal health services, etc. The difference between the husband and wives with respect to breeding, health care and marketing related activities were found to be significant. No significant difference was observed between the roles performed by the husband and wife with respect to management, and feeding activities. The share of women in decision making was also found low in most of the activities. Women took decisions in 14 per cent cases independently as against 75 per cent in case of males and 10 per cent decisions were taken jointly.

About 30 per cent of the males had access to extension agencies like village level extension worker (30.83%), veterinary assistant surgeon (30.83%), paravets (25.86%) and agricultural extension officer (26.39%), 5 per cent to NGOs against only 18 per cent women, who had access to village level extension worker, 14 per cent to veterinary assistant surgeon and 11 per cent women to agricultural extension officer and NGO personnel. The frequency of regular contact with extension agencies was about 65 per cent amongst males compared to 38 per cent among females. Contact to other agencies like traders, vet medicine dealers, feed dealers, etc was found to be negligible among both the type of respondents. The major reasons for not availing extension services revealed by the respondents were; non availability of timely extension services (91.67%) at door step and sometimes without prior notice (81.95%) and the contact of extension

workers to selected farmers only (77.77%). Besides, the venue being inconvenient, non availability of female extension worker and difficulty in contacting the male extension workers due to socio-cultural constraints were the other reasons revealed by the female respondents for not availing the livestock extension services. Majority of the respondents relied on their neighbours (75.83% females and 78.33% males) as interpersonal source of information followed by Research Institute / University personnel (52.50% females and 67.78% males) and friends & relatives (41.67% females and 40.28% males). Radio was the major source of information (47.78% females & 46.94% males) in the category of mass media. Group discussions / goshlies (45.56% females and 47.50% males) were also found to be the important source of information in the studied area.

Appropriate practices were selected and refined based on their socio-economic profile of household, herd structure, major crops grown, interest and awareness about extension programs, access and control on resources, role in dairy husbandry practices, decision making pattern, perception and adoption of improved technologies, problems faced in adoption of improved technologies, etc and other technological constraints revealed by the respondents. The study also attempted to link the gender and socio economic factors in livestock keeping and livelihood security and used this information as a basis for identifying the interventions and strategies for enhancing income and employment. Successful implementations of these interventions were not only motivational but also helped in increasing knowledge, skills and attitudinal changes among the clients in a sustainable way.

To overcome the problem of repeat breeding and infertility, area specific mineral mixture in concentrate feed was demonstrated to the farm women. Feeding area specific mineral mixture and vitamin supplementation to buffalo from calving to 6 months into lactation observed an increase of 12-15 per cent milk yield per animal per day, 20-25 per cent improved body weight in calves and 23-30 per cent economic returns with BC ratio 2.06 over the existing practice 1.82:1 i.e. feeding dry fodder. Supplementation of UMMB licks significantly increased feed intake, milk yield, weight gain and general body condition of the cows with enhanced cash benefit of over ₹ 7-8/day/cow in mixed farming system. The cost benefit ratio calculated from the economic returns was found 1:2.36. Results of goat demonstration units each comprising 5 adult females and 1 male yielded an average gain of ₹ 3500/- to 4000/- per unit @ ₹ 500/- per kid after six months. After one year, a family could fetch ₹ 10,000/- to 12,000/- per unit from the sale of the available young stock (if not sold earlier) and kids of second lactation. The success rate of poultry demonstration units comprising 20-25 day old chicks suitable for backyard poultry - *Shyama* and *Nirbheek* were also found to be impressive in most of the villages. A family could earn an average of ₹ 3500/- to 4000/- @ ₹ 4/- to 5/- per egg from the sale of eggs in a year. The results of economic impact of the pig demonstration units each comprising 4 females and 1 male piglets of landrace breed revealed an average gain of ₹ 6000/- to 8000/- per animal by selling piglets at two months of age @ ₹ 1000/- to 1200/- each in a year.



Women participating in animal health camp

Women were also motivated to use the revolving stool (*pirhi*) for milking animals for reduction of drudgery and in order to reduce the cardiac cost per unit of output. The productivity of the workers increased over the traditional method of sitting in squatting position while milking animals, resulting in reduction in physical drudgery, grip strength, perceived exertion and total cardiac cost of work. The study revealed about 26 per cent saving in cardiac cost of women workers per unit of output for milking a buffalo using a revolving stool as compared to the continuous squatting position traditionally. The physical drudgery/body part affected was reduced and no complaint of low back pain, knees, ankles and calf muscles were reported. There was a saving in the reduction of grip strength to the tune of 11.81 per cent when milking was done using revolving stool over the squatting position. The reduction of grip strength was 9.03 per cent as compared to the squatting position where grip reduction was 17.07 per cent.

VCRI, Namakkal

Capacity building programme on Appropriate Livestock Production Technologies were conducted in four villages namely, Yodapalli Agraharam, Kadachanallur villages (Irrigated block) and Munjanoor and Morangam villages (rain fed block). Ninety farmers from the above villages participated in the programme. Inputs such as Co4 fodder slips, Agathi, Glyricidia, Subabul and kodukapuli tree saplings and desmanthus, CoFS 29 seeds, guinea grass, mineral mixture and mineral blocks and books on latest technologies in dairying, sheep and goat farming and backyard poultry specially prepared for the scheme were distributed among the beneficiaries. Demonstrations were carried out on azolla cultivation, milking machine and use of chaff cutter. The beneficiaries from all the villages were taken to Veterinary College and Research Institute, Namakkal livestock, poultry and agronomy model farms for field visits. To upgrade the local breed of goat, Tellichery bucks were distributed in the villages. Preparation of value added milk products were demonstrated to produce entrepreneurs to improve the economic status of the respondents. Follow up visits to all the scheme villages were carried out to document the adoption of scientific technologies. About 75 per cent of the dairy farmers (especially large farmers) started practicing chaffing of the fodder and using mineral

mixture after the demonstration were carried out in the villages. Sheep and goat farmers started using tree fodders (especially in rainfed areas) and feeding concentrates for breeding animals and kids from 2-4 months.

To improve the adoption of scientific livestock rearing practices three books on dairy, sheep and goat and backyard poultry and five folders on different practices on first aid, vaccination schedule, farm implements, backyard poultry and important contagious diseases of livestock have been prepared in regional language based on problems encountered in the project area.

Post Graduate Institute of Veterinary & Animal Sciences, Akola

Capacity building of women livestock farmers were done by organizing three training programmes on different aspects of livestock production in which 180 women participated. They were taught different aspects of scientific management of livestock and creating awareness and giving knowledge and motivation for taking up livestock enterprises and adoption of improved livestock technologies. The training programme comprising of lectures and practical work were arranged by the subject experts. A training manual on 'Care and management of livestock' was distributed among the trainees. Various topics such as backyard poultry, quail rearing, buffalo management and azolla cultivation were also covered during the training programme.

Three animal health camps were organized at Charangaon, Pandhurna and Sonona villages in which 159 animals like goat, cows, buffaloes, bullocks etc. were treated for different diseases. Organization of the animal health and infertility camp created the mutual trust and liaison and rapport building between Institute and village livestock owners. This facilitated the organization of further programmes. Impact of the health camp resulted in improved general health and body score of the livestock increased livestock productivity. First aid kits containing feed supplements, liver tonics, rumenotronics, anthelmintics, wound ointment was distributed to all the 180 participants to increase the productivity and fertility of livestock. The nutritional feed supplements were distributed to the participant women to improve production performance and to adopt scientific livestock management practices.



Backyard poultry rearing by women

Action research on backyard poultry was undertaken by distributing 90 units of 8+2 Giriraja or Vanraja 5 months old poultry birds for egg production, to those either having some poultry birds or having experienced in backyard. The birds were preferably distributed to the widows, divorcees, orphan and lonely women from the selected participants at all villages as a source of supplementary income to earn their livelihood. The average monthly income per unit was ₹1043/- by the sale of eggs and birds. The poultry units was very popular among the women, however the units may be increased to 25 birds with 2-3 roosters to draw considerable income and for self employment enterprise as a refinement otherwise maintaining merely 10 birds by one person would be uneconomical considering the cost of labour.

Review workshop

The Workshop on Enhancing the Livelihood of Rural Women through Livestock Production under network project was conducted on 8-9th November 2011 at ICAR Research Complex for NEH Region, Umiam, Meghalaya under the chairmanship of Dr. S.V. Ngachan, Director, ICAR Research complex for NEH region in which the scientists from the cooperating centres, and ICAR complex, Barapani and representatives from State Government and NGOs also participated. All the network centres presented the progress report and elaborate discussions were made on it. Dr. Anil Kumar, PI of the lead centre gave an overview of the project including the genesis and objectives of the project. Progress of work at different centres was discussed and it was emphasized that the various technological interventions identified in the respective region should be taken to the women livestock keepers and the impact should be studied. Besides, the various programmes and policies of the government departments with respect to livestock development programmes should be evaluated from the perspective of gender sensitiveness and involvement.



Review workshop

Capacity building of coastal fisherwomen through post harvest technologies in fisheries

Abha Singh and P. K. Sahoo

Network project was operated in seven network centres DRWA, Bhubaneswar (Lead Centre), FC&RI, Thoothukudi, CIFT, Cochin, CIFE, Mumbai, College of Fisheries (OUAT) Rangailunda, Barhampur, KVX-Undi (ANGRAU), West Godavari and NFDB, Hyderabad.

Data on socioeconomic conditions, women's role and gender issues, in fisheries post harvest technologies were collected by each network centre. Collected market samples of dry fish were analysed and were found poor biochemical quality with high content of ash indicating the presence of sand. The quality of market samples of dry fish suggested intervention at the producer level for hygienic dry fish production. Self help group comprising 25-30 fisherwomen was formed for the production, processing, packaging and marketing of hygienic dry fish by each network centre. These fisherwomen were trained on hygienic production of dry fish process by each centre. Six demonstration units has been constructed one at each network centre to demonstrate the hygienic production of dry fish process to fisherwomen with the financial support of NFDB.

DRWA, Bhubaneswar

Data on socioeconomic conditions, women's role and gender issues, in fisheries post harvest technologies were collected from six coastal districts namely Ganjam, Puri, Balasore, Bhadrak, Kendrapara and Jagatsinghpur. Sixteen blocks, 32 villages and 910 households were covered for data collection.

The methodology included both primary as well as secondary data collection. For primary data collection semi-structured interview schedule, group discussion and meetings were conducted. Information for secondary data was collected from state fisheries departments, block office and village panchayats etc.

The women involved in dry fish production were mainly in the age group of 25 to 50 years and majority of them from OBC category with only 27.6 per cent literacy. Major primary occupation of the families was fishing and dry fish production. Major secondary occupation of households involved in dry fish production was wage labourer in shrimp exporter industry, ice factory, peeling, icing, net weaving, poultry, prawn farming and over all 35.32 per cent fisherwomen were working as labourer as secondary occupation. Annual income of majority of the households was more than Rs.20000/-. Majority (72.24%) of the households had their own land and 61.04 per cent of the households were having katcha house.

Fisherwomen felt that social support is the most important need for dry fish production followed by support from their spouse and financial and technical support from the Government.

Participation profile of men and women in dry fish production process indicated that 50 per cent women population in Puri and Ganjam districts were involved in fish collection/procurement from the sea coast along with other activities of dry fish production process but in the other districts this work was mainly done by men only. grading, salting, drying and storage were mainly done by women in all the districts. Packaging and marketing were done by both men and women.

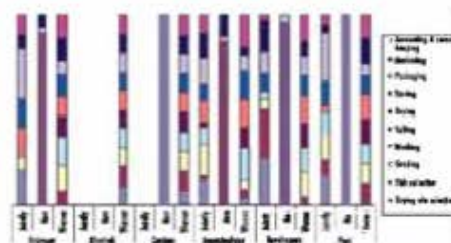


Fig. 13. Gender participation in dry fish production

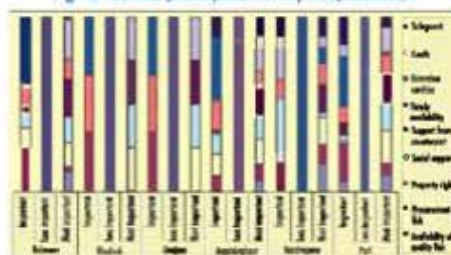


Fig. 14. Women's views on their need in dry fish production

As an intervention to improve the quality of dry fish, a group of 25 fisherwomen of Penthagota village of Puri district were selected for hygienic production process and marketing of dry fish. A two day training programme on "Hygienic handling and production of dry fish" was conducted from 3-4 February 2012 at Penthakota, Puri, Odisha involving 29 fisherwomen. A protocol booklet on Hygienic handling and production of dry fish in simple local language was developed and distributed among fisherwomen during the training programme.

A demonstration unit with all the facilities of dry fish production process has been constructed in Penthagota village of Puri district with drying platform with the financial support of NFDB. A low cost fish drying rack for quality production of dry fish was constructed by using PVC pipe, connector and net. The frame consists of length 7' 9", height 5' 7.5" and width 3' 6" which holds four removable drying beds of 3' 6" x 3' 6". Height from ground to first rack is 3' 5.5" and the gap between two racks is 2'.



Raised drying rack

Review workshop

The review workshop of the network project was held on 4 July 2011 at DRWA, Bhubaneswar under the chairmanship of Dr K. Srinath, Director, DRWA Bhubaneswar. All the network centres presented the progress report and elaborate discussions were made on it. Focused deliberations were made on the final outcome of the project as the activities are to be concluded by March 2012.



Training cum demonstration on quality production of dry fish



Model fish drying unit, Puri, Odisha

FC & RI, Thoothukudi

Eight fishing villages of Thoothukudi districts were purposefully chosen for the present study based on the intensity of fish curing. Proportionate random sampling technique was used for selection of respondents and 120 samples were selected for the study. Majority of the fisherwomen involved in the dry fish production and trade were middle-aged and educational status wise functionally illiterate. They have more than 10 years of experience, had high social participation through SHGs and better decision making power in family and their trade. Television is the most preferred mass media followed by radio and newspaper. Forty eight per cent of income comes from dry fish trade and major share of the income was spending for food. For dry fish production they concentrate on low to medium valued fishes. Except addition of salt no preservatives or additives were added to improve the quality of the dry fish. Adopting hygienic and standard procedures were not in place for dry fish production

Most of their products were sold in adjacent villages and nearby towns. Very little portion is sold to markets in distant places. Transportation of the dry fish was found to be the important problem for them. In few villages women transport their products collectively by arranging trucks. Common infrastructure facilities for dry fish production lack in the villages. Financially they were not in problem due to the micro credit programmes.

Based on the survey it was found that a standardized and improved method to enhance the quality of dry fish can benefit the fisherwomen. Based on the market survey conducted and availability of raw material Anchovy was selected for the trials with improved drying setup.

A raised drying rack was designed for improved fish drying. A steel frame of 2.5 feet height and 5 feet wide that holds 4 removable racks of 2.5 x 2.5 feet was constructed.



Raised drying rack

Civil work has been initiated in January 2012. Thirty women belonging to different SHGs from two fishing villages in Thoothukudi district were selected and training was conducted from 7-8 March 2012.

CIFE, Mumbai

Socio-economic survey of selected coastal villages were completed and women selected for participation in intervention were trained in the hygienic production process of dry fish. Construction of demonstration unit was completed.

KVK, Undi, West Godavari

Socio-economic survey of selected coastal villages was completed and women selected for participation in intervention were trained in the hygienic production process of dry fish. Construction of demonstration unit is going on.

CIFT, Cochin

Socio-economic survey of selected coastal villages was completed and women selected for participation in intervention were trained in the hygienic production process of dry fish. Construction of demonstration unit was completed and handed over to selected fisherwomen for hygienic handling, production and drying of dry fish in the presence of local leaders and NFDB Officials.



Model fish drying unit, Cochin, Kerala

College of Fisheries, QUAT

Socio-economic survey of selected village was completed and women selected for participation in intervention were trained in the hygienic production process of dry fish. Construction of demonstration unit is going on.

Empowerment of farmwomen through Information and Communication Technologies (ICT)

Suman Agarwal and Sabita Mishra

Women play an enormous role in agriculture and allied activities but they are marginalized with respect to access to information about latest technological developments in agriculture and allied fields. Information and Communication Technologies (ICTs) are "enabling" tools that can help poor rural women to capitalize on emerging opportunities especially in access of information and



Capacity building of adolescent girls for using computer

Income generation. The need of the hour is to develop the capacities of farmwomen for use of improved technologies, so that they can perform activities with more competences. A pre-requisite for this is to identify the information needs of farm women related to agriculture and allied fields. Accordingly, information needs of farmwomen for agriculture and allied

sectors were assessed. After assessing the need based areas of information for customization of Information, a study was conducted to assess the awareness and extent of use of ICT tools/ technologies by farmwomen. It was found that television set were possessed by 70 per cent farm - families followed by radio (62%). However, 76 per cent farmwomen had mobile phones in their homes. Very few women were found to have landline telephones in their homes (4%) and only 2 women had computers in their home and only one computer had internet facility. Regarding extent of use of these available ICT tools for obtaining information related to agriculture, findings indicated that majority of women use television (68%), followed by radio (36%). However, use of mobile phones was also indicated by 56 per cent women.

Data collected from January to December 2011 from a kisan call centre to find out whether women use toll free number of call centre for accessing agriculture related information or not from their mobile phones. Findings revealed that during the year a total of 146 farmwomen contacted and out of these only 100 women made the meaningful queries for seeking information. The types of information sought by farmwomen were mainly in the areas of crop, horticulture, entomology, diseases in small animals, and entrepreneurship. This confirms that farmwomen use ICT for seeking agriculture related information. Study revealed that 40 per cent farmwomen knew that besides radio, television and mobile phones, they can use computer with internet to obtain information related to agriculture and allied areas. Therefore to facilitate the use of computers and internet, capacities of rural adolescent girls were developed through a five days training programme. Besides, content has also been customized in local language (Odia) on the following areas for use through ICT:

- Water management in field by farmwomen
- Diseases of pregnant cow and its care
- Value addition in fruits and vegetables
- Floriculture – cultivation of marigold
- Fruit drop
- Banana diseases
- Pests in pointed gourd

Occupational health hazards of farm women at their workplace in Bhopal district

Jyoti Nayak, S.P Singh and Gayatri Moharana

Occupational health hazards of farm workers may be due to exposure to weather/climate, snakes or insect bites, sharp tools, use of farm equipment, physical labour, carrying loads, pesticides, dusts/fumes / gases/particulates, biological agents & vectors of diseases. In rural parts of the country, men and women, both are engaged in farm activities. Women do the household work in addition to child bearing and nursing to old parents. Thus their job in rural surrounding is more challenging than counter parts. This also reflects that they may be more prone to health hazards as they are involved in household's activities, animal caring, child rearing etc. Thus there is every



possible chance to face the hazards, which can cause harm if not controlled. So the outcome is the harm that results from uncontrolled hazards.



Women carrying head load of fodder grasses

The study was conducted in Bhopal district of Madhya Pradesh on occupational health hazards of farm women at their workplace. Data were collected from 480 households from 96 villages of Berasia and Huzur tehsils. The landless, marginal (<1.0 ha), small (1-2 ha), medium (2-4 ha) and large (>4.0 ha) respondents were 25.2, 21.0, 26.9, 17.1 and 9.8 per cent, respectively. Most of the respondents (75.2%) were from age group of 31 to 50 years. Data revealed that the nuclear family was decreasing from landless (56.3%) to large (22.4%) categories. Literacy rate of respondents was 58.1 per cent. On an average, a farm woman spent 11.6h per day for house hold, farm and animal rearing activities. Time spent in household, farm and animal rearing activities were 2.7h, 5.6h and 3.2h, respectively. Farm women carried green fodder & fuel wood from a distance of 2 to 4 km on their head that ranged from 17 to 36 kg head-load (Table 18) and time involved from 1 to 2.5h.

One of the major hazards faced by farm women in indoor environment was smoke and its effect on health due to burning of bio-mass fuel (cut-wood, dung cake, agriculture residue and forest wood) in un-ventilated and less illuminated condition at their workplace. Hazard faced by farm women in farm work was trapping of cloth, fall of machine on body, cut, irritating sound, vibration in working environment, snake bite, post-pesticide effect etc., in addition to heat stress in summer. Harm by animal was observed one of major hazards in animal rearing. Occupational health hazard index was developed on a numerical rating of 1 to 4 (one being low and 4 being severe) using overlay and index methods for use by researchers/ planner/extension functionaries and workers. By considering the perception about hazards faced by women in household, farm and animal rearing activities, the overall occupational health hazard index was found to 0.405. The medium level of hazard was found in household (0.49) and farm (0.44) activities. Low level of hazard was in animal rearing (0.27) activity. For validating their perception about extent of hazards, data collected from 66 respondents of 24 villages for workplace i.e. cooking related activities revealed the

occupational health hazard index was 0.67 which is about 37 per cent higher level of index. This clearly indicated that their perception about the existence of hazards was lesser than the actual as faced by them in performing various activities.

Fuel wood burning in stove created problems of eye itching/ irritation/ pain (24.2%), breathing difficulty (12.5%), watering of eyes (2.5%) and blurred vision (0.2%) as compared to the burning of dung cake, agriculture residue and forest wood. Kerosene stove also provided discomfort under same environment in terms of eye itching, irritation, pain, breathing difficulty, watering of eyes and blurred vision to the 2.9 per cent respondents.

Farm women faced discomfort due to sun-stroke (53.0 %) and dehydration (59.0%). Working methods and workload during household and farm work discomforted 51 to 69 per cent respondents in terms of pain in shoulder, leg/foot/pain, back pain due to load and headache. Chest pain, itching and dust problem were reported by 32.8, 18.5 and 16.0 per cent respondents, respectively. Cloth trapping and fall of machine on body were some of farm equipment (mechanical) hazards reported by 3 to 5 per cent respondents. The less number may be due to limited use by farm women. Cleaning of animal shed, collecting dung, feeding animal and fodder collection were the activities related to animal rearing which discomforted 40.6, 40.2, 34.2 and 52.7 per cent respondents, respectively. Injured body parts (hands, eyes and legs) due to animal were reported by 0.2 to 1.2 per cent respondents.

Anthropometric data collected during survey from 50 subjects involved in cooking activities were given in Table 18.

Table 18. Head load carrying by rural women

Particular	Weight carried (kg)	Distance to travel (km)	Time spent per trip (min)	Remark
Green fodder	17-30	2-4	60-120	More than the limit (15 kg)
Fetching of water	15	0.5	15-30	High frequency
Fuel wood	20-36	4	90-150	More than the limit (15 kg)

Table 19. Anthropometric data of selected 50 rural women (subjects) engaged in cooking activities.

Particular	Maximum	Minimum
Age (yrs)	70	19
Stature (cm)	169	122
Weight (kg)	72	33
BMI (kg/m ²)	32	15.6
Sitting height from floor (cm)	85	62
Acromial height while sitting (cm)	60	44
Elbow rest height (cm)	30	20
Arm reach from wall (cm)	80	60
Hand preference (no.)		



Reducing the gender gap in the nutritional status of farm families in rice based cropping systems

Abha Singh and M. P. S. Arya

Four districts namely Puri, Tehri, Faizabad and Hosangabad of Odisha, Uttarakhand, Uttar Pradesh and Madhya Pradesh were selected respectively for assessment of gender gap in the nutritional status of men and women from four rice cropping systems viz., rice-rice, rice-millet, rice-wheat and rice-pulse. Gender gap of three rice cropping systems in the anthropometric measurements as calculated by body mass index indicated that highest gender gap was found in rice-rice cropping system (13.33%) followed by rice-millet (11.11%) and negligible in rice-wheat cropping system (one per cent only). Haemoglobin estimation done in rice-rice and rice-millet cropping pattern indicated large gap in rice-rice (Odisha) and very negligible gap in rice-millet (Uttarakhand) cropping pattern. Large gender gap in the nutritional status in rice-rice cropping pattern was mainly due to only production of rice which creates less food choice at household level and major dependence on market for variety of foods. Blood pressure imbalance and diabetes problem was also assessed and found not so common in any of the three rural rice based cropping areas because both the problems are mainly due to mental pressure and sedentary life style as rural families had enough physical activities.

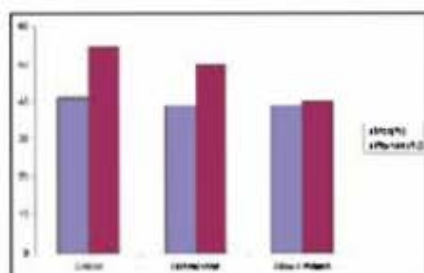


Fig 15. Gender gap in body mass index in three rice cropping systems.

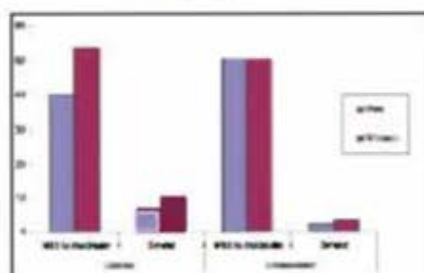


Fig 16. Gender gap in haemoglobin level in Rice-rice and rice-millet cropping system

Distribution of CED in men

As an intervention in rice-rice cropping pattern in Puri district of Odisha, kitchen garden, vegetables and pulse cultivation was initiated in participatory mode to incorporate more vegetable especially green leafy and pulses in their diet for improvement of protein and iron content. Ten kitchen gardens were established and fifteen demonstrations of pulses half acre each were conducted in Satyavadi block of Puri district to incorporate vegetables and pulses in their cropping pattern and thereby improving their diets.



Pulses grown after rice



Green vegetables grown after rice

AICRP on Home Science

The All India Coordinated Research Project (AICRP) on Home Science is in operation in nine State Agricultural Universities. The main thrust of the project is empowerment of rural women for enhancing the quality of life of farm families. The salient achievements under major thematic areas are summarized below:

Gender disaggregated database

Data pertaining to 8875 households from 46 agro-climatic zones were analyzed to study the gender participation in agriculture through selected indicators.

Farming

Role and responsibility

The data pertaining to role in each activity under farming indicated that independent participation of male member was higher than the female members in all the states except Uttarakhand. Among all the states, participation of women in farm related activities was found highest in Uttarakhand (29.41%) and negligible in Punjab, Haryana, Karnataka and Maharashtra. Joint participation with female members was higher in Andhra Pradesh, Himachal Pradesh, Maharashtra and Rajasthan in seed selection, nursery raising, transplanting, weeding and harvesting, highest was recorded in Assam whereas joint participation of male members with other male member was higher in land preparation, plant protection, irrigation, engagement of labour and procuring and repayment of loan in Assam, Andhra Pradesh, Maharashtra and Karnataka. For all the activities taken together in all the states 48.70 per cent male members had complete responsibility, whereas only 6.7 per cent female members had the complete responsibility of farm related activities. State wise comparison reflected a different picture in Himachal Pradesh, nearly 17.70 per cent rural women were completely responsible for different activities, which is much higher than the national average of 6.67 per cent. The reason behind this is mainly because the male members remain outside their home for a long period of the year serving outside their hometown. Inter zonal variation was visible with regard to role and responsibility profile in all the states.

Access to and control over land

Complete access of rural women over use of land was noticeably high in Himachal Pradesh (70%), Maharashtra (50%) and Uttarakhand (32%) but low in sale and purchase of land. More women respondents of Himachal Pradesh, Rajasthan and Karnataka had complete access over tools and implements than other states. Complete access to and control over storage and retention for household use for women was higher than other resources in Punjab (63%), Uttarakhand (55%), Andhra Pradesh (51%), Himachal Pradesh (31%), Rajasthan (30%) and Haryana (27%) than rest of the states. Control over improved seeds was visibly high in Uttarakhand (55%).

Post harvest management

Role and responsibility

Independent joint participation of rural women was visible in all home based post harvest operations such as winnowing, cleaning and drying. Joint participation with male members emerged to be high in all states with highest in Uttarakhand followed by Himachal Pradesh. The comparative analysis of men and women in post harvest activities between nine states revealed that drying, storage, cleaning and processing of grains is mostly performed by majority of the women in all the states with highest mean score of 3.57 in Uttarakhand and lowest of 1.93 in Maharashtra. The lowest scores for processing at commercial level, management of cash, marketing and engagement of labour indicated a lesser participation of women in these operations.

Homestead gardening

Role and responsibility

Homestead garden was not found in the sampled families of Andhra Pradesh and Rajasthan. The pooled data reflected out of the total families involved in homestead garden related activities, independent participation of rural women was higher (28.78%) than male members (20.42%), while equal numbers of male and female members shouldered complete responsibility. Highest independent participation of women was seen in Uttarakhand (43.65%), followed by Haryana (36%) and then Himachal Pradesh. More than 50 per cent of the rural women were performing activities in this area independently in all the states. The rural women were performing nursery raising, transplanting of seedlings, maintenance of seedlings and irrigation, retention for seed and consumption independently in comparison to male members with complete responsibility.

Access to and control over resources

The scenario of female members having complete access over homestead resources was brighter, in comparison to the resources in other areas. More than 90 per cent of the female members had partial access to and control over these resources indicating that the women have limited right to make decisions related to cash and credit. The complete access to and control over homestead resources of the rural men of different states varied from 45 per cent to 72 per cent indicating that in the study area households were still under the command of the male members. Interstate comparison reflected that in case of Punjab equal number of rural women had complete access to and control over homestead related resources and services while nearly 49 per cent rural women of Himachal Pradesh had complete access but only 17.50 per cent had complete control. The extent of complete access of female members was high in purchase of food and clothing, immunization of children, jewellery and maternal health and engagement of labour, but the number of female members having complete control was lower than the members having complete access to the services/resources. But majority of the rural women had partial access to and control over resources.



Horticulture

Role and responsibility

Independent participation of rural women in horticulture related activities was not reported in Punjab, Rajasthan and Karnataka. Only few members performed the activities that too either jointly with other female member or male members. Nearly 34 per cent rural women performed horticulture related activities independently and 66 per cent shouldered the complete responsibility. Most of the horticulture related activities were performed jointly with male members, but complete responsibility was visible for majority of the male members in all the states.

Access to and control over resources

Horticulture related resources were found to be under control of the male members as the data revealed that in most of the states complete access to and control over these resources was less for the rural women but they had partial access to and control over. More than 30 per cent of the rural women of Himachal Pradesh and Karnataka had complete access over Horticulture related resources but the complete control was with 9.7 per cent rural women of Himachal Pradesh, 10 per cent in Maharashtra and Uttarakhand and 5.5 per cent in Karnataka.

Livestock management

Role and responsibility

Taken all the livestock management activities together, independent participation of rural women members was not only higher than male members in Punjab, Haryana, Uttarakhand and Rajasthan but also than the national average of 22.32 per cent. At national level too the independent participation of women was higher than the male members, which was only 18.06 per cent. More number of male members were involved in fodder management and care of livestock taking complete responsibility. Involvement of female members were higher than male in cattle shed management, processed excreta management, management of produce and cash earned from produce, procuring and repayment of loan. Rural women of Punjab, Haryana and Rajasthan having complete responsibility of livestock management activities was higher than the rest of the states also the national average of 29.34 per cent.

Access to and control over resources

In livestock management resources complete access to and control over of rural women was predominantly recorded in excreta management and management of produce at household level in Punjab. Fodder was raised jointly with other male members. The comparative analysis of access to and control over of livestock management resources of men and women between nine states revealed that women having complete access to and control over was highest in Punjab among nine states which was 59.45 per cent and 61 per cent. The findings indicated that staying at home the rural women not only managed the animals but also took many decisions in this area. In Himachal Pradesh, Rajasthan and Haryana the rural women having complete access to and control over livestock resources was higher than male members.

Fishery

Role and responsibility

The number of households involved in fishery related activities was very small and was totally absent in Punjab, Uttarakhand and Rajasthan and in Haryana only male members were involved. The national data reflected independent participation of male member was prominent but joint participation of rural women with male member was higher than independent participation of women.

Access to and control over resources

With regard to access to and control over fishery related resources nearly 21 per cent of rural women of Maharashtra had complete access to and control over. But data from other states revealed that majority of the resources were complete control of the male members. State wise comparison further indicated that in Karnataka the rural women had access to but with no control over indicating that the human resources were used as labour only, limiting their decision making power. In Andhra Pradesh an equal number of women had complete access to and complete control over may be due to the fact that some of households were headed by women and male members were away from the families leaving it to the women to decide.

A comparison of the role profile in different activity areas indicated that highest independent participation of rural women was in homestead gardening (28.80%) followed by livestock management activities (22.30%) and post harvest management (11.40%). The responsibility profile showed women shoulder major responsibility in livestock management (29.30%), followed by homestead gardening and post harvest management activities. Regarding access of resources, rural women had complete access for livestock management (33.30%) followed by homestead (26.10%) in comparison to resources in other areas. Control over resources of the rural women was also higher (28.30%) in livestock resources than other areas.

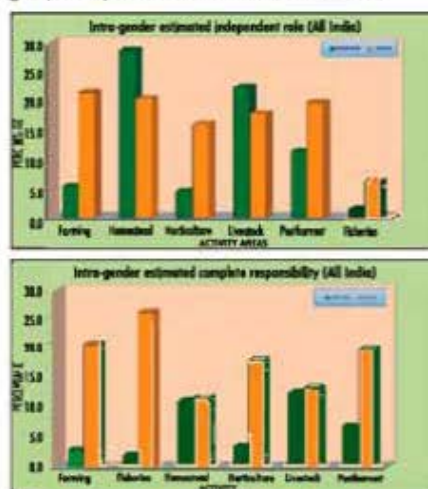


Fig. 17. Intra-gender role & responsibilities in different activity areas



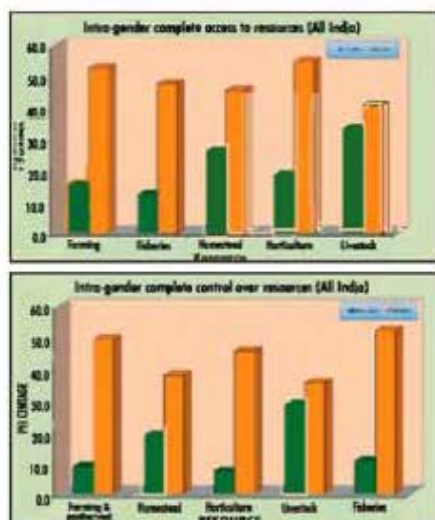


Fig. 18. Intra-gender access & control in different activity areas

Extension services

Knowledge and frequency of contact with extension person

Both rural women and men included as respondents in the present study possessed knowledge of different extension personnel such as VLEW, NGO professional, University personnel and Bank officers. Among those who have knowledge of Extension personnel more women know VLEW, followed NGO personnel and then Bank officers with occasional contact. Moreover, the female members had regular contact with the university personnel and occasional contact with the VLEW whereas male members had occasional contact with the extension officers and regular contact with VLEW.

Participation in extension programmes

More of the male members participated in different extension programmes in different areas and these were mostly farm related followed by livestock management and horticulture while the women members participated in farm and homestead related programmes. Inter state comparison reflected that rural women of Assam attended maximum number of trainings related to livestock management, in Andhra Pradesh it was homestead in case of women, horticulture in Himachal Pradesh while it was in farming area in almost all the states among those who participated in extension programmes. Nearly 89 per cent rural women participated in farm related programmes in Uttarakhand which was highest among all the programmes and participation.

Reasons for non participation in extension programmes

In spite of different extension programmes conducted by various institutions and organizations, participation was not satisfactory all the time. The reasons given for non participation was shortage

of time for both rural women and men and sometimes it was organised without prior notice and also the subjects are not relevant indicating that the programmes were conducted without assessing the need.

Development of gender specific extension methodologies and training modules

For economic empowerment of women, nine training modules were developed for establishment of micro-enterprises related to bee keeping, value addition to tomatoes, fruit preservation, vermicompost, soybean – The golden grains and, dairy management, mushroom cultivation, value addition to amla and production of bio fertilizer. Along with the subject matter, the procedures/ methods, the photographs, video clips, video films and documentaries were also included in an interactive mode for easy comprehension by the user



Training models developed under AICRP

Technology interventions for drudgery reduction in agriculture

Nineteen technologies were field validated in the operational villages such as seed bag, fertilizer trolley, manual seed drill, mat nursery, vegetable plucker, vegetable bag, water bag, face protector, dung collector, fodder chopper, fodder collector, ground nut stripper, groundnut decorticator (sitting & standing), groundnut stripping frame, long handle fork, maize sheller, mango harvester, potato picker and revolving stool.

It was observed that among the technologies, mat nursery, revolving stool, groundnut decorticator was found above 70 per cent adoption where as long handle fork, water bag, face protector, mango harvester, vegetable plucker, maize sheller, ground nut decorticator (sitting type) and fertilizer trolley found 50 – 70 per cent adoption and dung collector, vegetable bag, groundnut stripper, potato picker and fodder collector found the adoption of 30-50 per cent.



Mango harvester



Face protector



Potato picker



Harvest bag

The study of livelihood occupations reported that rural women experienced muscular and physiological stress, due to environment, work process, tools with which they operate. In

order to reduce their drudgery improved labor intensive methods with alternate technologies were developed and evaluated. The following enterprise activities were identified for detailed analysis in terms of drudgery prone activities:

Table 20. Technologies evaluated at different centres

Center	Technologies evaluated	Improvements of selected enterprise	Method of evaluation	Benefits
AAU	Chair weaving	Ergonomically designed weaving chair after 2 nd modification	Ergonomic evaluation on physiological, environmental variables	● Increase work efficiency, ● Less physical stress ● Comfortable in use
ANGRAU	Blower type briquette stove for cooking mid day meal	Suggested smaller capacity of briquette stove for cooking midday meal	Thermal efficiency, complete cooking test, kitchen performance test	● Burning rate of fuel was 2.6 kg/hr- ● Power out put of the stove was 0.58 kw/hr- ● Fuel consumption was estimated as 4.482 kg/hr/kw- ● Useful for preparing community lunch with a capacity of 30 kg rice and 5 kg d/al
CCSHAU	Rotary oscillating disk for bead string making	Material storage and handling, work station design, work environment & work organization	Ergonomic evaluation on work station and process of work	● Better organized work place- Lesser handling operations ● Comfortable posture ● Better work environment & work organization
CSKHPKV	Bamboo strip smoothening tool in bamboo hand craft mill	Promotion of the improved tool	Impact evaluation on drudgery	Smoothening increase pace of work output by 4 per cent
GBPUA&T	Spreader frame and low level chair, thimble in quilt making	● Spreader frame with low level chair for quilt making ● High level stool for checking mending and packaging activities	Ergonomic evaluation on work station and process of work and process of work	● Reduced physiological workload and energy expenditure- Relief in muscular pain
MAU	Tailoring table in tailoring	Designed and developed new drudgery reducing technology for tailoring enterprise	Ergonomic evaluation on work station and process of work	● Low cost ● Multipurpose use ● Useful for resting the hands while performing the activity ● Easy to handle and carry ● Reduces physiological stress of worker ● Adjustable as per the height of the worker ● As fixing rods are useful for fixing the saree, the hand movements of the worker are reduced while attaching saree fall.



Tailoring table



Briquette stove

Capacity building in drudgery reducing technologies

Five post tests were conducted in the 45 operational villages for capacity building of women on drudgery reducing technologies through awareness and knowledge generation. Impact was assessed after five years and awareness and knowledge between the centers and the impact was found significant. Among the 9 centers, MPU&T followed by AAU, and UAS have achieved more improvement in knowledge status compared to others where as the other centers have achieved an improvement between 33 to 50 per cent. Successful impact of technology interventions was documented in the form of a technical bulletin on Impact of technological interventions for drudgery reduction.

Empowerment of women in resource management practices

All the centers imparted trainings/demos on fuel, alternative energy, water sanitation and income management practices to the selected group of women in 5 adopted villages. The various technologies of resource management practices were identified and transferred to the women self help groups. Improved chulha, rice husk stove, pressure cooker, LPG, solar devices were introduced as fuel saving technologies and found women favoring the adoption of pressure cooker, LPG stove, improved chulha, indigenous solar dryer compared to other devices.

Indigenous solar distillation techniques, drip irrigation, use of purification agents and filtration techniques were introduced as water management technologies and found women favoring the adoption of cleansing agents followed by filtering using commercial filters at the domestic level and boiling. In addition, drip irrigation was most preferred to manage the irrigation needs of crops in Hyderabad centre. A resource empowerment training module on Water management technologies and practices for rural homes was prepared in English.



Demonstration on water conservation and sanitation



Method demonstration on solar cooker

Nutritional security and health promotion of farm families

Promotion of nutrition garden

In the Rabi season 240 nutrition gardens were established out of which only 215 gardens sustained till the end of the season. Non sustainability of 25 gardens was due to the reasons like water scarcity, high temperature, crop diseases, land used for paddy seedbeds, monkey menace etc. MPU&T, Udaipur centre could not establish the gardens due to water scarcity. Similarly, a total of 270 nutrition gardens were established during Kharif season out of which 227 gardens sustained till the end of the season. Failure of 43 gardens was due to damage by cattle, poultry and monkey.

Table 21. Fruits and vegetables produced during Rabi and Kharif season in nutrition garden

Fruits & Vegetables grown in Rabi Season	Fruits & Vegetables grown in Kharif Season
Green leafy vegetables	
Amaranth, Mustard leaves, Spinach, Brassica Coriander, Bhrase, Cabbage, Mint, Lal, Methi, Shepu leaves, Palak, Fenugreek leaves, Dantu, Radish leaves and Chilakavare	Palak, Fenugreek leaves, Spinach, Coriander, Mint, Coriander leaves
Other vegetables	
Knolkhol, Lesera mah/Cowpea, Brinjal, Bottle gourd, Bitter gourd, Pumpkin, French bean, Cauliflower, Tomato, Cabbage, Lady's finger, Green chilli, Cucumber, Papaya, Pea, Cluster bean and Sungre	Cowpea/ Lesera mah, Cucumber, Pumpkin, Kunduli, Brinjal, Lady's finger, Bhat kerela, Bottle gourd, Ridge gourd, Gouar bean, Tomato, Bitter gourd, Green chilli, French bean, Cabbage, Papaya, Seetaphal, Shatputia, Cluster bean, Long melon, Tinda
Roots & tubers	
Radish, Garlic, Potato, Turnip, Carrot, Turmeric, Onion and Ash gourd	Kochu, Colocasia, Suran, Onion
Fruits	
Banana, Lemon, Guava, Ziryphus and Papaya	Papaya, Pomegranate, Guava, Mango, Pear, Banana, Sharifa, Grapes, Litchi, Sapota, Jackfruit

Mean nutrient intake and percent adequacy:

Calcium and iron intake before establishing nutrition gardens were in the range of 257.69 mg (MAU, Parbhani) to 1470.80 mg (CCSHAU, Hisar) and 13.80 mg (ANGRAU, Hyderabad) to 23.66 mg (CCSHAU, Hisar) fulfilling RDA requirement (Calcium - 1000mg and Iron - 28mg) of 64.42 to 363.04 per cent and 49.29 to 84.23 per cent respectively. Similarly Calcium intake after establishing nutrition gardens were in the range of 309.77 mg (AAU, Jorhat) to 1518.52 mg (CCSHAU, Hisar) and intake of iron ranged from 16.51 mg (ANGRAU, Hyderabad) to 33.76 mg (CSKHPKV, Palampur) meeting 77.44 to 378.89 per cent and 58.94 to 122.63 per cent of RDA respectively (Table 22 & 23).

Table 22. Mean nutrient intake for nine centre (per adult consumption unit/ day)

Centre	Calcium (mg)			Iron (mg)		
	Before	After	Difference	Before	After	Difference
AAU, Jorhat	267.09	309.77	42.68	16.09	19.50	3.41
ANGRAU, Hyderabad	339.30	398.64	59.34	13.80	16.51	2.71
CCSHAU, Hisar	1470.80	1518.52	47.72	23.66	24.41	0.75
CSKHPKV, Palampur	374.85	598.65	223.80	23.56	33.76	10.20
GBPAUT, Pantnagar	835.74	989.50	153.76	21.08	26.23	5.15
MPUAT, Udaipur	416.15	436.59	20.44	17.99	21.69	3.70
MAU, Parbhani	257.69	334.57	76.88	18.27	22.33	4.06
PAU, Ludhiana	1060.00	1083.60	23.60	18.52	27.48	8.96
UAS, Bangalore	665.10	725.60	60.50	17.40	21.80	4.40

Table 23. Per cent adequacy of nutrient consumption of families (per adult consumption unit/ day) of the villages compare to RDA

Centre	Calcium (mg)*			Iron (mg)*		
	Before	After	Difference	Before	After	Difference
AAU, Jorhat	66.77	77.44	10.67	57.45	69.64	12.19
ANGRAU, Hyderabad	84.83	99.66	14.83	49.29	58.94	9.66
CCSHAU, Hisar	363.04	378.79	15.76	84.23	87.55	3.32
CSKHPKV, Palampur	93.75	156.85	63.10	84.68	122.63	37.95
GBPAUT, Pantnagar	208.94	247.37	38.43	75.28	93.66	18.38
MPUAT, Udaipur	104.04	109.67	5.63	64.24	77.36	13.12
MAU, Parbhani	64.42	83.64	19.22	65.25	79.74	14.49
PAU, Ludhiana	261.00	271.20	-10.20	62.40	98.00	-35.60
UAS, Bangalore	165.90	180.76	14.90	61.90	77.50	15.60

* RDA requirement of Calcium is 1000mg and Iron is 28mg

Storage and bioavailability study of iron rich formulations Lehyam

Storage study was conducted in terms of sensory evaluation and conducted upto 3 - 6 months depending upon the product developed by the centres. Products with higher moisture content had a shelf life of approximately 3 months, and therefore storage study was conducted only upto 3 months. Whereas, products with low moisture content had a better shelf life, hence storage study was conducted upto 6 months. Sensory evaluation of iron rich formulations showed that the scores for colour, taste, flavour and texture attributes were on the higher side during the initial stage of storage but gradually decrease towards the later month. The overall acceptability scores were good to satisfactory during the entire storage period ranging from 8.6 to 6.3 for all the products developed by AAU, Jorhat; CCSHAU, Hisar; CSKHPKV, Palampur; GBPAUT, Pantnagar; MPUAT, Udaipur; PAU, Ludhiana and UAS, Bangalore. Similarly the overall acceptability scores gradually declined towards the later months ranging from 8 to 3 for all the products developed by ANGRAU, Hyderabad and MKV, Parbhani (Table-24).

Table 24. Overall acceptability (at 0-10 scale) of iron rich formulations during storage period

Item	Duration of storage (months)						
	0	1	2	3	4	5	6
AAU, Jorhat							
Fresh madhusuleng leaves lehyam	7.9	7.5	7.1	6.5	-	-	-
ANGRAU, Hyderabad							
Khajikaya	8.0	8.0	7.0	7.0	5.0	5.0	4.0
Toffee	8.0	8.0	7.0	7.0	5.0	4.0	4.0
Murukulu	8.0	8.0	7.0	7.0	5.0	5.0	4.0
Laddoo	8.0	8.0	7.0	6.0	5.0	4.0	4.0
Lehyam using cauliflower leaves	8.0	8.0	7.0	6.0	4.0	3.0	3.0
CCSHAU, Hisar							
Amia green leafy balls	7.6	7.1	7.0	-	-	-	-
CSKHPKV, Palampur							
Colocasia lehyam	-	-	-	7.4	-	-	7.5
Fennel and lettuce lehyam	-	-	-	7.5	-	-	7.1
Seabuckthorn	-	-	-	7.0	-	-	6.9
GBPAUT, Pantnagar							
Iron rich laddu	7.5	6.1	6.0	-	-	-	-
MPUAT, Udaipur							
Lehyam	7.9	7.3	7.6	7.7	7.6	7.5	7.4
MAU, Parbhani							
Iron rich toffee (var I)	7.5	7.4	7.2	6.9	6.4	5.8	4.9
Iron rich toffee (var II)	7.1	7.0	6.9	6.7	6.4	5.9	5.0
PAU, Ludhiana							
Tamarind ball	8.4	8.3	7.9	7.4			
Amia ball	8.6	8.1	7.5	7.3			
UAS, Bangalore							
Lehyam	7.8	7.7	6.6	6.3	-	-	-
Pushtika laddu	8.0	7.7	7.5	7.1	-	-	-
Pushtika chikki	8.0	7.8	7.5	7.3	-	-	-



The bioavailability of iron of the iron rich formulations reported that the total iron content of the iron rich formulations ranged from 31.80mg in iron rich toffee, variation I (MAU, Parbhani) to 12.25mg in Seabuckthorn Lehyam (CSKHPKV, Palampur). The ionizable iron content of the products ranged from 9.50mg in iron rich toffee, variation I (MAU, Parbhani) to 0.33mg in Seabuckthorn Lehyam (CSKHPKV, Palampur), the percentages ranging from 29.90 to 2.69 respectively.

Total antioxidant content of other vegetables

Sixteen varieties of other vegetables such as potato, colocassia, ivy gourd (kunduli), Bhat kerela, mangalore cucumber, cho-cho-marrow, capsicum, bittergourd, sem bean, cluster bean, cowpea beans, french beans, lady's finger, pumpkin, tomato and onion were selected for estimation of TAC in terms of percentage inhibition using the DPPH (2,2-Diphenyl-1-picryl hydrazyl) method. The total antioxidant content in the other vegetables ranged from 89.36 per cent in tomato to 5.37 per cent in potato.

Promoting vocational skills amongst adolescent girls

Vocational education and training was imparted to the youth in the age group 15-25 years in very specific activities to provide them a significant "hands on" experience in acquiring the necessary skills for economic independence. About 55 skill oriented training programmes were conducted on the areas such as fabric painting, viable economic enterprises, preparation of utility articles, knowledge based intervention (child rearing practices, nutrition and health), preservation of vegetables (mixed vegetable pickle), paper flower making, art activities for preschoolers etc, for 1351 adolescent girls, young women and anganwadi workers.



Training on utility items

Training modules for farmwomen for care and management of children

In the areas of socio-emotional development and relational concept anganwadi children (3-4 years) were assessed at the beginning and interventions were given through various techniques like training to mothers and anganwadi workers and through direct interaction with the children. Positive impact of intervention was noticed in socio-emotional behaviour and relational concept of children from anganwadis. Children under "good" category increased during post testing.

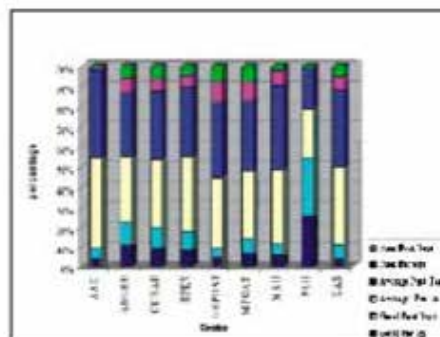


Fig. 19. Percentage of children under different category in socio-emotional behaviour during pre and post test

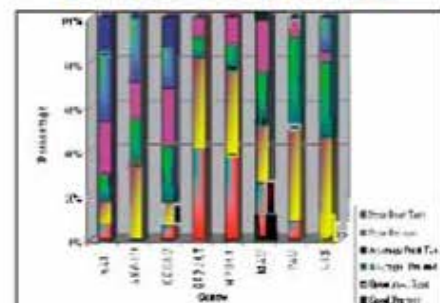


Fig. 20. Distribution of children under different category in relational concept during pre and post test

Social and educational empowerment of adolescent girls and young mothers

Pre and post testing were completed on remaining five life skills namely creative thinking, critical thinking, empathy, problem solving and stress management. Non-significant t values were observed in all the skills but slight improvement during post tests were observed in a few skills. Continuous intensive intervention is required for developing life skills among rural adolescent girls.



Stress management



Problem solving

Gendersocialization

The checklist covered areas like toys, behaviour, activities education, occupation where a mother generally shows gender discrepancies. When all the aspects of gender socialization were studied for the entire sample irrespective of various states, significant gender differences in mothers' attitude were noticed in the choice of occupation, education during pre test.

The present project made an attempt to create a gender free environment at home right from early age. In order to achieve this, various training programmes, film shows, discussions were arranged at field level. Impact of such intervention programmes were noticed in maternal attitudes while dealing with their sons and daughters. Significance level of gender differences in maternal attitude in various areas like use of toys, activities, behaviour, choice of occupation were calculated. It was seen that in most of the areas where differences were significant prior to intervention programme, were found non significant during post test. Hence it can be said that some amount of changes can be brought into mothers' attitude through intervention (Table 30).

Value addition to underutilized natural resources for enterprise development

Different underutilized local available fibres were selected to produce value added products. According to the nature and quality characteristics of the fibre, different woven and non woven products were prepared and the impact assessment of developed products were tested and found that the products were readily accepted by the consumers.

Utilization of non-degradable farm waste

Different degradable and non-degradable farm wastes were selected according to availability for preparing value added products such as folder, tea bags, durries, envelopes, photo frames, toran, jewellery boxes, bags, fibre sheet, floor coverings, bib, wall panel, cushion cover, book holder, baby feeder, hood, phone mat, cloth envelope, etc. and impact assessment of developed products were tested and found that the products

were readily accepted by the consumers. Value addition and income generating technologies namely – loom weaving, measurement techniques, embroidery, fabric painting, tie-dye Products assessment at adopted villages techniques, block printing and garment construction using degradable and non – degradable farm waste were disseminated to farmwomen of adopted villages.



Products assessment at adopted villages

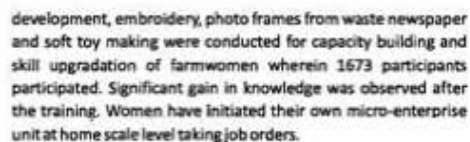
Empowerment of rural women

Empowerment to combat occupational health hazards

According to the problems faced by the pesticide applicators and wheat harvesters, seven protective garments were designed to protect them from the health hazards such as beak shaped mask, cap with mask, hood mask, scarf mask, starched kurta, jacket and pyjama of water proof fabric. Apart from this, protective gloves from knitted fabric were developed for okra pluckers. Trainings on construction and use of protective clothing were conducted in adopted villages for girls and farmwomen. The functional features of protective clothing and its advantages were explained to them and make them aware about the after effects of pesticide spray. It was found that the farmwomen were interested in learning drafting, cutting and stitching of protective clothing and showed interest in taking job orders at small scale.



Field trial of protective clothing



Training on Stitching of protective clothing

Besides these programmes following innovative extension methodology was also adopted for empowerment of women:

PARICHAY: It was implemented first time in operational villages of AICRP Home Science, ANGRAU. Women friendly technologies, farm oriented drudgery reducing technologies, NSKE, vermicomposting, eco-friendly mulching material and protective clothing were selected for women and tried in three places with an objective of assessing impact of the approach. Women's



Parichay at Mahila Samakhya



Parichay at Shandy



Parichay at vegetable marketyard

active participation was observed in Mandalsamakhya (90%) followed by Shandy (50%) and Marketyard (20%). flexibility, cost and time saving on the spot training, instant responses and feedback were some of the advantages experienced in this approach. It allowed scientists and extensionists to demonstrate, explain and clarify queries. This method is comparatively cost effective, quick and allows contact with people from many areas at a time.

E-Message: It was conducted in the operational villages of AICRP, Hyderabad as supporting material in capacity building programmes and impact of interventions were assessed (pre knowledge test and post knowledge test) with an experimental design. Equal number of sample was taken for the study consisting of 60 respondents who were exposed to e-message and 60 women respondents who were exposed to conventional lecture. The impact of the intervention programme revealed that lecture using e-message was found to be significant indicating a remarkable gain and retention in knowledge.



Dissemination of information through e-message

AIP (Awareness-Interest-Practice): An innovative extension approach tried at Assam Agricultural University to empower rural women through entrepreneurship development. It was implemented in three stages. In awareness stage a programme on value addition to woven fabric through fabric painting was organized for entrepreneurship development of rural women. In interest stage the participants were asked to volunteer their names for the series of trainings to be conducted with the condition of bearing all the expenses towards learning material and travel by them selves. Lastly in the practice stage training cum workshop was organized and the participants reported with



Dissemination of information conventional method

their developed products which were judged for quality and marketability.

Empowerment of women through entrepreneurship development: A success stories

Fabric painting and jewellery making

Jina Khanikar of Hatichungl Komargaon village of Jorhat district is an H.S.L.C passed rural girl. She dropped out her education due to their poor economic family condition. During the month of December 2010 she came into contact with scientist of AICRP (Home Science), Department of Extension Education and discussed about her financial condition as well as her interest to develop a micro enterprise.

Jina attended the awareness camp on fabric painting conducted on 23 December, 2010 in collaboration with Pidilite: Fevicol hobby ideas. Being motivated by the awareness camp, she attended all the four trainings each having four days duration comprising of fabric, silk, ceramic painting and moulding craft (jewellery making).

On completion of the trainings, she started paintings on mekhala and chaddar, pillow cover, bed sheets and handkerchiefs. She also prepared some jewellery sets and sold them during festive - bihu season. She was one of the members of "Karabi SHG" registered under DRDA. First she started her business getting loan from her own SHG.

Ms. Jina Khanikar started earning income by fabric painting and jewellery making. She wants to start her own small enterprise on fabric painting. Now she is getting more orders from her own and nearby villages. She had already sold 48 different types of fabric painting and 34 of jewellery products and earned ₹ 22670.

Table 25. Economics of fabric painted garments and jewellery making

Garments used for fabric painting	Item sold (no.)	Cost of production per item/set (₹)	Total cost of production (₹)	Sale price per item/set (₹)	Income (₹)	Net profit (₹)
Fabric painting						
Mekhala chaddar	20	300.00	6000.00	900.00	18000.00	12000.00
Mekhala	9	120.00	1080.00	250.00	2250.00	1170.00
Pillow cover	16	80.00	1280.00	150.00	2400.00	1120.00

Presently she wants to apply for loan from DRDA and counting the work with the profits obtained from fabric painting and jewellery making. She expressed that the main factor responsible for her success were the influence of the training, self confidence to do something and co-operation from her family and SHG members. From her experience she also expressed that it is a good income generating activity, which has good market potential.

Tailoring-cum-training centre

Banta Devi a resident of Shahpur married in Seeswal village had done Diploma in dress making from ITI, Hisar but was not practicing it at home. She attended trainings on garment construction, knitting and embroidery imparted by AICRP team of

Department of Textile and Apparel Designing, COHS, CCS HAU, Hisar in Shahpur village. She got motivated and started working at home for her family members. Later on she joined a vardi centre run by one of SHG member in Shahpur village. She was so motivated that she started a tailoring-cum-training centre after her marriage in Seeswal. She is imparting training to 10 students along her regular stitching. She is also selling fabric for school uniforms, ladies suits and embellishment material/ accessories. With an investment of ₹ 50,000 she has started earning ₹ 9000 - 10000 per month working from home. She has been successful in her village in a very short period. This was only possible due to her excellent tailoring skill, strong determination and good behavior.



Farm women participating in training on tailoring



WEATHER REPORT

Odisha lies in the East coast of the country between 17° 49' and 22° 34' N latitudes and 81° 27' and 87° 29' E longitudes. Whereas, Bhubaneswar is located between 20° 15' N latitude and 85° 52' E longitude at an altitude of 45 meters above mean sea level. The state has been divided into ten agro climatic zones. However, Bhubaneswar belongs to east and south eastern coastal plains and experiences tropical hot and humid climatic condition. The weather data of 2011-12 were collected from the meteorological unit of DRWA located at the Directorate.

The average maximum and minimum temperatures were recorded to be 31.8 and 22.0 °C, however, March, 2012 (36.1 °C) was the hottest month and December, 2011 (15.4 °C) was the coldest month (Figure 21). Surprisingly, March 20, 2012 was the hottest day with the maximum temperature of 39.6 °C and January 15, 2012 was the coldest day with the minimum temperature of 9°C

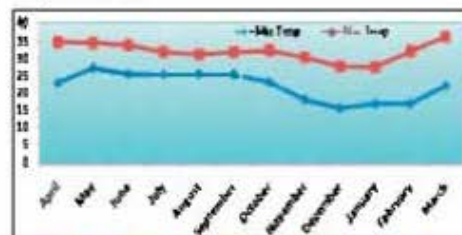


Fig. 21. Month wise distribution of temperature

Bhubaneswar has been quite humid throughout the year with the average relative humidity of 81.8%. Duration between June – October was quite humid with the humidity of more than 85%, whereas February was least humid.

The total annual rainfall was 1752.5 mm which is almost double than that of India's average rainfall. The South east monsoon, which sets in the second week of June, was the major contributor of rainfall and consequently, July, August and September, 2011 were the wettest months and contributed more than 73% of total rainfall. However, sporadic rain was also observed in May and January. There was almost no rainfall in April, November, December, 2011 and February, and March, 2012. June 15 was the wettest day with 82.4 mm rainfall.

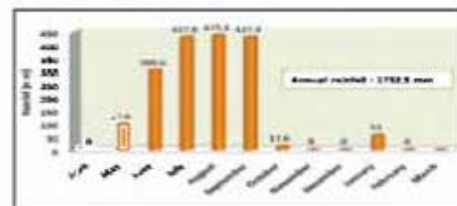


Fig. 22. Month wise distribution of rainfall

The report gives an indication of prevalence of climate for a particular season which in turn helps the farm women to carry out field activities including selection of crops. The high rainfall followed by dry period gives an opportunity for micro-level rainwater harvesting during June - September to meet the water requirement of crops during November to April.



IMPORTANT MEETINGS

12th meeting of Research Advisory Committee

The 12th Research Advisory Committee meeting was held during 24-25th May, 2011 under the Chairmanship of Dr K.Narayana Gowda, Vice Chancellor, GKVK, Bangalore at Directorate of Research on Women in Agriculture, Bhubaneswar. The following RAC members were present in the meeting.

- | | |
|--|--------------------|
| 1. Dr K.Narayana Gowda | - Chairman |
| 2. Dr V.Venkatasubramaniam | - Member |
| 3. Dr V.S.Korikanthimath | - Member |
| 4. Dr V.K.Tewari | - Member |
| 5. Dr Krishna Srinath | - Member |
| 6. Dr Rita Singh Raghuvanshi | - Member |
| 7. Mrs. Megha Borse | - Member |
| 8. Dr S.K. Srivastava, Principal Scientist, DRWA | - Member-Secretary |

The following recommendations were made during the meeting

- RAC appreciated DRWA's efforts in bringing national perspective through Network projects in the research programmes. The research programmes can be taken up with the objectives of addressing sustainable livelihoods.

- ITK is a very important area of research as women in villages apply these in their day-to-day life, therefore these aspects should be included in the research programmes.
- Emphasis should be given on role of women in plantation crops, hi-tech horticulture and creation of women entrepreneurs which will lead to socio-economic transformation in rural areas.
- Number of scientists and number of projects mismatch due to less staff, therefore projects should be taken in a phased manner.
- Energy is a very important issue at household level, therefore type of fuel and the constraints and consequences should be examined.
- Programme on women in agriculture should be covered in mass media for dissemination of gender friendly technologies, policies and programmes.
- It was also suggested to take up capacity building programmes on gender sensitive approaches in R&D.

11th meeting of Institute Research Council of DRWA

11th meeting of Institute Research Council (IRC) of the Directorate of Research on Women in Agriculture, Bhubaneswar (ICAR) was held on 13-14 June, 2011.



Members discussing at 12th RAC meeting

In the meeting presentations and discussions of the research projects were made under different sections. A total number of 23 projects including 6 Network, 6 newly formulated, 1 completed and 10 ongoing projects were discussed during the meeting. Scientists were advised for making more efforts for publication of research papers in Journals of high impact factor.

12th meeting of Institute Research Council of DRWA

12th meeting of Institute Research Council (IRC) of the Directorate of Research on Women in Agriculture, Bhubaneswar (ICAR) was held on 23 January, 2012.

The members were informed about the sanction of six more posts of technical staff. It was also informed that as per the recent

guidelines of Council, only one meeting of IRC should be organised in each year and it should be completed by February/March. RAC meeting should be organised only after the IRC meeting. RPF-II and RPF-III of each project as the case may be, should be submitted by the end of March every year by each of the PI of the Project. Thereafter, presentations and discussions of the research projects were made under different sections. A total number of 19 projects including 9 ongoing projects, 6 network projects and 4 newly formulated projects were discussed.

Media Meet: Media Meet was organized on 28.06.2011 at DRWA in which 27 media persons attended and they were explained on Ample opportunities in offering for women in agriculture and Time to harness the untapped potential of women for sustaining agriculture

National Workshop on Gender Dimension to Manpower Planning in Agriculture by NAARM was conducted on 8 July 2011 at DRWA and 40 participants took part.

Consultation on Youth in Agriculture: Consultation meet on Youth in Agriculture was organised on 30.09.2011 and 01.10.2011 at DRWA. 150 participants took part.

World Food Day: The Directorate observed World Food Day on 16 October, 2011 at DRWA Campus. An interaction meet of scientists and farmwomen and demonstration of Low cost weaning mix was arranged at this occasion. Around fifty farm women attended the programme.



Scientists and farmwomen at interaction meet

Vigilance awareness week: As vigilance officer for DRWA, organized various events related to the theme 'participative vigilance' to observe the vigilance awareness week from 31 Oct 5 Nov. 2011 in DRWA, BBSR.

Celebration of Women in Agriculture Day: The Women's Day in Agriculture was celebrated on 03.12.2011 in Giringaput village wherein more than 100 women participated. The scientists from DRWA delivered lectures on selected themes which were relevant to the village circumstances followed by group discussion on prioritized needs of villagers. The participants showed greater enthusiasm on women friendly farm technologies particularly drudgery reduction tools and implements.

RAJBHASHA IMPLEMENTATION

Hindi Chetna Mas : Hindi Chetna Mas was observed at DRWA from 14 September- 13 October, 2011. Hindi Divas was organised on 14 September. Four competitions were organised for Hindi and non-Hindi speaking staff of the Institute during Hindi Chetna

Mas and winners of competitions and also all the participants were given away prizes and consolation prizes. Two Hindi workshops were also organised on 19 September and 29-30 November for the promotion of Hindi.



Staff taking part in Hindi Chetana Mas

PUBLICATIONS

Research Papers

1. Ponnusamy, K. 2010. Production constraints of animal based farming systems in coastal India *Indian Journal of Extension Education*. 46 (3 & 4): 26-30.
2. Ponnusamy, K., Shukla, A.K and Moharana Gayatri. 2011. Determinants of adoption of horticulture crops in backyard gardens. *Progressive Horticulture*. 43 (2): 328-331.
3. Singh, S.P., Singh, Surendra and Singh, Pratap. 2012. Ergonomics in developing hand operated maize dehusker-sheller for farm women. *Applied Ergonomics*. 43:792-198.
4. Singh, S.P., Singh, Pratap and Singh, Surendra. 2011. Status of maize shelling in India. *Agricultural Mechanization in Asia, Africa and Latin America (AMA)*. 42 (3): 21-27.
5. Singh, S.P., Singh, R.S. and Singh, Surendra. 2011. Sale trend of tractors & farm power availability in India. *Agricultural Engineering Today (ISAE)*. 35 (2): 25-35.

Papers presented in Conferences/ Symposia/ Seminars/ Workshop

1. Agarwal, Suman 2012. Bridging the knowledge Action gap for sustainable livelihood security. Abstracts of Global Conference on Women in Agriculture held at NASC Complex, New Delhi, from 13-15 March 2012, P.52-53.
2. Agarwal, Suman and Srinath, Krishna 2011. Self-help groups and their sustainability for socio-economic empowerment of rural women: field experiences' Abstract of International Conference on 'Innovative Approaches for Agriculture Knowledge management: Global Extension Experiences' held on 9-12 November at New Delhi, P.410.
3. Arya, M.P.S., Srivastava, S.K., Singh, S.P., Behera, B.C. and Patra M. 2012. Farmwomen preference in rice based production system of Madhya Pradesh. Paper presented at Global Conference on Women in Agriculture held in New Delhi on 13-15 March 2012, P.11.
4. Babu, N., Tripathi, P.C., Kundan Kishore and Shukla, A.K., 2012. Strengthening livelihood security of farmwomen through promotion of mango based cropping model. Global Conference on Women in Agriculture, New Delhi (13-15 March), P.121-122.
5. H.K.Dash and Krishna Srinath 2011 policy and institutional Imperatives for aquaculture development- some evidences. In book of abstracts published by 9th Asian Fisheries Forum held on April 21-25 2011 in Shanghai, China P.125-126.
6. Krishna Srinath, Ponnusamy, K., Dash, H.K., Tripathy, Asima and Dash, S.S.J. 2012. Migration and climate change: Impact on farm women and gender issues. Global Conference on Women in Agriculture during 13-15, March 2012 at New Delhi P.199.
7. Kumar, Anil., Mishra, A.K. and Sahoo, P.K. 2011. Feeding pattern and livestock ownership of livestock in Odisha. National Symposium on Forage resource and livestock for livelihood, environment and nutritional security held on September 10-11, 2011 at IGFRI, Jhansi.

8. Kumar, Anil., Singh, Abha, Tanuja, S. and Moharana, A. 2012. Women's role in marketing and processing in livestock activities in Odisha State. Global Conference on Women in Agriculture held on March 13-15, 2012 at New Delhi.
9. Kundan Kishore, Shukla, A.K., Babu, N., Ponnusamy, K., Vishwakarma, R.K. and Tripathi, P.C. 2012. Does the degree of women's access to and control over resources influence horticultural production system? Global Conference on Women in Agriculture, New Delhi (13-15 March), P.171.
10. Mishra, Sabita 2011, Problems of Rural Women at Work and its Effects during International Conference on Ergonomics and Human factors: Innovation and Usability in Product Development from 15-17 December, 2011 organized by IIT, Madras, Chennai. P.86.
11. Mishra, Sabita, Dash, H.K. & Prusty, M. 2012. Gender Issues in Marketing of agro-forest produces by Tribal women during Global Conference on Women in Agriculture organized at NASC, New Delhi during 13-15 March, 2012, P.110-111.
12. Nayak, Jyoti, Singh S.P., Srinath Krishna and Moharana, G. 2011. Rural women's Condition in Cooking Related Activities. International Conference and Human Factors Innovation and Usability in Product Development at IIT, Chennai, India, December 15-17, P.131.
13. Nayak, Jyoti, Singh, S.P. and Moharana, G. 2012. Health risks of rural women in indoor environment- Urgency for action. Global Conference on women in Agriculture at NASC Complex, New Delhi, March 13-15, P.74.
14. Ponnusamy, K. and Mahalakshmi, 2012. Barriers to technology generation, diffusion and commercialization in aquaculture. National Conference on New Vistas in Indian Aquaculture in commemoration of silver jubilee celebration of CIBA during 23-24 February 2012 at CIBA, Chennai, P.154.
15. Ponnusamy, K. and Priyanka Rani. 2012. Potential utility of expert system for farm women. Global Conference on Women in Agriculture during 13-15, March 2012 at New Delhi, P.201.
16. Ponnusamy, K., Meenakshi, S., Dash, S.S.J., Sethi, R. and Priyanka Rani. 2012. Ingenuity of farm women in combating climate change. Global Conference on Women in Agriculture during 13-15, March 2012 at New Delhi, P.156.
17. Ponnusamy, K., Prusty, M., Shukla, A.K. and Krishna Srinath, 2011. Perceived effect of honey bee rearing on crop productivity: a gender perspective. International Conference on Innovative Approaches for Agricultural Knowledge Management: Global Extension Experiences at New Delhi during 09-12 December 2011, P.211.
18. Sadangi B.N., Dash H.K. and Samantaray, S. 2012. Redefining the agenda of dairy cooperative societies in abstracts of Global conference on women in agriculture held on 13-15 March 2012 at NASC complex, New Delhi, P.172.
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- Research Complex for Goa, Old Goa during 17-19 December, 2011, P.176
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 21. Singh, S.P. 2012. DRWA gender friendly hand operated maize dehusker-sheller: An option to reduce drudgery of farm women. Abstracts of Global Conference on Women in Agriculture held on March 13-15 at NASC Symposium Hall, New Delhi. P.91.
 22. Singh, S.P. 2012. Physiological workload of farm women in selected farm activities of maize crop. 46th Annual Convention of ISAE & International Symposium held on February 27-29, at GBPUAT, Pantnagar, P.204.
 23. Srinath Krishna, Dash, H.K. and Sahoo, P.K. 2011. Empowering women in aquaculture-Lessons from rural aquaculture projects in India, in book of abstracts of 9th Asian Fisheries Forum held on April 21-25 2011 in Shanghai, China.
 24. Srivastava, S.K., Naresh Babu, Suman Agarwal and Behera, B.C. 2012 Gender participation in grain storage practices A case study. Abstracts. Global Conference on Women in Agriculture, held on 13 -15 March 2012 at NASC Complex, New Delhi, P.40-41.
 25. Srivastava, S.K., Sadangi, B.N. and Behera, B.C. 2011 Evaluation of storage structures and pest management techniques of pulses in Odisha with gender concern. Souvenir & Abstracts. National symposium on Biodiversity & food security Challenges & devising strategies held on 10-11 December 2011 at Kanpur, P.49-50.
- Popular articles**
1. Agarwal, Suman and Roy, P.L. 2012. Role of Home Science in women empowerment. *Indian Farming*, March, 61 (12), P 34-36.
 2. Arya, M.P.S., Srivastava, S.K. and Behera, B.C. 2012 Strategies for technological empowerment of farm women in crop production. *Indian Farming* 61(12):16-18 and 28.
 3. Kumar Anil, and Tanuja, S. 2012, Role of women in livestock husbandry, fisheries and aquaculture, *Indian farming*, 51 (12): 21-24.
 4. Mishra, Sabita 2012, Krishi Udyogikarana: Gramya Mahilankara Rojagarara Uscha, Souvenir, Eastern Zone Regional Agriculture Fair on Technology and Programmes for Eastern India, CRR, Cuttack, P.126-128. (Odia)
 5. Mishra, Sabita 2012, Plant-Bio-Diversity: A Reflection on Religion, *Sabujima*, Vol. 20. P.29-33.
 6. Nayak, J., Singh, S.P., Moharana, G and Agarwal, N. 2011. Assessment of source of health hazard for rural women in indoor environment- A case study. *Agrovet Buzz*, 4 (4): 27-29.
 7. Nayak, Jyoti. 2011. Literacy for Women Empowerment. *Sathi* July: 38.
 8. Nayak, Jyoti. 2011. Nutrition and Health Education for Women. *Sathi* September: 30-31.
 9. Nayak, Jyoti. Singh, S.P. Moharana, G and Agarwal, N. 2011. Assessment of Source of Health Hazard for Rural Women in Indoor Environment -A case study. *Agrovet Buzz*, 4 (4): 27-29.
 10. Ponnusamy, K., Sabita Mishra, M. Prusty and S.S. Dash. 2012. Market linkages for women farmers: Public Private Partnership shows way ahead. *Indian farming*, 61 (12): 25-28.
 11. Shukla, A.K., Babu, N., Kundan Kishore and Patnaik, S. 2012 Opportunities in Horticulture for empowering farm-women. *Indian Farming*, 61(12): 13-15.
 12. Shukla, A.K., Kundan Kishore and Babu, N. 2012 Naye dwar Bagwanime sambhawnae. *Kheti* 64 (12): 19-21.
 13. Singh, S.P. 2012. Drudgery alleviating farm tools and implements. *Indian Farming*, 61(12): 19-20, 24.
 14. Singh, Y. V. and Nayak, Jyoti 2011. Status of rural women in Agriculture. *Kurukshetra*, 59(11): 6-9.
 15. सुमन अग्रवाल. कृषक जीवन और प्रियम्बदा संवन्धन राय, २०१२. कृषिरत महिला सशक्तिकरण की दिशा में बढ़ते कदम । खेती, ६४ (१२) : ३-४
 16. कृषक जीवन और अग्रवाल, २०१२. ग्रामीण क्षेत्र में व्यापक खाद्य सुरक्षा के उपाय । खेती, ६४ (१२) : ५-७
 17. शिव प्रताप सिंह, २०१२. महिलाओं के लिए सहायक उन्नत कृषि औजार और यंत्र । खेती, ६४ (१२) : ८-११
 18. कृषक जीवन और सन्तोष कुमार शंकरास्वय. २०१२. समय कृषि विकास में महिलाओं की भूमिका । खेती, ६४ (१२) : १२-१४
 19. महेंद्रपाल सिंह अर्वा, सन्तोष कुमार शंकरास्वय और प्रियंका चरण बेहरा, २०१२. फसल उत्पादन के लिए प्रौद्योगिकी सशक्तिकरण । खेती, ६४ (१२) : १६-१८
 20. अनिल कुमार शुक्ल, कुन्दन किशोर और नरेश बाबू, २०१२. बागवानी में सभाबनाएँ । खेती, ६४ (१२) : १९-२१
 21. अनिल कुमार, २०१२. पशुपालन से महिला सशक्तिकरण । खेती, ६४ (१२) : २४-२५
 22. का. पुनसामी और कुन्दन किशोर, २०१२. कृषिरत महिलाओं में उद्यमिता विकास । खेती, ६४ (१२) : २८-३०
- Books & technical bulletin**
1. B.N.Sadangi, Sabita Mishra, H.K.Dash, P.K.Sahoo, S.K.Srivastava, L.P.Sahoo, Abha Singh and B.C.Behera 2011. Gender Sensitive Extension Model. (Technical Bulletin No 17) Directorate of Research on Women in Agriculture, (ICAR) Bhubaneswar, Orissa, P.1-30.
 2. Kokate, K.D., Krishna Srinath, V.P.Chahal, Ponnusamy, K. and Sabita Mishra 2012. Farm Women Innovators-2012 published by ICAR. P.1-106.
 3. Kundan Kishore, Shukla, A.K., Babu, N. Singh, A., Tripathi, P.C. and Sarangi, D.N. 2012. Production technology of vegetables and spices for income enhancement of



farmwomen. (Technical Bulletin No. 18) Directorate of Research on Women in Agriculture, Bhubaneswar, Odisha, P.1-71.

4. Singh A. and Sadangi, B.N., 2011 Gender analysis framework and tools in the book Gender Analysis in Agriculture, P.13-32
5. Srinath Krishna, Ponnusamy, K., Dash, H.K., Tripathy, Asima, Pattnaik, Smaranika and Roy, P.L. 2011 Labour migration, Agriculture and Gender issues (V-PAGE Case study series-2), DRWA, Bhubaneswar, P.1-42
6. Srinath, Krishna Ponnusamy, K., Dash, H.K., Tripathy, Asima and Jeeban dash, S.S. 2012. Strengthening Role of Youth in Agriculture (V-PAGE case study series-3), DRWA, Bhubaneswar, P.1-30
7. Srivastava, S.K., B.L. Attri, L.P. Sahoo, M.P.S. Arya, Geeta Saha and B.C. Behera 2012 Empowering farmwomen in eco-friendly pest management of vegetables. (Technical Bulletin No. 19) Directorate of Research on Women in Agriculture, (ICAR) Bhubaneswar, Orissa, P.1-30.
8. Tripathi, P.C., Srinath Krishna, Shukla, A. K., Kundan Kishore and Babu, Naresh 2012. Women in Horticulture and Women friendly technologies. Published by Directorate of Research on Women in Agriculture, Bhubaneswar, Odisha, P.1-153.

Awards/recognitions

1. S.P. Singh has been awarded as Fellow of Institution of Engineer(s) India, Kolkata.
2. Suman Agarwal was invited as a subject expert member for the selection committee meeting held on 28th September, 2011, for the selection of SMS (T6) Home Science under KVK of Central Research Institute for Jute and Allied Fibers (CRIJAF), Barrackpore, Kolkata.

HUMAN RESOURCE DEVELOPMENT

1. A.K. Shukla attended Global conference on augmenting production and utilization of mango: biotic and abiotic stresses at CISH, Lucknow from 21-24 June 2011.
2. A.K. Shukla Participated and presented research paper in National conference on horti business linking farmers with market, Dehradun Uttarakhand from 28-30 May 2011.
3. A.K. Shukla and Kundan Kishore attended 4th NPSC Meeting of the UNEP/GEF TFT Project entitled 'Conservation and sustainable use of cultivated and wild tropical fruit tree diversity' at Lucknow on 21st June, 2011.
4. Abha Singh attended 6th National extension education Congress on Emerging models of technology application for Agri-rural development at ICAR Research Complex for Goa, Old Goa during 17-19 December, 2011 and presented a paper orally.
5. Abha Singh attended National consultation on Gender perspective in Agriculture at NASC Complex, New Delhi on 8-9 August, 2011.
6. Anil Kumar attended the 99th Indian Science Congress held on January 3-7, 2012 at KIIT, Bhubaneswar.
7. Gayatri Moharana attended workshop on gender dimensions for man power planning in agriculture, organized at DRWA, Bhubaneswar on 7th July, 2011.

8. H. K. Dash attended Meeting of sub-group of Planning commission on Empowerment of Women in Agriculture at MANAGE, Hyderabad from 25th to 26th May 2011.
9. H. K. Dash attended V-PAGE Workshop on 3rd March 2012 at NCAP New Delhi.
10. H. K. Dash attended Workshop on Gender Dimension for Manpower Planning in Agriculture organized by NAARM at DRWA on 8th July 2011.
11. H. K. Dash participated in National Consultation on Gender Perspectives in Agriculture on 08.08.2011 and 09.08.2011 at New Delhi organised by DRWA.
12. Jyoti Nayak participated in state level consultation on Youth and Agriculture on 30th September, 2011 & 1st Oct. 2011 at DRWA, Bhubaneswar.
13. K. Ponnusamy participated in Consultation meeting on Food and Nutritional Security on 18.04.2011 organised by MSSRF, Jeypore in Koraput district of Odisha.
14. K. Ponnusamy participated in training programme on Public Private Partnership in Social Sector during 17-19 November 2011 organised by Administrative Staff College of India, Hyderabad.
15. Kundan Kishore attended Global Conference on Augmenting Production and Utilization of Mango: Biotic and Abiotic Stresses, 21-24 June, 2011, at Lucknow.
16. Kundan Kishore attended Training on Rapid and non-destructive evaluation of food quality and safety factors using spectroscopy and biosensing methods. CIPHET, Ludhiana. May 6-19, 2011.
17. Naresh Babu Participated and presented research paper in National conference on horti business linking farmers with market, Dehradun Uttarakhand from 28-30 May 2011.
18. S.K. Srivastava attended State level consultation on Prioritization of researchable issues in the areas of Agriculture, Horticulture, Animal Husbandry/Fisheries, Soil conservation and allied areas for different agro-ecological sub-zones of Odisha, held on 5 May, 2011 at CRRI Cuttack, organized by ICAR Research Complex for Eastern Region Patna.
19. S.K. Srivastava attended Workshop on Gender Dimension for Manpower Planning in Agriculture held on 8 July, 2011 at DRWA, Bhubaneswar.
20. Sabita Mishra participated at Indian Science Congress, 3-7, January, 2012, KIIT University, Bhubaneswar.
21. Sabita Mishra participated at Workshop on Gender Dimension for Manpower Planning in Agriculture, 08 July, 2011, organized by NAARM at DRWA, Bhubaneswar.
22. Suman Agarwal 2012. Participated in the 99th Indian Science Congress 'Science and Technology for Inclusive innovation: Role of Women' held on 3-7 January 2012, at Bhubaneswar.
23. Suman Agarwal participated in the Conference on Scheduled Tribe Women and Children: Issues and Challenges for development held on 30-31 May 2011 at Vigyan Bhavan, New Delhi, organized by Ministry of Women and Child Development.



24. Suman Agarwal participated in the interactive meet on 'Water Care for Future' held on 12th May 2011 at Directorate of Water Management, Bhubaneswar.
25. Suman Agarwal participated in the workshop on Gender Dimension for manpower planning in Agriculture held on 8th July, 2011 in DRWA, Bhubaneswar.
26. Tanuja S. participated in a training programme on Non thermal/ Non chemical Processing and membrane technology in food systems at CIAE, Bhopal from 12/10/11 to 21/10/11 (10 days).

AICRP on Home Science

Research articles

1. Awasthi, M., Malhotra, S.R. and Modgil, R. 2011. Dietary habits of kidney stone patients of Kangra district HP, North, India. *J. Hum. Ecol.* 34: 163-169.
2. Bains, S. and Kaur, R. 2011. Comparative study of pesticide removal from pesticide infested cotton / cotton / polyester blended fabric. *Env and Eco.* 29 (1): 207-210.
3. Borah and Kalita, M. 2011 Identifying drudgery prone home activities in rural areas of upper Brahmaputra Valley Zone of Assam, *Home and Community Science* 5 (3):165-168.
4. Dhaka, P., Ahlawat, I. and Tiwari, G. 2011. ICTs Improving self-confidence and expression of women, *Advance Journal of Social Science* 2(2):272-274.
5. Dhaka, P., Tiwari, G. and Ahlawat, I. 2011. e-Homemakers(eH) in India, *Advance Journal of Social Science*, 2(2):267-268.
6. Duhan, K and Balda, S. 2011. Life skills education to improve social and communication skills of rural adolescents. *Journal of Family Ecology*, 6 (1):46-45.
7. Duhan, K. 2011. Gender discrimination in Mother's feelings with regard to education and choice of occupation. *Journal of Family Ecology*. 6 (1):6-11.
8. Gandhi, S., Dilbaghi, M., Mehta, M. and Pruthi, N. 2012. Occupational health hazards & efficacy of protective masks in threshing operation. *International Journal of Scientific and Research Publications*. 11 (2) P.1-3.
9. Gang, A., Malhotra, S.R., Satya Bhama and Sandal, A. 2011. Nutritional evaluation of selected varieties of Peas (*Pisum sativum*) of Himachal Pradesh. *Himachal J. Agri. Res.* 37(2): 226-230.
10. Gulati, N., Pruthi, N. and Singh, S.S. Jeet. 2012. Standardization of paper-patterns of Kameez - Salwar for pre-adolescent girls. *Journal of Family Ecology*. 6 (1): 75-78.
11. Gupta, M. and Jain, S. 2011, Access and control of gender of district Ganganagar over agriculture resources. *Advance Research Journal of Social Science*. 2(2): 217-220.
12. Jain, S., Singh, V. and Chelawat, S. 2011. Dietary management of diabetes mellitus with low glycemic index Foxtail millet products. *International Journal of Clinical Nutrition*, 22: 25-26.
13. Joshi, P. and Jain, S. 2011. Acceptability assessment of yellow colour obtained from turmeric (*Cucuma Longa*) in food products and consumer level *Asian Journal of Food and Agro Industry*, 4(1): 1-15
14. Kanwar, P. and Sharma, N. 2011. Traditional pre and post natal dietary practices prevalent in Kangra district of Himachal Pradesh. *UTK*, 10(2): 339-343.
15. Kanwar, P. and Sharma, N. 2012. Rainwater harvesting using Khatri in Himachal Pradesh: A viable technique for water conservation, *Asian Agri History*. 16(2): 205-209
16. Kanwar, P. 2011. Thimbi - An indigenous grain measuring tool prevalent among farm families in Kangra district of Himachal Pradesh, *Asian Agri History*, 15(1):73-75.
17. Kanwar, S.S., Gupta, M.K., Katoch, C., Kanwar, P. (2011). Cereal based traditional alcoholic beverages of Lahaul and Spiti area of Himachal Pradesh. *UTK* 10(2): 251-257.
18. Kaur, H. and Sharma, S. 2011. An ergonomic study of fodder collecting activity performed by farmwomen of Punjab. *Journal of Progressive Agriculture*. 1(2):29-33.
19. Kaur, H., Oberoi, K., Sharma, S. and Kaur, Harpreet 2011. Potato picker: A tool for drudgery reduction for farmwomen. *Indian Journal of Social Research*. 52(1): 23-30.
20. Khadke, P.A. and Khan T.N. 2011. Effect of herbomix supplementation on lipid profile of subjects. *BIONANO FRONTIER*. 4 (2): 318-321.
21. Khadke, P.A., Khan, T.N. and Nalwade, V. M. 2011. Acceptability and nutrient composition of developed herbomix. *Food Science Research Journal*. 2 (1): 40-44.
22. Khan T.N., Lahade, K. N. and Nalwade, V. M. 2012. Nutritional evaluation of Rajkeera leaves incorporated recipes. *BIONANO FRONTIER*, 5(1):72-76.
23. Khan, T. N., Nalwade, V. M. and Nerlekar, J. P. 2012. Impact of safflower decoction on lipid profile. *Journal Oilseed Research*, 29(Special Issue): 458-460.
24. Khan, T. N., Nerlekar J. P. and Zanvar, V. S. 2011. Glycemic index of developed recipes. *Food Science Research Journal*. 2(2): 129-131.
25. Lahade, K. N. and Khan, T. N. 2011. Acceptability of recipes prepared with Rajkeera leaves powder incorporation. *Food Science Research Journal*. 2(2): 157-160.
26. Lahade, K. N., Khan, T. N. and Mamilla, V. V. 2011. Consumption practices of green leafy vegetables among selected households. *Asian Jr. of Home Science*. 6(2): 143-145.
27. Longvah, T., Toteja, G.S., Bulliya, G., Raghuvanshi, R. S., Jain, S., Rao, V. and Upadhyay, A. 2012. Stability of added iodine in different Indian cooking processes. *Journal of Food Chemistry*, 130: 953-959.
28. Mahale, G., Rajashri, K. and Shameembanu, B. 2011. Women empowerment sustainable livelihood through income generating activities. *Textile Trends*, 54 (8) 39-42.
29. Mahale, G., Shameembanu, B. and Rajashri, K. 2011. Protective clothing for pesticide applicators and other agricultural activities of farm families. *Asian Journal of Home Science*, 8 (2): 112-120.



30. Malhotra, N., Gupta, S.R., Sharma, R.A. and Satya Bhamu 2011. Assessment of nutritional status of selected school children of Himachal Pradesh. *Himachal J. Agri. Res.* 37(2):235-240.
31. Mamilla, V. Vinitha and Khan, T. N. 2011. Relationship between socio-economic status and hypertension. *Food Science Research Journal*. 2(2):140-142.
32. Mamta Kumari and Jain, S. 2011 Tannins: Brighter side as nutraceutical. *International Journal of Clinical Nutrition*.
33. Nahwade, V.M., Ambekar, S. and Khan, T. N. 2011. Value addition of selected bakery products by incorporating mushroom. *BIONANO FRONTIER*, 4 (1): 115-119.
34. R. Bindu, Shukla, P. and Saini, P. 2012. Development of sprouted oat flour and its incorporation in vada at different levels. *Beverage and Food World*, V39(1), P.59-60.
35. Raj, P., Sharma, S., Chopra, G. and Katoch, A. 2010. Differential in self concept in only child and childhood siblings. *Current advances in agricultural sciences* 2(1):38-39.
36. Rathore, H., Shukla, K., Singh, S. and Tiwari, G. 2012. Shift work - problem and its impact on female nurses in Udaipur, Rajasthan India Work: A *Journal of Prevention, Assessment and Rehabilitation*, 41: 4302.
37. Sidhu, K and Brar, J.K. 2011. Use pattern of medicinal plants for prevention and cure of respiratory disorders. *Indian Journal of Social Research*, 52 (3): 265-271.
38. Sidhu, K. 2011. Agro-climatic Zone-wise analysis of women in farming in Punjab. *Journal of Human Ecology*, 33 (1):47-52.
39. Singh, P. and Tewari, P. 2011. Women decision makers in livestock activities, *Pantnagar Journal of Research*, 9(2): 96-301.
40. Singh, S., Sinwal, N., H. Rathore and Sinwal, S. 2011. Workload related to selected manual material handling tasks. *The Anthropologist International Journal of Contemporary and applied Studies of Man*. 13(4): 293-298.
41. Sood, N., Sangwan, S. and Duhan, K. 2011. Social, emotional and behaviour status of pre-schoolers. *J .Psychology*, 2 (1):37-44.
42. V.V., Mamilla, and Khan, T.N. 2011. Development, nutritional and organoleptic evaluation of herbal composite. *BIONANO FRONTIER*. 4 (2): 305-306.
- Popular articles**
1. Antwal, P., Bellurkar, C. and Bhosale, P. 2012. Dhanya sathavanuki sathi keed niyantranat shetakari mahilancha sahbhag. *Shetibhoti, Mahila Shetkari Visheshank* P.30-32.
2. Bains, S. and Verma, N., 2011. Khetibadi di rahand- khund to varto youg saman banaoo. *Changi Kheti*, 47 (11): 19.
3. Bains, S. and Verma, N., 2011. Make innovative articles from agro waste, *Progressive Farming*, 47 (11):20.
4. Banu, N. and Usha Rani, K. 2011. Chinna pillalalo Abhivrudhi mailurallu (0-3 Yrs), *Roithu bondhu* magazine, P.48-49.
5. Banu, N. and Usha Rani, K. 2011. Developmental milestones in young children (below 3 years). *Surya Daily news paper Dharani*, 28 July.
6. Banu, N. and Usha Rani, K. 2011. Empowering girl child for quality life (Nanyamaina jivananiki adapillala sadikarata). *APARD Journal*, Vol 2, P.8-10.
7. Banu, N. and Usha Rani, K. 2011. Pillala pravarthana perigae vathavarana prabhavam, *APARD Journal*, Sthanika palana, Vol 11, P.40.
8. Banu, N. and Usha Rani, K. 2011. Pillalalo Pravarthana samasyalu (Behavioural Problems in children). *Surya Daily news paper Dharani*, 12 December.
9. Banu, N. and Usha Rani, K. 2011. Pillalalo Sariraka Abivrudhi (Physical Development in children), *Surya Daily news paper Dharani*, 21 November.
10. Banu, N. and Usha Rani, K. 2011. Pillalu Perigae vathavarana, *Surya Daily news paper Dharani*, 19 September.
11. Gaikwad, N.B. 2012. Striche Bhuswamtva, *Shetibhoti*, P.6-7.
12. Gaikwad, N.B. and Wahane, M. M. 2011. Dipparva te Striparva, *Shetibhoti*, P.35-36.
13. Grover, K., Kaur, R. and Sangha, J. 2011. Eat greens for good health, *Progressive Farming*, (47): 10.
14. Kanwar, P. and Thakur, S. 2012. Khadyano main milavat *Giriraj Saptahik*, February, 2:5.
15. Kanwar, P., Kapoor, A. and Shrama, N. 2011. Neem aik prakrati vardan, *Parvatiya khetibari*, P.10.
16. Kaur, R., Grover, K. and Sangha, J. 2011. Changi Sehat lai salad khao. *Changi Kheti*, (47): 14.
17. Kaur, R., Grover, K. and Sangha, J. 2011. This summer, beat the heat with fruit drinks, *Progressive Farming*, (47): 5.
18. Mahale, G. and Kotur, R., 2011. Pidenashakglinda anahut tappisalu surakshit udupu. *Krishi Munnade*, P.24-25 (8).
19. Mahale, G., Kotur, R. and Byadgi, S. A., 2011. Krishi chatuvatikagalalli bekaguva surakshit udupugalu. *Krishi Kamadhenu*, P.24-26 (8).
20. Malhotra, S.R. and Satya Bhamu 2011. Food adulteration: Its preventive measures. *Himachal Reporter*. 12 (50) Palampur, P.9.
21. Malhotra, S.R. and Satya Bhamu 2011. Madhumeh: karan vhi nivan. *Himachal Reporter*. 12 (48) Palampur, P.24.
22. Rajkumar, Shukla, P. and Pandey, U. (2011). Poi leaves Uncommon green leafy vegetable, *Indian Farmer Digest*, 45(1): 42 & 44.
23. Sadana, B. and Bakheta, P. 2011. Dii diyan bimarian ton bachan deyzaroorinukte. *Kheti Dunya*.
24. Sadana, B. and Bakheta, P. 2011. Tips for healthy heart. *Progressive Farming*.
25. Sadana, B., Bakheta, P. and Dhaliwal, R. 2011. Combat anaemia with amla and tamarind, *Progressive Farming*, P.12-13.



26. Satya Bhamra and Malhotra, S.R. 2011. AIDS : Ek Janlewa bimart. *Giriraj Saptahik*. P.9.
 27. Satya Bhamra and Malhotra, S.R. 2011. Ash Gourd : Nature's gift to human being. *Health Action*. P.31-32.
 28. Usha Rani, M. and Vani Dhushanam G. 2012. Milk products as an income generating activity for rural women, *Rythubandu*, P.28-29.
- Papers presented in Conferences/ Symposia/ Seminars/ Workshop**
1. Antwal, P.N., Bhosale, P.B. and Bellurkar, C. M. 2012. Gender roles in livestock development activities. Abstract : Global Conference on Women in Agriculture at NASC Complex, New Delhi, 13-15 March 2012.
 2. Bains, S., Verma, N. and Grewal, N. 2011. Effect of bio-treatment on dyeing of Khadi silk using eco-friendly dye (*Valeriana jatamansi*). Abstract : National Conference on Sustainable development - A collective visions, organized by Institute of Home Economics, University of Delhi, New Delhi, 31 October - 1 November, P.69.
 3. Bala, S., Khambra, K., Pruthi, N. & Punia, P. 2011. Development of paper patterns of Kurta Pyjama for sustenance of its stitching at home. Paper presented in National Conference on Sustainable development - A collective vision at IHE, New Delhi, 31 October - 1 November.
 4. Bala, S., Khambra, K., Pruthi, N. & Punia, P. 2012. Clothing construction for adolescent boys using paper pattern technique. Paper presented in 3rd International Conference Recent Innovation in Engineering & Technology, 24-25 March.
 5. Bala, S., Khambra, K., Pruthi, N. & Punia, P. 2012. Paper pattern technique: A source of income generation for women. Paper presented in National Seminar on Scenario of women in agriculture and future projections at CCSHAU, Hisar, 16-17 February.
 6. Bala, S., Khambra, K., Pruthi, N. & Punia, P. 2012. Women empowerment through drafting technique in garments construction. Paper presented in National Seminar on Scenario of women in agriculture and future projections at CCSHAU, Hisar, 16-17 February.
 7. Baruah, J. 2011. Importance of stimulation in early childhood period. Paper presented in Skill training of instructors of AWTCs/ MLTCs on Strengthening preschool education component in ICDS, organized by The Regional Centre of the National Institute of Public Cooperation and Child Development (NIPCCD) at Guwahati, 25-29 October.
 8. Baruah, J. 2012. The importance of early intervention for Persons with Intellectual and Developmental Disabilities (PWIDs). Paper presented in 7th Regional Parents Meet organized by PARIVAAR - the National Confederation of Parents' association at 'PRERONA' Spastics Society of Jorhat, Assam, 25-26 February.
 9. Chanchal and Punia, D. 2012. Sensory characteristics, nutrient composition and storage stability of value added biscuits prepared from composite flour of oat, wheat and chickpea. Abstract : National Seminar on Sustainable agriculture and food security: Challenges in changing climate at CCSHAU Hisar, 27-28 March.
 10. Duhan, K. & Aneja, A. 2011. Educating women on gender socialisation for gender mainstreaming in rural Haryana. Paper presented in International Conference on Empowering women through Higher Education, organised by Kanya Mahavidyalaya (KMV) Jalandhar (Punjab), 20 -21 October.
 11. Duhan, K. & Aneja, A. 2011. Empowerment of rural adolescent girls on life skills through intervention. Poster paper presented in 5th National Seminar on Multi sectoral innovations for rural prosperity, organised by Mobilization in Collaboration with NDRI, Karnal, Bhartiya Beej Nigam Ltd; Rudrapur and Protection of plant varieties & Farmer's Rights Authority, New Delhi, 19-21 May.
 12. Duhan, K. & Aneja, A. 2012. Educating Mothers on Gender equality with regard to provision of education and occupational opportunities. Paper presented in National Seminar on Scenario of women in agricultural and future projections organized by I.C. College of Home Science and Society of Home scientists for Agricultural and rural institutions, 16-17 February.
 13. Duhan, K. & Aneja, A. 2012. Empowerment of rural adolescent girls on life skills. Poster paper presented in National Seminar on Scenario of women in agricultural and future projections organized by I.C. College of Home Science and Society of Home scientists for agricultural and rural institutions, 16-17 February.
 14. Duhan, K. 2011. Gender discrimination in mother's feelings with regard to education and choice of occupation. Paper presented in 5th National Seminar on Multi Sectoral Innovations for Rural Prosperity, organised by Mobilization in Collaboration with NDRI, Karnal, Bhartiya Beej Nigam Ltd; Rudrapur and Protection of plant varieties & Farmer's Rights Authority, New Delhi, 19-21 May.
 15. Duhan, K. 2011. Personality development in adolescents - The challenges. Paper presented in 10th Annual Conference of Indian Psychiatric Society North Zone, (Haryana Branch) MAMC, Hisar, 5-6 November.
 16. Duhan, K., Aneja, A. & Duhan, B.S. 2012. Economic empowerment of rural women through training in agribusiness skills. Paper presented in National Seminar on department of Higher Education, Haryana, organized by Department of Commerce, Government College for Girls, Panchkula, 14 March.
 17. Gerwal, S., Punia, P., Pruthi, N., Singh, V. & Joon, P. 2012. Adaptation of traditional embroidery design for fabric painting on jacket : A step for entrepreneurship. Paper presented in National Seminar on Scenario of women in agriculture and future projections at CCSHAU, Hisar, 16-17 February.
 18. Grewal, S., Punia, P., Pruthi, N. and Singh, V. 2011. Transformation of traditional embroidery motifs for fabric painting. *Social Science Abstracts*, IASS. XXXV. P.95.
 19. Hunshal, S., Pujar, L. and Patil, M. 2012. Technology intervention to enhance development of rural infants.



- Abstract: Global conference on Women in Agriculture organized by Indian Council of Agricultural Research and Asia-Pacific Association of Agricultural Research Institutions at New Delhi, 13-15 March.
20. Kanwar, P., and Kapoor, A. 2012. Evaluation of status of gender in availing extension services in rural areas of Himachal Pradesh. Abstract: Global Conference on Women in Agriculture at NASC complex, New Delhi, 13-15 March, 2012.
 21. Kaur, A. and Bains, S., 2012. Utilization of agro minor fibres through weaving in Punjab. Abstract: National Conference on Value added apparel and home textiles from natural fibres, organized by Deptt. of Textiles and apparel Designing, SVT College of HSC, SNDT Women's University, Juhu Tara Rd, Santacruz, Mumbai and Indian Fibre Society, Central Institute for Research on Cotton Technology, Adenwala Rd, Matunga, Mumbai, 23 March, P.8.
 22. Khan T.N., Mamilla V.V. and Nalwade V. M. 2011. Supplementation of herbicide and lipid profile. Abstract: Proceeding of International Journal of Clinical Nutrition on Nutraceuticals and Functional Foods at India Habitat Centre, New Delhi, 12-14 September, Vol 22: 14.
 23. Mahale, G. 2012. Protective clothing for pesticide applicators and other agricultural activities of farm families. Poster presentation in Global Conference on Women in Agriculture at New Delhi, 13-15 March.
 24. Mahale, G., Rajashri, K. and Shameembanu, B. 2012. Women empowerment sustainable livelihood through income generating activities. Abstracts: Proceedings & abstracts of National Seminar on Positioning women entrepreneurship in changing socio- economic milieu at Dept. of Home Science, University of Rajasthan, Jaipur, 2-3 February.
 25. Makkar, P., Singh, S.S.J., Rose, N.M., and Pruthi, N. 2011. Effect of Tesu flower dye on physical properties of silk. Abstract: 1st International Science Congress Association at Indore, 24-25 December, P.190.
 26. Malhotra, S.R. and Satya Bhama 2012. Women empowerment: Issues and challenges. Abstract: National Seminar on Scenario of women in agriculture and future projections, organized by CCSHAU, Hisar and Society of Home Scientist for Agriculture and Rural Institutions, 16-17, February, P.89.
 27. Malhotra, S.R., Garg, A. and Satya Bhama 2011. Effect of frozen storage on dietary fibre and carbohydrate profile of promising varieties of pea (*Pisum sativum* L). Abstract: National Seminar on Agricultural engineering intervention, Organized by CSKIPKV, Palampur, 16-17 November.
 28. Mamta and Punia, D. 2012. Sensory characteristics and nutrient composition of value added sev prepared by incorporation of green beans powder. Abstract: National Seminar on Sustainable agriculture and food security: Challenges in changing climate at CCSHAU, Hisar, 27-28 March.
 29. Mamta, Punia, D. and Gupta, M. 2012. Organoleptic evaluation of products prepared from fresh beans. Abstract: Seminar on New perspectives in aromatic and medicinal plants at Medicinal, Aromatic & Under-Utilized Plants Section, Deptt. of Genetics and Plant Breeding, CCSHAU, Hisar, 8-9 February 2012, P.175.
 30. Manu and Punia, D. 2012. Value addition to bajra porridge with Ragi and green leafy powder: Improvement in mineral content. Abstract: National Seminar on Sustainable agriculture and food security: Challenges in changing climate at CCSHAU, Hisar, 27-28 March.
 31. Mukesh, N. Pruthi, P. Punia & S. Yadav 2011. Diversified products of wool-insulation characteristics. Paper presented in National Conference on Sustainable development - A collective vision at IHE, New Delhi, 31 October - 1 November.
 32. Nalwade V. M., Mane G.M. and Khan T.N. 2011. Effect of spirulina incorporated foods on lipid profile in hyperlipidemic subjects. Abstract: Proceeding of International Journal of Clinical Nutrition on Nutraceuticals and Functional Foods at India Habitat Centre, New Delhi, 12-14 September, Vol 22: 15.
 33. Padma, A. 2011. Viable home science technologies for women in agriculture. Paper presented in Zonal Research and Extension Advisory Council meeting, Regional Agricultural Research Station (RARS) Anakapali, Andhra Pradesh, 6-8 April 2011.
 34. Pathania, R. 2012. Socio-economic variables and personality pattern of adolescents. Paper presented in International Conference on Frontier global issues and challenges in the New Millennium on Emerging economy, accounting, finance, information and communication technology, business and management at Jaipur, 5-7 January.
 35. Pruthi, N., Chanchal and Yadav, S. 2011. Manage dressing problems of paralytics through functional garments. Abstract: 1st International Science Congress Association at Indore, 24-25 December, P.191.
 36. Pruthi, N., Makkar, P. and Yadav, S. 2012. Sensitizing women to mitigate health hazards of farm workers during threshing. Abstract: Global Conference on Women in Agriculture at New Delhi, 13-15 March.
 37. Pruthi, N., Singh, S.S.J. & Rose, N. 2011. Self-Help garments for both upper limb amputees. Paper presented in 29th Biennial National Conference on Innovative horizons and emerging challenges for Home Scientists at Lucknow, 4-6 November.
 38. Pruthi, N., Yadav, S. & Chawla, G. D. 2011. Barberry bark: An eco-friendly dye source for silk. Paper presented in 29th Biennial National Conference on Innovative horizons and emerging challenges for Home Scientists at Lucknow, 4-6 November.
 39. Pruthi, N., Yadav, S. and Gaba, G. 2011. Eco-friendly cotton printing with neem leaver at cottage level for women empowerment. Abstract: International Conference on Empowering women through Higher Education at Jalladhar, P.63-64.



40. Pruthi, N., Yadav, S., Gaba, G. & Makkar, P. 2012. Tailoring centre : An ideal micro-level enterprise for rural women. Paper presented in National Seminar on Scenario of women in agriculture and future projections at CCSHAU, Hisar, 16-17th February.
 41. Pujar, L. 2012. Life skill development of adolescent girls. Paper presented in International Conference on Social work practice in multicultural context at Tumkur University, 2-4 March.
 42. Punia, D and Gupta, M. 2012. Impact of nutrition gardening on nutritional status of farm families. Abstract : National Seminar on Scenario of women in agriculture and future projections at COHS, CCSHAU Hisar, 16-17 February, 2012, P.14.
 43. Punia, D and Gupta, M. 2012. Food consumption pattern and nutrient intake of rural families. Abstract : National Seminar on Scenario of women in agriculture and future projections at CCSHAU, Hisar, 16-17 February 2012, P.15.
 44. Punia, D and Gupta, M. 2012. Nutrition gardening : An effective solution for achieving nutritional security of farm families. Abstract : Global Conference on Women in Agriculture at NASC complex, New Delhi, 13-15 March, P.143.
 45. Rajkumari and Shukla, P. 2011. Improving health and nutrition of farmwomen and adolescent girls of farm families through IEC programmes. Abstract : Souvenir, 5th National Seminar on Multi-sectoral innovations for rural prosperity at National Dairy Research Institute, Karnal, Haryana, 19-21 May, P.181.
 46. Rajkumari, Shukla, P. and Limbu, R. 2011. Impact of nutrition garden on nutrient consumption of the people of three villages of Uttarakhand. Abstract : Souvenir, 6th Uttarakhand State Science and Technology Congress at Kumaon University, Uttarakhand, 14-16 November.
 47. Rani, M., Pruthi, N., Punia, P. and Makkar P. 2011. Preferences for diversified products prepared from Sheep wool. Abstract : 1st International Science Congress Association at Indore, 24-25 December, P.190.
 48. Rani, P., Pruthi, N. & Yadav, S. 2012. Occupational health hazards of farm workers in pesticides application. Paper presented in National Seminar on Scenario of women in agriculture and future projections at CCSHAU, Hisar, 16-17 February.
 49. Rani, S. and Candy, T. 2011. Gender perspective in agriculture and rural development. Abstract : International Conference on Innovative approaches for agricultural knowledge management organized by ISEE, Nagpur and ICAR New Delhi, 9-12 November, 2011.
 50. Rani, S. and Candy, T. 2012. Role and responsibility profile of gender in farming. Abstract : National Seminar on Scenario of women in agriculture and future projections, 16-17 February 2012.
 51. Rani, S. and Tandon, C. 2011. Gender perspective in agriculture and rural development. Abstract : International Conference on Innovative approaches for agricultural knowledge management organized by ISEE, Nagpur and ICAR New Delhi, 9-12 November, 2011.
 52. Saini, P., Punia, P., Pruthi, N. & Singh, V. 2012. Diversified Durric products. Paper presented in National Seminar on Scenario of women in agriculture and future projections at CCSHAU, Hisar, 16-17 February.
 53. Saini, P., Punia, P., Pruthi, N., Singh, V. & Bala 2011. Durrie-its diversified use for sustainable development. Paper presented in National Conference on Sustainable development - A collective vision at IHE, New Delhi, 31 October-1 November.
 54. Satya Bhama and Malhotra, S.R. 2012. Emerging status of women in Indian society. Abstract : National Seminar on Scenario of women in agriculture and future projections, organized by CCSHAU, Hisar and Society of Home Scientist for Agriculture and Rural Institutions, 16-17 February, P.25.
 55. Sidhu, K. and Sharma, M. 2012. Safeguarding rural environment : An action research, Abstract : Global Conference on Women in Agriculture at New Delhi, 13-15 March 2012.
 56. Singh, D., Dhaka, P., Ahlawat, I. 2012. Web-based learning system for rural communities. Abstract: Proceedings of All India Seminar on Information and Communication Technology for Integrated Rural Development. The Institution of Engineers, Udaipur Local Centre, 11-12 February, P.13-20.
- Bulletins**
1. Deka, M. B., Saikia R. M & Saikia P. 2012. Book keeping strategy for capacity building and stabilization of SHGs Promote millet cultivation and consumption among the population
 2. Singh, P., Yadav, R. & Tewari, P. 2012. Women development programmes.
 3. Singh, P., Yadav, R. & Tewari, P. 2012. Nutritive value of Uttarakhand fruits
 4. Antwal, P. N., Bhosale, P. B. & Bellurkar, C. M. 2012. Keed kitapanasoon anna dhanyanche sanrakshan (in Marathi).
 5. Raj, P., Chopra, G. & Katoch, M. 2011. Aapke phesle aapki soach.
- Books published**
1. Drudgery of Farmwomen: its Assessment and Management. Eds. Maya Choudhry, Suman Singh, Hemu Rathore 2012. Himanshu Publications, New Delhi, Udaipur.
- Technical bulletin**
1. Thind, S., Chawla, A and Mahal, R. 2011. Agricultural proverbs and slogans on Women empowerment, Indian Council of Agricultural Research, New Delhi.
 2. Thind, S., Chawla, A. and Mahal, R. 2011. Effective life skills for Adolescent Girls (in Punjabi), Indian Council of Agricultural Research, New Delhi.



TRAINING/WORKSHOP/ CONFERENCE CONDUCTED

Title	Date	Number of participants	Name of coordinator/s
Trainers' training on Gender sensitization in agriculture	21-25 November 2011	32 extension functionaries of Uttar Pradesh	Dr K. Ponnusamy
Involvement of farm women in Agriculture	19 August 2011	56 Trainees and 2 staffs of Regional Institute of Training & Extension, Rangailunda, Ganjam district	Dr K. Ponnusamy
Gender sensitization of agricultural research and extension	21 July 2011	7 including one teacher and 6 PG students of Division of Agricultural Extension, OUAT	Dr K. Ponnusamy
Role of DRWA in empowering farm women	21 July 2011	6 ARS probationers of NAARM 93 rd batch as part of their FET institute visit	Dr K. Ponnusamy
Women poultry vaccinator training of Odisha community tank management project organized at Central Poultry Development Organization	16 July 2011	30 participants	Dr A. Kumar
Stakeholders' meeting under network project on horticulture	06 July 2011	20 participants	Dr A K Shukla, Dr Kundan Kishore and Dr Naresh Babu
Workshop on network project on horticulture	05 July 2011	20 participants	Dr A K Shukla, Dr Kundan Kishore and Dr Naresh Babu
Gender issues in agricultural development	08 June 2011	19 trainees from Gopabandhu Academy of Administration	Dr K. Ponnusamy
Women in agriculture and development	11 May 2011	18 trainees from Gopabandhu Academy of Administration	Dr K. Ponnusamy
Exposure visit	24 March 2012	87 farmers and a Assistant Technical Officer from Soil Conservation Research and Training Institute, Jharkhand	Dr K. Ponnusamy
Domestic method of fruits and vegetable preservation	21-25 February 2012	30 village women of Giringaput village	Dr K. Ponnusamy
Nutritious fodder for milch cow	09 February 2012	25 participants of "Master Farmers Training on Dairy Production" organized by IMAGE	Dr A. Kumar
Production technology for horticultural crops	30 January 2012 to 04 February 2012	20 participants from Giringaput village of Khurda district.	Dr A K Shukla, Dr Kundan Kishore and Dr Naresh Babu
Participatory training cum demonstration on vegetable production technology	25 January 2012	20 farmers	Dr A K Shukla, Dr Kundan Kishore and Dr Naresh Babu
Research Extension- Farmers / farm women Interface	10 January 2012	30 farmwomen	Dr A K Shukla, Dr Kundan Kishore and Dr Naresh Babu



Capacity development of rural adolescent girls for use of Information and communication Technology	09 January 2012 to 13 January 2012	9 adolescent girls	Dr S. Agarwal
Capacity building programme on protected cultivation in horticulture	03 November 2011 to 04 November 2011	40 farm women	Dr A K Shukla, Dr Kundan Kishore Dr Naresh Babu
Package of practices of maize cultivation	29 August 2011	20 farm women of Bantala village	Dr S. Mishra
Package of practices of mushroom cultivation	18 August 2011	4 housewives of Aditya Sakthi club, Girish Nagar near Bharatpur Square	Dr K. Ponnusamy
Package of practices of mushroom cultivation	08 August 2011	150 farm women	Dr K. Ponnusamy
Package of practices of mushroom cultivation	22 July 2011	30 farmwomen	Dr S. Mishra Dr K. Ponnusamy

Participation in Exhibitions

1. Exhibition during Celebration of 65th Foundation Day of CRRI, Cuttack on 23.04.2011.
2. Exhibition at Regional Fair, CRRI, Cuttack from 21.02.2012 to 23.02.2012.
3. Exhibition during 99th Indian Science Congress, Bhubaneswar during 03-07 January 2012.
4. Exhibition organised during 13-15, March 2012 at New Delhi on the eve of Global Conference on Women in Agriculture

Meetings attended by Dr Krishna Srinath, Director, DRWA

Attended the following meeting during the period:

- Consultation on Food and Nutrition security for Koraput region, Chaired by Prof. M. S. Swaminathan at Jeypore, Odisha, 17-18 April, 2011.
- First Meeting of the Sub-Committee on Empowering women for Agricultural Development for Twelfth Five Year Plan of Planning Commission at Hyderabad, 25 May 2011.
- Niche Area Committee to recruit Principal Scientist (IPM) for DRWA, New Delhi, 27 May 2011.
- Meeting convened by DDG regarding CAG Audit Para and financial matters at New Delhi from 14-15 July 2011.
- Directors' Conference and ICAR Foundation Day and Award Ceremony at ICAR, New Delhi from 16-17 July 2011.
- Organized National Consultation on Gender perspective in Agriculture at NASC, Complex, New Delhi from 4-15 August 2011.

- 2nd special Meeting of Vice-Chancellor's at NASC Complex, New Delhi, 26-27 September 2011.
- Meeting called by DG, ICAR, regarding Global Conference at DG's office, New Delhi, 20-22 October 2011.
- Pre-conference meeting of National Workshop under the project Enhancing Livelihood of Rural Women through Livestock Production at Shilong, 8-9 November 2011.
- International Conference on Innovative Approaches for Agricultural Knowledge Management at New Delhi, 9-12 December 2011.
- Attended and Co-chaired a session in the National Workshop on farmer-led Innovations at CCSHAU, Hisar, 23-24 December 2011.
- Vth National Project Steering Committee meeting at NRC for Citrus, Nagpur, 7 January, 2012.
- Chaired the workshop on Women in Agriculture at ASRB, New Delhi, 15 February, 2012.
- As the Organizing Secretary organized the Global Conference on Women in Agriculture and presented and invited a paper on Empowering of Women in agriculture at New Delhi from 6-20 March 2012.
- Special interaction between Independent Science Partnership Council (ISPC) and ICAR at NASC Complex, 29 March, 2012.



RESEARCH PROJECTS

S. no.	Title	PI & Co PI	Duration
INSTITUTE PROJECT			
1.	Development of gender information system for Agriculture	Dr H.K. Das Dr Sabita Mishra	2008-12
2.	In vitro Multiplication of Pointed Gourd and Pineapple for Income Enhancement of Farm Women	Dr Kundan Kishore Dr A.K. Shukla	2011-14
3.	Refinement and development of Horticulture based cropping models for gender mainstreaming	Dr Naresh Babu Dr Kundan Kishore Dr A.K. Shukla	2008-13
4.	Empowerment of farmwomen through Information and Communication Technologies (ICT).	Dr Suman Agarwal Dr Sabita Mishra	2009-12
5.	Refinement of vegetable based organic farming practices with gender perspective	Dr Naresh Babu Dr M.P.S. Arya Dr S.K. Srivastava	2009-12
6.	Involvement of tribal women in post harvest handling and marketing of fruits, vegetables and non-timber forest produces	Dr Sabita Mishra Dr H.K.Dash	2009-12
7.	Reducing the gender gap in nutritional status of family members in rice based farming system	Dr Abha Singh Dr M.P.S. Arya	2010-13
8.	Occupational health hazards of farm women at their workplace in Bhopal	Dr Jyoti Nayak Dr S.P. Singh Kumari Gayatri Moharana	2010-2012
9.	Technology Application and Gender Mainstreaming in Agriculture for developing a Model Village	Dr K. Ponnusamy Dr M. P. S. Arya Dr A.K. Shukla Dr Anil Kumar Dr Jyoti nayak Miss Gayatri Moharana	2011-2014
NETWORK PROJECT			
1.	Public-private partnership for Gender Mainstreaming in Agriculture Network Centre : DRWA, Bhubaneswar, KAU, Kerala, CCSHAU, Hissar, AAU, Jorhat, AUW, Coimbatore and MPUAT, Udaipur	Dr Krishna Srinath Dr Sabita Mishra Dr K. Ponnusamy Dr M. P. S. Arya	2009-12
2.	Assessment of gender issues, identification and refinement of selected women specific technologies in Horticulture crops Network Centre: DRWA, Bhubaneswar, IHR, Bangalore, CTCRI, Thiruvananthapuram, CIPHET, Abohar, CISH, Lucknow and CITH, Mukteswar	Dr A.K. Shukla Dr Naresh Babu Dr Kundan Kishore Dr K.Ponnusamy	2008-12
3.	Gender issues in rice based production system and refinement of selected technologies in women perspective Network Centre: DRWA, Bhubaneswar, CRRRI, Cuttack, DRR, Hyderabad, KAU, Kerala and GBPUAT, Pant Nagar	Dr M.P.S.Arya, Dr S.K. Srivastava Dr S.P. Singh	2009-12
4.	Capacity building of coastal fisher women through post-harvest technologies in fisheries Network Centre: DRWA, Bhubaneswar, CIFT, Kochi, CIFE, Mumbai, NFD, Hyderabad, FC &RI, Thoothukudi, OUAT, Bhubaneswar and KVK, ANGRAU, West Godavari	Dr P.K. Sahoo Smt Abha Singh	2009-12
5.	Enhancing livelihood of rural women through livestock production. Network Centre: DRWA, Bhubaneswar, IVRI, Izatnagar, ICAR, Research Complex for NEH Region, Umiam, VC&RI, Namakkal and PGIV&AS, Akola	Dr P. K. Sahoo Dr Anil Kumar	2008-12
6.	Development of expert system for crop and animal enterprises. Network Centre: DRWA, Bhubaneswar, ZCU, Zone VIII, Bangalore, DOEE, TNAU, Coimbatore and DOEE, TANVASU, Chennai	Dr S. K. Srivastava / Dr. K. Ponnusamy	2008-12
EXTERNALLY FUNDED			
1.	NAIP on Visioning, Policy Analysis & Gender (VPAG -e)	Dr Krishna Srinath Dr H.K Das Dr K. Ponnusamy	2007-12
AICRP ON HOME SCIENCE			
1.	All India Coordinated Research Project on Home Science	Dr Suman Agrawal (SIC)	2007-12

PERSONNEL

(As on 31 March 2012)

S. no.	Name	Designation
1.	Dr (Mrs.) Krishna Srinath	Director
2.	Dr Mahendra Pal Singh Arya	Principal Scientist (Agronomy)
3.	Dr Suman Agarwal	Principal Scientist (HORM)
4.	Dr Santosh Kumar Srivastava	Principal Scientist (Entomology)
5.	Dr Anil Kumar Shukla	Principal Scientist (Horticulture)
6.	Dr K. Ponnusamy	Principal Scientist (Agrl. Extn.)
7.	Dr Anil Kumar	Principal Scientist (LPM)
8.	Dr Shiv Pratap Singh	Senior Scientist (FMP)
9.	Dr (Smt.) Sabita Mishra	Senior Scientist (Agrl. Extn.)
10.	Dr Naresh Babu	Senior Scientist (Horticulture)
11.	Dr Hemanta Kumar Dash	Senior Scientist (Agrl. Economics)
12.	Dr (Smt.) Jyoti Nayak	Senior Scientist (FRM)
13.	Dr Kundan Kishore	Senior Scientist (Horticulture)
14.	Smt. Laxmi Priya Sahoo	Scientist (Seed Technology)
15.	Dr (Smt.) Abha Singh	Scientist (Food and Nutrition)
16.	Kum. Gayatri Moharana	Scientist (FRM)
17.	Smt. Tanuja S.	Scientist (FTP)
18.	Smt. Geeta Saha	Technical Officer (T-5)
19.	Shri Bishnu Charan Sahu	T-3
20.	Shri Debendra Nath Sarangi	T-3
21.	Shri Bhikari Charan Sahu	T-3
22.	Shri Manoranjan Prusty	T-3
23.	Shri Sujit Nayak	T-3
24.	Shri G. S. Rao	Administrative Officer
25.	Shri V. Ganesh Kumar	Assistant Administrative Officer
26.	Shri. Janardan Biswal	Assistant Finance and Accounts Officer
27.	Shri S. S. Verma	Private Secretary
28.	Smt. Parisima Sen	Personal Assistant
29.	Smt. Bishnupriya Moharana	Assistant
30.	Shri Parikshit Mallik	Stenographer Gr. III
31.	Shri Jyoti Ranjan Das	Lower Division Clerk
32.	Shri Biswanath Biswal	Skilled Support Staff



Women at agricultural activities