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वार्षिक प्रतिवेदन
Annual Report

2005 - 2006

National Research Centre for Women in Agriculture

Indian Council of Agricultural Research

Bhubaneswar, Orissa, India

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National Research Centre for Women in Agriculture

कृषि में महिलाओं पर राष्ट्रीय अनुसंधान केन्द्र

(Indian Council of Agricultural Research)
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Preface

Presently poverty is the greatest challenge faced by most of the world's developing countries. The poorest countries of the world are those in which agriculture is the predominant sector of employment. To a large degree, the poverty experienced in these countries is a product of unproductive agriculture. Indian condition is not much different from that of many such other countries, where agriculture is still core of economy. Mass poverty reduction initially depends on widespread growth of farm productivity and employment income, and hence on specific scientific progress, usable by small family farmers, mostly in so far recalcitrant areas. Such science needs to see *productive* employment creation in agriculture as a benefit, not a cost. Given that the majority of poor people live in rural areas or rely on agriculture, and that agriculture paves the way for economic growth in the poorer nations, agricultural and rural development will underlie progress on the broad array of economic and social indicators. Gender roles identification and addressing gender issues and gender concerns are essential action points to be seriously implemented in all developmental activities. National Research Centre for Women in Agriculture (NRCWA) is mandated to work in this direction in National Agricultural Research System (NARS). During the period 2005-06, many activities under research, extension and training components were planned and carried out for the benefit of rural farm women while addressing gender issues. This Annual Report is a document of the centre to bring out the highlights of its research, training and extension activities carried out during the year as well as the achievements made towards infrastructural and human resource development.

I express my deep sense of gratitude to Dr Mangala Rai, Secretary, DARE, Govt. of India and Director General, ICAR, for his guidance and sustained support. I sincerely thank Dr P. Das, DDE (AE) for his kind support, consistent guidance and encouragement in all the activities of this Centre.

My appreciations are for all the scientific, technical and administrative staff for contributing material, compiling and editing done for the Annual Report.

HEMA PANDEY
DIRECTOR

कार्यकारी सारांश

केन्द्र में वर्ष 2005-06 में अनुसंधान व प्रसार कार्यक्रम मुख्य रूप से लिंग सम्बंधी तथ्यों पर केन्द्रित रहे। लगभग सभी क्षेत्रों के कार्यक्रमों व योजनाओं में लिंग सम्बंधी तथ्यों को सम्मिलित करने के प्रयास शुरू किये गये जैसे अनुसंधान, प्रसार प्रबन्धन व कृटिा से सम्बन्धित व्यक्तियों में लिंग सम्बंधी सम्वेदना विकसित करना इत्यादि। इन सभी क्षेत्रों में लिंग को किस प्रकार मुख्य धारा में लाया जा सकता है उसका संक्षिप्त वर्णन नीचे किया गया है:

'कृषि अनुसंधान व प्रसार का लैंगीकरण' नामक नेटवर्क शोध परियोजना के अन्तर्गत तीन राज्यों केरल, हरियाणा व उड़ीसा से महत्वपूर्ण आँकडें प्राप्त हुए हैं। जिन्हें इस शोध परियोजना की रिपोर्ट में व्यवस्थित रूप से एकत्रित किया गया है । इस शोध से प्राप्त उड़ीसा राज्य की जानकारियों को संक्षिप्त रूप से इस वार्षिक प्रतिवेदन में शोध व प्रसार से सम्बन्धित व्यक्तियों की जानकारी हेतु दिया गया है। कृषि अनुसंधान व प्रसार का लैंगीकरण नामक प्रशिक्षण मौडयूल जो कि पिछले वर्ष विकसित किया गया था उसे लिंग सम्बन्धी विशेषज्ञों के साथ चर्चा के बाद प्रकाशित किया गया है। इस प्रशिक्षण मोडयूल के प्रकाशन से केन्द्र की लिंग सम्बन्धी अध्ययनों के बारे में साख बढ़ी है। तीन राज्यों से इकट्ठे किये आँकडों के आधार पर लिंग सम्बन्धी जानकारी और अधिक प्रयोग की जायेगी।

कृषि में महिलाओं की कठिनाइयों को दूर करने के लिए निरन्तर प्रयास जारी है। इसी कड़ी में शोध परियोजना 'पर्यावरण हितैषी खर-पतवार के प्रबन्धन का अध्ययन' के अन्तर्गत धान व मूंगफली की फसलों के लिए उपयुक्त सस्यवैज्ञानिक एकीकृत खर-पतवार प्रबन्ध के तरीकों पर शोध किया जा रहा है। पर्यावरण हितैषी खर-पतवार के प्रबन्धन के तरीकों को विकसित करने के लिए विभिन्न किस्मों का प्रभाव, पौधों में आपस की दूरी व खर-पतवार नाशी छिड़काव का मूल्यांकन किया गया है।

महिलाओं को ग्रामीण विकास की मुख्यधारा में लाने में स्वयं-सहायता समूहों की मुख्य भूमिका है। अत: उनके पास उपलब्ध संसाधनों का उचित प्रयोग व इन समूहों की निरन्तर कार्यक्षमता को बढ़ाने के लिए, इनका अध्ययन 'ग्रामीण महिलाओं को स्वंय-सहायता समूहों द्वारा निरन्तर जीविका के लिए प्रोत्साहित करने के लिए मोड्यूल बनाना' नामक शोध परियोजना के अन्तर्गत किया गया है। महिला स्वंय-सहायता समूहों द्वारा स्थापित विभिन्न व्यवसायों का अध्ययन उनकी कार्यविधि का विश्लेषण, शक्तिस्तर, कमजोरी, अवसर व नुकसान के सम्बन्ध में किया गया है। स्वंय-सहायता समूहों को विभिन्न व्यवसाय स्थापित करने के लिए प्रोत्साहित करने के उचित तरीकों का भी अध्ययन किया गया है।

'महिलाओं के द्वारा गृह-वाटिका में उगायी सब्जियों में कीट प्रबन्धन के लिए पर्यावरण हितैषी तकनीकी ज्ञान को कृषक महिलाओं में लोकप्रिय करना' नामक शोध परियोजना के अन्तर्गत टमाटर, बैंगन, बन्दगोभी की फसलों पर पर्यावरण हितैषी कीट प्रबन्धन के विभिन्न तरीकों का सत्यापन किया गया है। जिससे कि महिलाएं व्यवसाय के रूप में कार्बनिक सब्जियों का उत्पादन कर सके। एकीकृत कीट प्रबन्धन

तकनीकी ज्ञान में सब्जियों की विभिन्न किस्मों, फिरोमोन प्रपंच, प्रलोभन, नीम शील्ड व नीम का तेल इत्यादि को सम्मिलित किया गया है।

सब्जियों को तोड़ने के बाद इनमें होने वाले नुकसान को कम करने व इनके रख-रखाब में महिलाओं की महत्वपूर्ण भूमिका को ध्यान में रखते हुए 'सब्जियों को खेत से तोड़ने के बाद उनकी देखभाल एवं प्रबंधन से सम्बन्धित प्रशिक्षण देना' नामक शोध-परियोजना शुरू की गई है। सब्जियों को तोड़ने के बाद उनकी उचित देखभाल के बारे में महिलाओं की जानकारी व कुशलता का मूल्यांकन किया गया जिससे प्राप्त आँकडों के अनुसार आवश्यक प्रशिक्षण के लिए क्षेत्र व जरूरत के आधार पर प्राथमिकता दी जा सके। लघु रूप से सब्जियाँ उगाने वाली कृषक महिलाओं के लिए शून्य उर्जा शीत कक्ष, सब्जियों को तोड़ने के बाद के प्रबन्धन के लिए उपयुक्त पाया गया है।

कई विकास कार्यक्रमों के वावजूद कृषक मजदूर महिलाओं में गरीबी एक बहुत ही ज्वलंत समस्या है। अत: इन महिलाओं की आर्थिक-सामाजिक दशा को ठीक करने के लिए केन्द्र द्वारा 'कृषक मजदूर महिलाओं द्वारा संसाधनों का दक्षतापूर्ण प्रबन्धन नामक शोध परियोजना के अन्तर्गत उड़ीसा व आन्ध्र प्रदेश राज्यों में कार्य किया गया। इसमें मजदूर महिलाओं की कार्यकारी स्थिति एंव उनकी क्षमता को प्रभावित करने वाले कारक, आराम के लिए समय का प्रयोग व उनकी प्रशिक्षण आवश्यकताओं का अध्ययन किया गया है। अध्ययन से प्राप्त निष्कर्षो में इन महिलाओं की कुशलता को बढ़ाकर कार्य करने के लिए अन्य क्षेत्रों को विकसित करने की आवश्यकता है। तथा कृषि के क्षेत्र में भी इनकी कुशलता को बढ़ाने से यह अपने कार्यो को अधिक क्षमतापूर्वक कर अपनी मांग को स्थानीय क्षेत्रों में बढ़ा सकेंगी।

मछली पालन के क्षेत्र में केन्द्र में विभिन्न शोध परियोजनाओं पर कार्य किया गया जैसे - 'महिलाओं के सशक्तिकरण के लिए निरन्तर मछली पालन की विधियों का अध्ययन', 'पिछड़ी जाति समुदायों में परिवारिक आर्थिक सुरक्षा के लिए रंगीन व समेकित मछली पालन' एंव 'महिलाओं का मछली पालन में योगदान - आर्थिक व पोषण सुरक्षाकी ओर एक कदम'। इन शोध परियोजनाओं के द्वारा मछली बीज उत्पादन, मछली पालन, रंगीन मछली पालन, समेकित मछली पालन के क्षेत्रों में महिलाओं का सशक्तिकरण, किया गया है। इसके अतिरिक्त ग्रामीण महिलाओं द्वारा निरन्तर मछली उत्पादन के लिए विभिन्न प्रयोग समूह विधि द्वारा किये गये। परन्तु प्राकृतिक विपदाओं जैसे बाढ़, सूखा एंव उपयुक्त तालाबों के न होने की वजह से मछली पालन की न्यूनतम-मूल्य विधियों व मानक विधियों के विभिन्न आयामों का ठीक से अध्ययन न हो सका। 'पिछड़ी जाति समुदायों में परिवारिक आर्थिक सुरक्षा के लिए रंगीन व समेकित मछली पालन' शोध परियोजना के अन्तर्गत 194 पिछड़ी जाति के परिवारों ने रंगीन व समेकित मछली पालन के लिए किये गये प्रयोगों में भाग लिया। यह प्रयोग 6.685 हेक्टेयर के पानी के क्षेत्र के 50 तालाबों में किये गये। कृषक महिलाओं को कार्प बीज उत्पादन, कार्प पालन, समेकित मछली पालन व रंगीन मछली पालन में प्रशिक्षण दिया गया। विभिन्न तालाबों से समेकित प्रणाली द्वारा मछली पालन उत्पादन से निष्कर्ष निकला कि 1.63 टन/हेक्टयर मछली उत्पादन किया जा सकता है जबकि प्रचलित प्रणाली द्वारा केवल 0.2 टन/हेक्टयर उत्पादन होता है। 'महिलाओं को मछली पालन

में लगाना - आर्थिक व पोषण सुरक्षा की ओर एक कदम' नामक शोध परियोजना के अन्तर्गत कार्प के बीजों का पालन, कार्प का पालीकलचर, ताजेपानी में झींगा पालना, व समेकित मछली पालन इत्यादि क्षेत्रों में कार्य किया गया। 86 महिलाओं ने 14 तालाबों में मछली के बीजों को पालने में भाग लिया। जिससे करीब 4.9 लाख मछली बीजों का उत्पादन हुआ जिनका मूल्य रू45,800.00 हुआ। करीब 5. 4 हेक्टर पानी के क्षेत्र में मुख्य कार्प जैसे कटला, रोहू, मृगल इत्यादि का पालन किया गया। 194 कृषक महिलाओं को समेकित मछली पालन के आवश्यक संसाधन उपलब्ध कराये गये। ताजे पानी में झींगा पालन (मेक्रोब्राचियम रोजनवरजी) पी.एल. को प्रसिद्ध करने के लिए इन्हें समेकित कार्प पालन के साथ कुछ तालाबों में पाला गया। इन्हें करीब 6-8 महीने पाला गया तथा जब इन्हें तालाब से निकाला गया तो इनका वजन करीब 54.5 ग्राम था। मछली-बतख व मछली-मुर्गी के समेकित पालन को लगभग 10 तालाबों में महिलाओं की साझेदारी में पाला गया। इससे लगभग रू1,15,000.00 के मछली-बतख व रू73685.00 मछली-मुर्गी के समेकित पालन से प्राप्त हुए। यद्यपि मछली-बतख के समेकित पालन से अच्छी आय हुई परन्तु फिर भी महिलाओं ने अपनी आर्थिक दशा की सुधारने के लिए मछली-मुर्गी के समेकित पालन में अधिक रूचि दिखायी।

'कृषि में लिंग संम्बन्धी आँकडों का कोष बनाना' नामक शोध परियोजना के अन्तर्गत निमापाड़ा व भुवनेश्वर ब्लाक के पाँच गाँवों के 130 परिवारों को सर्वेक्षण किया गया। पशु-पालन, गृह से सम्बन्धित गति-विधियों व फसल उत्पादन के विभिन्न कार्यो व सिंचित व असिंचित क्षेत्रों में उपलब्ध संसाधन से संम्बन्धित आँकड़े इकठ्ठे किये। आँकडों के विश्लेषण से पता लगा कि महिलाओं पर अधिक कार्यभार होता है तथा वह पुरूषों की अपेक्षा घर की आय में भी अधिक सहयोग करती है । परन्तु घर के आर्थिक मामलो में निर्णय लेने में महिलाओं की भूमिका कम ही रहती है ।

'बीज बलवर्धक तकनीकी ज्ञान में संशोधन कर कृषक महिलाओं के लिए उपयुक्त बनाना जिससे वह मडुआ की उपयोगिता बढ़ा सकें' नामक शोध परियोजना के अन्तर्गत जो महिलाएं मडुआ का उत्पादन कर रही है उनके लिए बीज बलवर्धक विधियों का मानकीकृत किया गया। प्रारम्भिक बीज बल का मूल्यांकन किया गया तथा फिर बीजों को 45 विभिन्न प्रकार के उपचार दिये गये, एक उपचार की तीन बार पुनरावृति की गई।

'शकरकन्दी को विभिन्न अनुपातों में मिला कर शिशुओं के उपरी आहार का मानकीकरण' नामक शोध परियोजना का उद्देश्य स्थानीय खाद्य पदार्थो से शिशुओं के लिए सस्ता उपरी आहार विकसित करना है। मानकीकरण के लिए विभिन्न खाद्य पदार्थो को विभिन्न अनुपातों में मिला कर रखा गया है। उपरी आहार का मुख्य आधार जो माताओं के द्वारा प्रयोग किया गया है वह है चावल के चिवड़ा का पाउडर, गेंहूँ का पाउडर, दालें (0.50 ग्राम मूंग दाल व 0.50 ग्राम चने की दाल) व तिल का पाउडर। इनका 2:1:1:0.25 का अनुपात अधिक उपयुक्त पाया गया है। उपरोक्त आहार को सूखी हुई शकरकन्दी के पाउडर के साथ 75:25 के अनुपात में माताओं द्वारा प्रथम दर्जा दिया गया है। इस उपरी आहार की सरंचना, स्वाद, खुशबू, खाने योग्य तैयार करना व सम्पूर्ण उपयुक्तता को माताओं से नो प्वाइंट के

हेडोनिक स्केल पर मापा गया जिससे उपरोक्त निष्कर्ष प्राप्त हुए। इसके साथ ही शकरकन्दी के साथ तैयार किए गये उपरी आहार की पोषण क्षमता को भी निकाला गया है।

केन्द्र का उप-केन्द्र जो कि भोपाल में स्थित है। उनके द्वारा महिलाओं की शारीरिक संरचना के सन्दर्भ में विभिन्न कृषि यन्त्रों जैसे हाथ से चलाने का सफाई व ग्रेडर, सीड ड्रिल, फर्टीलाइजर ब्रोडकास्टर एंव रीजर का मूल्यांकन किया गया है। 'मध्य प्रदेश राज्यों में महिलाओं की कृषि व इससे सम्बन्धित गति-विधियों में भागीदारी नामक शोध परियोजना के अन्तर्गत 279 ग्रामों से 10059 कृषक महिलाओं से एक सर्वेक्षण किया गया है। तथा महिलाओं की शारीरिक संरचना के संदर्भ में हाथ से चलाने का सी.आई.ए.ई. का दो लाइन का धान का ड्रम सीडर, टि.ए.एन.यू का चार लाइनों का धान ड्रम सीडर, सी.आर.आर.आई का दो लाइन का धान ट्रान्सप्लान्टर व उन्नत कटाई यन्त्र दशंती का मूल्यांकन किया गया है। तथा चयनित कारकों से सम्बन्धित आंकड़े इकठ्ठे किये गये है। मध्य प्रदेश की महिलाओं से इकठ्ठे किये गये आकड़ों के विश्लेषण से उनके द्वारा समय का प्रयोग, उनका कृषि कार्यो में भागीदारी, उनके द्वारा कृषि के औजार व यन्त्रों का प्रयोग, सुरक्षा बाक्स की जानकारी, निर्णय लेने में भागीदारी व उनकी प्रशिक्षण की आवश्यकताए इत्यादि के बारे में महत्वपूर्ण जानकारियां प्राप्त हुई है।

केन्द्र में इस बर्ष विभिन्न क्षेत्रों से सम्बन्धित छह प्रशिक्षक प्रशिक्षण कार्यक्रम आयोजित किये गये जैसे - कार्बनिक खेती, मूल्य-वृद्धि के लिए लिंग सम्बन्धी विशेष तकनीकी, कृषक परिवारों में खाद्य व पोषण सुरक्षा, उन्नत बीजों का उत्पादन, ग्रामीण महिलाओं के लिए कृषि-व्यवसाय, व महिलाओं में उद्यमता विकास विभिन्न शोध परियोजनाओं के अन्तर्गत कृषक महिलाओं के लिए गाँवों में तेरह प्रशिक्षण कार्यक्रम आयोजित किये गये।

केन्द्र में दो महत्वपूर्ण कार्यक्रम आयोजित किये गये जैसे - 'लिंग, विश्लेषण व इसका कृषि अनुसंधान व प्रसार कार्यक्रमों में प्रयोग' पर संक्षिप्त कोर्स आई.सी.ए.आर द्वारा आर्थिक सहयोग से 3-12 अगस्त, 2005 में आयोजित किया गया। इसके अतिरिक्त एक राष्ट्रीय सेमिनार 'कृषि अनुसंधान, प्रसार व प्रशिक्षण में लैंगिकरण - प्राथमिकताएं एंव समस्याएं', 25-27 अक्टूबर, 2005 में आयोजित की गई। केन्द्र में 'हिन्दी चेतना दिवस' व 'कृषि महिला दिवस' भी आयोजित किये गये। 'कृषि महिला दिवस' पर विभिन्न गाँवों से आयी हुई करीब 45 महिलाओं ने भाग लिया व कृषि से सम्बन्धित अपनी समस्याओं का समाधान किया। इन सभी कार्यक्रमो में केन्द्र के सभी सदस्यों ने काफी उत्साहपूर्वक भाग लिया।

प्रयोगशालाओं को अनुसंधान के लिए अच्छा बनाने के लिए जरूरत के अनुसार उपकरण खरीदे गये। पुस्तकालय को भी नई किताबों, शोध - पत्रिका व सी.डी. को खरीद कर समृद्ध किया गया है।

EXECUTIVE SUMMARY

Gender mainstreaming in agriculture research and extension was the focal point of the centre during the year 2005-06. Efforts in all possible directions namely; research, sensitization, extension management, plan and policy have been initiated. A brief account on each and their implications in the gender mainstreaming have been stated below

The network project entitled "Approaches to engendering in agricultural research and extension" in three selected states namely: Kerala, Haryana and Orissa yielded worthwhile data which has been compiled in shape of reports. The summary of the findings of Orissa state has been presented in the annual report in a crisp form for a general understanding of the research and extension professionals. The training module entitled "Gender Sensitization on Training module in Agriculture" developed in preceding year has been published and discussed with different important gender experts. The centre came to prominence in the gender studies through publication of the training module. More implications are expected from the data generated through the gender analysis made in three states.

In our continued effort to help the women reduce drudgery and diversify occupation, research entitled "Studies on eco-friendly weed management" have been undertaken to find out suitable agronomic integrated weed management practices in rice and groundnut. The effect of variety, weedicide spraying and spacing dynamics were assessed in order to develop suitable eco-friendly integrated weed management practices.

Women Self-Help Group being an important instrument of bringing women to mainstream of the development, mobilizing their resources, defining the approach and methods for sustainable functioning of the Self-Help Groups have been studied under the project "Development of modules for mobilization of rural women for sustainable livelihood through Women Self Help groups". Women Self-Help Groups involved in different enterprise patterns have been studied with respect to their functioning and perceived level of strength, weakness, opportunity and threats. Suggestions have been worked out with respect to approach and methodology of mobilizing the Self-Help Groups.

Under the project entitled "Popularization of eco-friendly pest management technologies for vegetables among farm women in homestead lands" validation trials in the crops like tomato, brinjal and cabbage were conducted to identify eco-friendly pest management methods which would help the women to venture in large scale production of organic vegetables. Vegetable varieties, pheromone trap, lure, neem shield and neem oil were incorporated under the integrated post management technology.

Considering the huge scope for women in post harvest and the urgent need to reduce the loss in handling vegetables, the project entitled "Empowerment of Farmwomen in post harvest handling of vegetables" was taken up. The knowledge and skill of farmwomen in post harvest handling of vegetables were assessed and gaps in each were calculated in order to prioritize the training needs and identify the interventions. Zero energy cool chamber has been identified as an suitable intervention to manage the present problems of the small scale vegetable growers.

Poverty among the Women Agricultural Labourers is a matter of concern and many development initiatives for them have failed to address them. In order to propose effective intervention for the socio-economic well-being of Women Agricultural Labourers, the centre undertook a project entitled "Efficient resource management of Women Agricultural Labourers". The above study was carried in Orissa and Andhra Pradesh which examined the employment status, factors associated with employment, leisure time utilization and training needs. The study recommends to open up new avenues of employment for them through capacity building. Enhancement of their skills in agriculture and allied fields may help them to do their job efficiently and create demand for their work in the locality.

In the field of aquaculture the centre undertook three different projects namely "Studies on sustainable aquaculture packages for empowering rural women", "Family based economic security of backward communities through ornamental and integrated fish farming" and "Involving women in aquaculture – A step towards economic and nutritional security". In the above projects empowerment of women in nursery raising, pisciculture, ornamental fish production and integrated fish farming were emphasized. Experiments for finding sustainable aquaculture package for rural women were tried through group approach. Many performance parameters under recommended package and low cost package could not be recorded due to flood, long dry spells and non-availability of comparable ponds. One hundred ninety four families belonging to backyard communities joined the participatory trials in ornamental and integrated fish farming under the project "Family based economic security of backward communities through ornamental and integrated fish farming". The above experiment was conducted in 50 ponds covering the water area of 6.685ha. Farmwomen were trained in the area of nursery raising of carp fry, grow out carp culture, integrated fish farming and ornamental fish production. The comparison of yield from different ponds indicates that fish harvest can be increased from 0.2 t/ha by local method to 1.63 t/ha on an average. In another fishery project entitled "Involving women in aquaculture – A step towards economic and nutritional security" carp seed rearing, carp polyculture, fresh water prawn culture and integrated fish farming were taken up. Eighty six women participated in the nursery rearing taken up in 14 ponds which produced 4.9 lakh fry costing approximately Rs.45,800/-. About 5.4 ha water area was stocked with Indian Major Craps i.e., catla, rohu, mrigal. Necessary support services were provided to 940 women participants.

In an effort to popularize freshwater prawn (*Macrobrachium rosenbergii)* PL was stocked in ten ponds along with composite carp culture. They were reared for 6-8 months and harvested with average weight of 54.5gms. Fish-duck and fish-poultry integrations were tried in 10 selected ponds with active participation of the farmwomen. The economic gain per/ ha in fish-cum-duck and fish-cum-poultry integration was Rs.1,15,000/- and 73,685/- respectively. Inspite of good income from fish-cum-duck integration the farmwomen favoured fish-cum-poultry integration to overcome some socio-economic constraints experienced by them.

Under the project "Database on gender in Agriculture" 130 households from 5 villages of Nimapara and Bhubaneswar blocks were surveyed. Efforts were made the provide data on livestock, household activities, crop production activities and access to resources under irrigated and non-irrigated tracks. The findings brought to light that women shouldered disproportionately more burden and even contributed more than men to household income. With respect to financial decisions taken in the family, majority of women did not have much say.

The project entitled "Refinement of invigoration techniques as suitable to farm women for enhancing planting value of finger millet (*Eluesine coracana*) seeds" has attempted to standardize invigoration techniques suitable for the women who were involved in cultivation of ragi. Initial vigour of seeds was evaluated. The seeds were subjected to 45 treatments in 3 replications.

With an objective to develop low cost weaning mix by using locally available food materials, a project entitled "Standardization of weaning mix using different proportions of sweet potato" was implemented. Various combinations of weaning mix bases were formulated and tried out. Amongst the bases evaluated by the mothers roasted flake powder, roasted wheat powder, pulses (0.50 green gram dal + 0.50 bengal gram dal) and sesame seeds powder in the ratio of 2:1:1:0.25 was found most suitable. The above base with dehydrated sweet potato powder in the proportion of 75 : 25 was ranked I amongst the low cost weaning mixes. The mothers' perception on appearance, taste, flavour, texture and overall acceptability were assessed on nine point hedonic scale to draw the above conclusion. Further the nutrition composition of sweet potato added weaning mix was determined.

The Sub-Centre, Bhopal besides making special efforts on "Ergonomically evaluation of manually operated Cleaner, Grader, Seed Drill, Fertilizer Broadcaster and Ridger with women workers" also undertook survey of 10059 respondents from 279 villages of Madhya Pradesh under the project "Involvement of farm women in agriculture and allied activities in the state of Madhya Pradesh". Ergonomically evaluation of manually operated CIAE two row paddy drum seeder, TNAU four row paddy drum seeder, CRRI four row rice transplanter

and improved sickles were undertaken and data on selected parameters were recorded. The data collected from farmwomen of Madhya Pradesh provided salient informations on time spend, their involvement in farming activities, tools and equipments used, awareness on safety kit, decision-making and training needs.

Six trainers training programmes in the areas of organic farming, gender specific technologies for value addition, food and nutritional security of farm families, enhancing quality seed production, agri-business for Rural Women and entrepreneurship development were held. Thirteen farm women trainings were also conducted in different villages under the approved projects.

The centre organized two important events namely ICAR sponsored short course on "**Gender analysis and its application to agricultural research and extension**" from 3-12 August, 2005 and National Seminar on "**Gender Mainstreaming in Agricultural Research, Extension and Training – Priorities and Problems**" on 25 – 27th October, 2005". "**Hindi Chetna Diwas**" and "**Women in Agriculture Day**" were celebrated wherein staff members participated in great enthusiasm. In the latter event 45 farmwomen from different villages participated and got solutions for their farming related problems.

For optimizing the laboratory facilities need based equipments were purchased. Library was enriched by procurement of new books, journals and CDs.

1 THE CENTRE

1.1 Brief History

The Working Group in Agricultural Research and Education constituted by the Planning Commission for the formulation of the Eighth Five Year Plan (1992-97) recommended for establishment of a National Research Centre for Women in Agriculture (NRCWA) during the Eighth Five Year Plan. Accordingly, the Indian Council of Agricultural Research established the NRCWA in the month of April 1996 at Bhubaneswar. The Sub-centre of NRCWA is located at the campus of CIAE, Bhopal.

1.2 Mandate and Objectives

The centre while finalizing the X plan EFC considered the views offered by different reviewing agencies including Planning Commission and in consultation with the Director General, ICAR, revised the mandate and objectives of the centre to streamline the research programmes to make it more relevant.

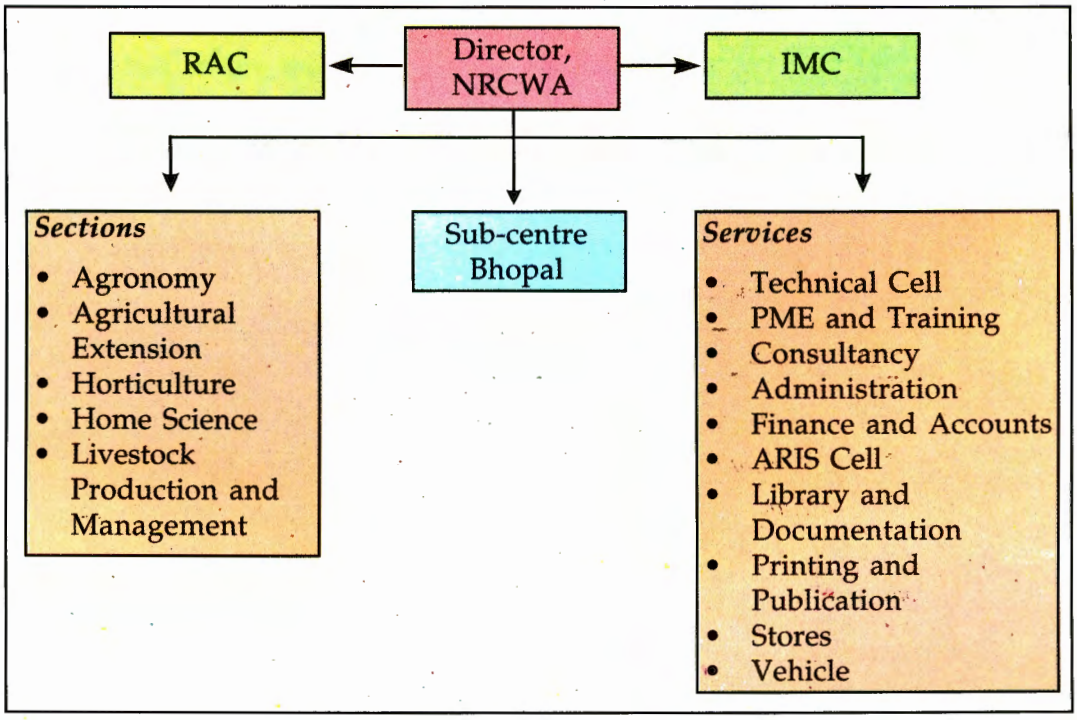
Mandate

To identify gender issues and test appropriateness of available farm-technologies/ programmes/ policies with women perspective 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

- To create a database on gender specific information about men's and women's role in food production and agriculture development for effecting technologies, programmes and policies.
- To test the appropriateness of farm technologies and programmes and policies in terms of gender sensitivity in collaboration with relevant national and international organizations and suggest suitable modifications.
- To develop drudgery reducing options for decreasing the workload and increasing the efficiency of women.
- To develop gender sensitive modules and methodologies for transfer of technology.
- To develop gender sensitive training modules and materials and impart training for capacity building of scientists, researchers, planners and policy makers for gender mainstreaming and practical application of gender related technologies.
- To develop and publish gender sensitive materials, create network linkage through journals and information sharing.

1.3. Organogram of NRCWA



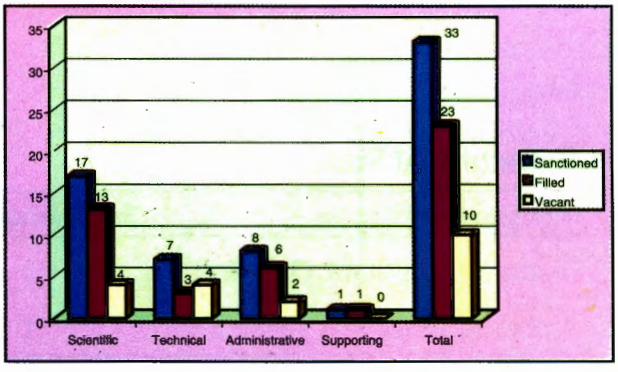
1.4 Budget and Expenditure

(In lakhs)

Sl. No.	Head of Account	Budget		R.E.		Expenditure	
		Non-plan	Plan	Non-plan	Plan	Non-Plan	Plan
A.	**Recurring**						
1.	Establishment Charges including LSP and PF contractual charges	59.90	0.00	65.90	0.00	64.43	0.00
2.	Traveling Allowances	0.10	6.00	0.10	6.00	0.00	6.00
3.	HRD	-	2.00	-	1.00	-	1.00
4.	Contingency	15.00	40.00	16.00	40.00	7.99	40.00
	Total	**75.00**	**48.00**	**82.00**	**47.00**	**72.42**	**47.00**
B.	**Non-recurring**						
1.	Equipments	-	25.00	-	25.00	-	18.37
2.	Works	-	32.00	-	32.00	-	32.00
3.	Vehicle	-	-	-	-	-	-
4.	Library	-	8.00	-	8.00	-	8.00
5.	Furniture/Livestock	-	6.36	-	6.36	-	6.36
	Total		**71.36**		**71.36**		**64.73**
	Total (A+B)		**119.36**		**118.36**		**111.73**

1.5 Manpower

Category	*Sanctioned*	*Filled*	*Vacant*
Scientific	17	13	4
Technical	7	3	4
Administrative	8	6	2
Supporting	1	1	0
Total	**33**	**23**	**10**



1.6 Scientific Staff

Sl.	Discipline	Sanctioned Strength			In position as on 31.3.2006		
		Scientist	Senior Scientist	Principal Scientist	Scientist	Senior Scientist	Principal Scientist
1	DIRECTOR			RMP (1)			RMP (1)
Scientific							
2	Agricultural Economics	1	-	-	1	-	-
3	Entomology	-	1	-	-	1	-
4	Agricultural Extension	-	1	1	-	1	1
5	Agronomy	-	-	1	-	-	1
6	Farm Machinery and Power	-	1	-	-	1	-
7	Food and Nutrition	1	-	-	1	-	-
8	Family Resource Management	-	1	-	-	-	-
9	Home Development Resource Management	-	-	1	-	-	1
10	Livestock Production and Management	-	-	1	-	-	-
11	Dairy Technology	-	1	-	-	-	-
12	Fish Processing Technology	-	1	-	-	1	-
13	Horticulture	2	1	1	1	2	-
	Total	**4**	**7**	**6**	**4**	**5**	**4**

1.7 Technical Staff

Designation	Sanctioned Post	In position as on 31.3.2006
Technical Assistant (T-II-3)	6	2
Technical (T-1)	1	1

1.8 Administrative Staff Inculding Supporting

Designation	Sanctioned Post	In position as on 31.3.2006
Asstt. Administrative Officer	1	1
Asstt. Finance and Accounts Officer	1	0
Personal Assistant	1	1
Sr. Clerk	2	2
Stenographer, Gr-III	2	2
Jr. Clerk	1	0
S.S.G.1	1	1
Total	**9**	**7**

2 RESEARCH ACCOMPLISHMENTS

During the period under report nine projects were being implemented, four projects were concluded and six new projects were approved as per the mandate of the Centre. The details of research achievements are given below:

2.1 Approaches to engendering agricultural research and extension - on networking mode

Hema Pandey, B.N.Sadangi, P.S.Geethakutty, & Indu Grover

Publication of Training Module

The training module entitled "Training Module for Gender Sensitization in Agriculture" developed under the project was published. This publication consists of day-wise activity schedule and supportive materials in the appendix. Publication of this module is an important milestone in the process of building gender sensitive human material. It would help the master trainers and students of social science, gender studies and women's studies.

2.1.1 Gender analysis in the farming systems of Orissa

B.N.Sadangi & Hema Pandey

The salient findings emanating from the gender analysis of 120 households drawn @40 households from three farming systems namely: rice, vegetable and livestock based are stated below:

I. SOCIO ECONOMIC PROFILES

- **Age :** It was observed that participation of the men and women from the age group 30-50yrs was maximum in all the three types of farming system i.e. 70% of women and 52.5% of men in case of both rice and vegetable based farming systems and 55% of women and 47.5% of men in livestock based farming systems.

- **Education :** Majority of men had primary education while most of women were illiterate. A comparison of the participation of educated farmer with the farming system they were involved revealed that educated farmers were found more in vegetable and livestock based farming systems than rice based farming system. The women in livestock based system had higher educational level than the women of other two farming systems.

- **Occupation :** In livestock based farming systems 95% of women had animal husbandry as their primary occupation. In the above system agriculture was primary occupation of 62.5% of the men and 2.5% of the women. The percentage of wage earning men and women in livestock farming systems was found to be lowest.

- **Annual Income :** A comparison among the three systems has made it clear that the prospect of women in getting higher income is more in livestock based farming systems than women did in other two systems. This is because women manage their livestock independently and get monetary benefits by directly selling the milk and milk products and the livestock. In rice and vegetable-based farming systems, the annual income of women is much less, than the men because women support the men in many activities but the output is by family members consumed and sold by the men in case of surplus production.

- **Nutritional status:** Comparison on nutritional status of men and women in the livestock based farming systems, revealed that 85% and 60% of men and women respectively were well nourished. Malnourishment was observed more in rice and vegetable based farming system where women were found most sufferers to an extent of 72.5% in both the systems.

- **Caste:** It was found that the involvement of socio-economically backward communities was more in rice and vegetable based farming systems than the livestock based farming systems. In the later one, the percentage of other caste i.e. socio-economically forward caste was found to be 57.5%.
- **Family type:** The percentage of nuclear family was found higher than that of joint family in all the selected farming systems. Forty five per cent of households in livestock based farming systems had children more than four.

II. ENTERPRISES IN THE FARMING SYSTEMS

- The animal husbandry enterprise was found taken by more than 74% of the selected households in rice and vegetable based farming system and 100% in the livestock based farming system.
- Rice + Pulse + AH (75%) and Vegetable + Rice + AH (72.5%) were found to be most common combination in rice and vegetable based farming systems respectively. Majority (67.5%) of the households took Rice + Pulse + Vegetable, in the livestock based farming systems.
- The agricultural labourers even though resorted to wage earning but were found engaged in farming in different systems by taking leased in land and cultivating their small piece of land. The three important farming systems adopted by them were vegetable + rice + AH (66.7%), AH + crop production + fishery (66.6%) and rice + pulse + AH (40%).
- Since animal husbandry was found as a very important enterprise in all the farming systems particularly for the socio-economic backward farmers, analysis of the animals reared by different category in livestock based farming systems was made. The number of cattle per household was found to be seven, five and four with the small, marginal and agricultural labourer family respectively.

III. TIME UTILIZATION PATTERN OF MEN AND WOMEN ON 24 HRS. BASIS

- By comparing the three farming systems on time utilization pattern during peak season, it was found that farmers in rice based farming systems had highest time spent for personal activities (16 hours 53 minutes) but with respect to farming activities farmers in vegetable-based farming systems had highest time spent (8 hours 32 minutes).

- It was also observed that there was no much difference in time utilization pattern in farming activities in peak and off-season of livestock based farming systems in comparison to other farming systems.
- Overall analysis bring out that women from three farming systems were exclusively responsible for home management activity.
- Women in livestock based farming systems spent more time (5 hours 30 minutes in peak season and 4 hours 50 minutes in off-season) in farming activities than women of other two systems. Women from agricultural labourer households in livestock based farming systems had spent remarkably more time (6 hours 6 minutes) in farming activities in comparison to other women from small and marginal categories who devoted approximately 3 hours 15 minutes.

IV. TOOLS USED BY MEN AND WOMEN IN DIFFERENT FARM ACTIVITIES

- By and large all the activities in rice based farming systems were done by both men and women by manual and traditional methods.
- Participation of women was found negligible in the activities like ploughing, harrowing, plant protection, repair of field channels and marketing.
- The use of modern tools were observed only with respect to spraying of the plant protection materials, threshing by power thresher, carrying crop to house by tractor and trolly, seed treatment drum and seed drill.
- Transport by the use of tractor and trolly was used by 20% of men and women did the transportation by head loads.
- Some of the very common activities performed by the women of different categories were clod breaking, removal of trash, irrigating through channels, manual manuring, seed selection, seed bed preparation, seed sowing, transplanting, weeding, irrigating through channels, harvesting, plucking, threshing, winnowing, bagging, drying, shorting, grading, packing, storage and processing.
- In addition to the above implements the farmers and farm women of vegetable based farming systems used more the spade, hand hoe, rake, local bund former and wooden clod breaker.

V. EXTENT OF INVOLVEMENT OF MEN AND WOMEN IN RICE & VEGETABLE BASED FARMING SYSTEMS

- It was also noticeable that men from all categories had second highest scores in transportation, processing and marketing activity followed by sowing and transplanting activity.
- In rice based farming systems the major involvement of women from all the categories were in sowing and transplanting followed by seedbed preparation activity, harvesting, and threshing.
- It was found that in case of seedbed preparation, sowing and transplanting there was no significant difference between men and women from large farmer category.
- In interculture, water management activities there was no significant difference among men and women of small farmer's category.
- In activities like transportation, processing and marketing, the involvement of women from small and agricultural labourer categories were significantly higher than women from large and marginal farmer categories.
- In vegetable-based farming systems, the data showed that the involvement of men from all categories had highest intensity in seedbed preparation followed by transportation, marketing, sowing, and transplanting. Similarly, women from all categories had highest intensity in harvesting and plucking followed by sowing and transplanting, processing and marketing. The involvement of women from all the categories was significantly higher than men in harvesting. Women from small and marginal farmer categories were significantly higher score over their men counterpart in processing and marketing of vegetables.
- In majority of activities, there was significant difference in the involvement between men and women from marginal farmer category in vegetable based farming systems, where men excelled women significantly in four major activities namely seed preparation, sowing and transplanting interculture and water management.

VI. INVOLVEMENT OF MEN AND WOMEN IN LIVESTOCK BASED FARMING SYSTEM

Activities	Women	Men
Cleaning of Cattle Shed	54% in marginal, 57% small and 78% Agricultural labourer categories	As high as 14% of men were involved in this activity
Cleaning of Utensils	Agril. labourer had highest 78% of involvement	Highest (4%) in marginal farmer category
Milking	Highest (44%) in agricultural l abourer category	Highest (29%) in small farmers
Preparation of feed and feeding	71% & 56% from marginal and agricultural labourers had highest involvement in preparation of feed and feeding respectively	As high as 11% in agricultural labourer category
Fodder Collection	Highest (22%) in agricultural labourer category	Highest (71%) in Small farmer category
Grazing Control	Highest (78%) in agricultural labourer category	Highest (57%) in small farmer category
Purchase of feed and procurement of feed	Small percentage (11%) in agril. labourer category	Highest (71%) in small farmer category
Cleaning of Animals and sale of milk	Highest (22%) in Agricultural labourer category for both activities	Highest (29%) and (14%) in small farmer categories for cleaning and sale of milk respectively
Taking for insemination, treatment and preparation of straw	Highest (11%) and (14%) in agricultural labourer and small farmer respectively	Highest (71%) in small farmer category

(The percentages indicated in the table refer to the involvement of men and women in different activities in the intensity category 'always')

VII. DIFFERENTIAL WAGE RATE

- It was found that women hardly participated in activities like ploughing, earthwork and plant protection, so no wage rate of women for the above activities was collected.
- The wage rates for different farming activities for men and women were found to be Rs. 50/- and Rs.40/- respectively for a work covering 7hrs per day.

VIII. VIOLENCE

- In rice based farming systems cent percent farm women from small farmer category faced physical violence (seldom). Farm women irrespective of their socio-economic status were found verbally abused.
- Seventy percentage women from agricultural labourer category experienced aggressive behaviour and accused their husbands for such violence.
- In vegetable-based farming systems 68% of farm women from marginal farmers category had incidence of physical violence (seldom). Verbal abuse was very common for all the categories of women.
- Highest percentage (67%) of farmwomen in small farmer category faced aggressive behavior of their husbands.
- In livestock based farming systems farm women from marginal farmer category seldom had highest incidence (58.3%) physical violence followed by agricultural labourer (55.6%). Verbal abuse was found highest (77.8%) labourer category.
- Primarily husbands were held responsible by agricultural labourer (66.7%) and marginal farmer (58.3%) for different abuses.

IX. ACCESS AND CONTROL OVER PRODUCTIVE RESOURCES BY GENDER IN THREE FARMING SYSTEMS

The difference between men and women and between systems together with the trends with respect to different resources as observed are presented in the following sub sections. Generalizations on access to and control over resources are drawn where clear cut trends are observed. Discussions are made to bring out underlying socio-cultural causes effecting differential findings between men and women.

- **Land**

(a) Rice based farming systems:

It was found that baring few percentages of households who had no land, majority of the men having farm land had almost full access to and control over it. Few percentages of men had shared the accessibility and control with women in the aspect to cultivation for which the accessibility and control scores were 0.38 and 0.43 respectively. Men's access to and control over other land resources namely buying and selling of land were

much higher than women as evidenced from the mean scores. Access to and control over land resources by women was very negligible in all aspects except cultivation. Only 25% of women respondents had expressed that they had access to and control over cultivation of land to an extent of 50%. None of them were independent with respect to access to and control over land in rice based farming systems.

(b) Vegetable based farming systems:

In vegetable based farming systems the situation was found to be little different in the sense that about 3 per cent of women enjoyed full access to and control over cultivation. Due to the above situation the accessibility score (0.86) and control score (0.55) of women were found higher than that of women in rice based farming systems. The comparison of scores on accessibility and control clearly brought out that men very well dominated the women in all aspects of land resources.

(c) Livestock based farming systems:

In the locale under study many households were land poor. Men were found dominating the women in all aspects of land, however women accessibility was found greater than control. Even in few households women had full accessibility with respect to ownership and cultivation. A fairly good percentage of women had accessibility equal to men with respect to ownership and cultivation.

A general trend was found that women in all the farming systems except cultivation had almost no control over the resources. The reason for somewhat better situation in cultivation (vegetable and livestock based farming systems) is mostly due to the fact that the capacity of the women to produce vegetable and earn money for family sustenance. The women might have achieved this power through the intense involvement in vegetable farming. In livestock based farming, few had earned money from the sale of livestock products and purchased plots in their name.

- **Capital**

The access to and control over capital by men and women were studied by taking three economic components such as family income, credit and savings. The men were relatively stronger as evidence from higher mean scores than women. Women's access to savings in rice based systems was found in an improved state than livestock and vegetable based farming systems. The percentage of women in vegetable based and livestock based farming systems having access to credit was 25% for both where as none from rice based farming systems had access to credit. So far as controlling the credit was concerned, women enjoyed to a small extent in vegetable and livestock based systems. The overall

picture provided that women's access to and control over capital was relatively better in vegetable and livestock based farming systems than that of women in rice based farming systems. Further reflection of women in rice based farming systems on higher accessibility to saving uncovered that in the prevailing value systems of the locality women keep the savings (money) of the family which they interpret as accessibility.

- **Seeds and seedling materials**

Negligible mean scores in rice based farming systems indicated very poor access to and control over seeds and seedlings materials by women. However, the situations for women were found better in vegetable and livestock based farming systems. Women were relatively given responsibilities for seeds and seedlings in vegetable farming which might have been reflected in the mean score.

- **Labour**

Accessibility of men and women to labour of self, family and hired was studied under the three farming systems. In rice based systems self and family labour were used mostly whereas in vegetable and livestock based all the three kinds of labour were used. Again women's access to family labour and hired labour in rice based was found to be zero. Whereas in vegetable and livestock based, women enjoyed greater access than that of women in rice based. Women's control over her self labour and hired labour in vegetable and livestock based farming although found less than men but indicated an improved state. Women in the above systems not only enjoyed some access to, but also could provide direction in growing vegetables, crops and livestock rearing.

- **Manure, Pesticides and Fertilizers**

Farm Yard Manure (FYM) being the commonly available under study natural manure had a greater accessibility for men in the farming situations. However, women had accessibility score of 0.11 in vegetable based farming systems and none had in rice and livestock based farming systems. It was also disheartening to find that the above resource was full controlled by men in rice based farming systems. With respect to synthetic manure men fully dominated the women with respect to access to and control over the resource. In livestock based farming men almost sale the FYM and women do not interfere in the matter.

- **Machinery and equipments**

Farm machinery and equipment were almost absent in all the situations and whenever the household had used it, it was on hiring basis. Men only had access to and control

over in vegetable based farming systems. It was observed that radio, as a medium of communication was more accessible to both men and women in all the farming systems than TV. The presence of TV in the families found dependent to a great extent on the economic condition of the household and quality of telecast. Both men and women enjoyed equally on the access to and control over radio in rice based farming systems. It was found that the households in the vegetable based locality belonged to backward classes constraining them to go for radio and TV. Both men and women had equal access to and control over TV in rice based farming systems. The situation in the vegetable based systems was far behind due to their backwardness of society. Two-wheelers were found almost in the hand of men and women had nil to negligible access and control over the two wheelers. Equal access to and control over by men and women with respect to radio and television in the livestock based farming was found.

- **Farm produce**

  Farm produce in rural areas includes crop, animal and fishery. In rice and vegetable based farming systems there is likelihood that different enterprises come up around the main enterprise like rice and vegetables. In all the selected locations fishery enterprise was found almost absent. Men had higher access to and control over the crop produces than women as evidenced from the scores.

  The gap between men and women for animal produces in both the farming systems was found less than crop; even women had more access to and control than men in vegetable and livestock based farming systems. In rice based farming systems the accessibility (1.75) and control (1.03) scores of men and women were same implying that both the dimensions went together. It is interesting to mention here that the position of women in matters related to crop and animal produces is not a passive one.

- **Farm Skills (technology)**

  Training as a method of transferring farm skills was studied. It was found that some opportunity of getting training was available only in vegetable-based farming systems through the facilities created by Orissa University of Agriculture and Technology (OUAT). So the analysis did bring out any data on rice and livestock based farming situations. About 3 per cent men in vegetable based farming systems had access to trainings in agriculture.

- **Market**

  The analysis on access of men and women to market was made under three selected parameters such as marketing place, market information and transport to market places. Although in the advanced and organized farming communities control of the parameters

by communities does exist but in the traditional farming environment prevailing in the localities, the behaviour of men and women with respect to control was not observable and meaningful. In rice and livestock based farming systems women did not have any access to the selected parameters whereas men had access score of 2.40 and 1.80 to market places and market information respectively. Men even perceived their access to public transport for carrying produces as nil. The vegetable based farming systems which was situated nearer to urban centre, the access of men to market, market information and transport was 1.91, 1.69 and 1.54 respectively. Farmwomen in the above systems had accessibility score of 0.11 for all the three parameters. Men in the livestock based farming had also fair degree of access to market. It may be stated here that urbanization may be an important factor affecting the access of men and women to the parameters (resources).

- **Farm income**

Income from crop and animal were studied as two major sources. As women were involved in farm production, it was intended to examine as to what extent they had access to and control over farm income. Data obtained form the survey revealed that men had higher access to and control over income from crop as well as animal than women in rice and vegetable based farming. The scores of men in the aspects of accessibility and control under both the systems from crop sources were found much higher than women whereas the gaps reduced for income from animal source implying that women had an improved state so far as accessibility and control on income from animal source was concerned. In livestock based farming women found enjoying greater access and control than men.

- **Institutions**

Institutions associated with farm and socio-economic development such as public sectors banks, post-office and SHGs were included in the analysis. The findings were almost similar to market resources, except in case of SHGs and Mahila Mandal. The accessibility of men to banks and post-offices was found to be much higher and women in vegetable and livestock based farming systems had almost nil access. In many localities of Orissa the programme under Mission Shakti had encouraged many institutions to organize women in rural areas. This had contributed for organization of Women Self-Help Groups (SHGs) and Mahila Mandal. The out comes of the above programme had been reflected in the findings i.e., the accessibility score of women in rice and livestock based farming systems to women SHGs and controlling the affairs was found to be higher than men. Similar was the trend in vegetable based farming systems.

Power

Both men and women had varying degree of access to and control over animal power in three farming systems. With respect to electrical power in rice based farming systems, the accessibility score of men was 1.24 which was much greater than their counterpart in vegetable based farming systems. The above trend was also observed in vegetable based farming systems. As discussed earlier the backwardness of the households living in vegetable based farming systems had contributed for low mean scores. Whenever the electrical power is available to households, men dominated women in matters of uses and other payment decisions. The presence of mechanical power was very poor in vegetable and livestock based farming systems and found nil in rice based farming systems. Mechanical power uses and its control in vegetable and livestock based farming systems was purely the domain of men and women had no role.

X. GENDER IN FOOD PREPARATION AND INTAKE

- The jobs of preparation of food, decision on items were found to be the sole responsibility of the women of the family.
- However, the job of purchase of food item was totally dependant on men.
- Regarding quantity of intake, men were found taking more than women in foods namely milk, fruits and pulses in rice based farming systems. Similarly in vegetable based farming systems men took more than women for all foods except milk and vegetable. The situation was found better in livestock based farming system in the sense that both men and women had higher quantity implying that there was almost equal distribution.
- The analysis of different patterns of food service in three farming systems brought out that elders and men were served first and next to them were the male children.
- Eating together always was not found among the households of the selected farming systems. Majority of the households were acquainted with non-veg food type.

XI. GENDER IN WATER, FUEL AND FODDER

- **Collection of water:**

(a) Approximately cent percent of farm women in all the farming systems collected water mainly for three purposes such as drinking, livestock use, households and personal needs.

(b) About 3% men in vegetable based and 5% men in livestock based were found in this activity.

(c) The three sources of water for households and drinking purposes in descending order were pond, well and tubewell.

(d) The result also revealed that men and women on an average carried 30 kg of water per trip. Men and women fulfilled their needs in 4-6 trips per day.

(e) Generally men carried water loads by their cycle whereas women by head load.

- **Collection of fuel:**

(a) The fuel as available in the locality namely, cow dung, firewood, leaves and twigs collected by men and women were analyzed.

(b) Cow dung which was an important source of energy for cooking had three major activities such as collection, preparation of cakes and storage. All these activities were done almost by women in cent percent in three different farming systems.

(c) In fire wood collection preparation and storage men dominated the women in all the activities in rice based farming systems. But in vegetable and livestock based farming systems the preparation and storage part was dominated by men.

(d) In vegetable based farming system involvement of women in collection, preparation and storage of leaves and twigs was highest followed by in rice and livestock based farming systems. Few percentages of men were also involved in the above activities in rice and livestock based farming systems in equal sharing basis.

(e) LPG and kerosene were found used by 5-12% of the households. This was used by the socio economically better up households.

(f) Due to opening of outlets for distribution of kerosene in each village, women preferred to collect their allotted quantity for their domestic use.

- **Fodder:**

(a) Men had full involvement in cutting of fodder; preparation of feed, collection of feed, transportation, chaff cutting in rice based farming systems. Whereas both men and women were found involved in vegetable and livestock based farming system and women had greater role in preparation of feed. In chaff cutting women did more than men in livestock based farming.

XII. HEALTH AND DISEASES OF MEN AND WOMEN IN DIFFERENT FARMING SYSTEMS

- In rice based farming system majority of men suffered from headache, cold, joint pain whereas women suffered from cold, tiredness, exhaustion, joint pain and back pain.

- In vegetable based the major diseases of men were fever and headache whereas women suffered from headache and cold.
- Majority of women in livestock based farming suffered from headache, cold and joint pain and men did not have any major diseases.

XIII. ADDICTION AND PERCEIVED CAUSES OF ADDICTION

- In rice based farming systems the addiction to vices was more in comparison to other two farming systems.
- Addiction to *beedi/ cigarette*, tobacco leaves, pan and *bhanga* was found more popular among men where as *pan* was found more popular among women of all categories. Addiction to tobacco leaves was also more popular among women from marginal farmer categories.
- Addiction to *bhanga*, tobacco, *beedi* and country liquor were found more in men from agricultural labour category than other categories. Women from large farmer category were found to be more addicted to pan, *supari* than women from other categories.
- By comparing all the farming systems, it was noticed that addiction was more in rice based than other two farming systems. It may be due to more stress and strain involved in rice cultivation. Women in vegetable and livestock based farming systems were not practising any addiction except pan that to by very limited percentage.
- Men from rice based were addicted to more vices but men from vegetable-based farming systems spent more than rice and livestock based farming systems. It was also noticed that men from marginal category in vegetable farming systems were spending highest amount for their addiction than any other categories. It may be due to their frequent visit to market places.

The data generated through the gender analysis have amply demonstrated the immense contribution of women to the three farming systems and raised many gender issues related to the socio-economic well being and technological empowerment of men and women in agriculture.

2.2 Studies on Eco-Friendly Integrated Weed Management

M.P.S.Arya

Screening of rice genotypes for weed suppression

The field trial was conducted during Rabi 2004-5 and Kharif 2005 aiming to study the six genotypes (Khandagiri, Udaigiri, Nilgiri, Ghanteswari, ORS 102-4 and OR 1519-2) with reference to their ability to suppress the weeds so that weed intensity could be reduced and the women workers will face less stress and strain in weeding. The experiment was conducted in Randomized Block Design with four replications.

During Rabi 2004-05, variety Nilgiri recorded highest yields (Table 1) both under weed stress (26.12 q/ha) and weed free (32.08q/ha) conditions. In Kharif, 2005 the yields recorded were very poor below 2.00 q/ha, thus no conclusion was drawn. The results further revealed that rice variety Udaigiri (19.20g/m2) in Rabi 2004-5 and Nilgiri (100g/m2) in Kharif 2005 recorded the lowest (Table 2) weed dry weight under unweeded check. The major weed species observed were *Bulbostylis barbata* (Rottb.) C.B. Clarke, *Cyperus compressus, Digitaria sanguinalis, Brachiaria mutica, Perotis indica, Digitaria ciliaris, Dactyloctenium aegyptium, Tephrosia purpurea* (Linn.) Pers. *Desmodium triflorum, Sida cordata* (Burm. F.) Waalkes, *Spermacoce ramani* and *Mitracarpus verticillatus* in Kharif and *Mitracarpus verticillatus, Perotis indica, Digitaria ciliaris, Dactyloctenium aegyptium and Hedyotis corymbosa* in Rabi seasons.

Table 1. Grain yield (q/ha) of rice varieties in response to weed infestation

Varieties	*Rabi* 2004-05				*Kharif* 2005	
	Weed free	Weedy	Yield at 50% input	% Loss over weed free	Weed free	Weedy
Khandagiri	25.77	16.15	20.96	37.33	1.13	0.42
Udaigiri	27.03	20.59	23.81	23.82	0.85	0.77
Nilgiri	32.08	26.12	29.10	18.58	2.88	1.57
Ghanteswari	19.88	16.82	18.35	15.39	0.29	0.11
ORS 102-4	21.53	20.42	20.98	5.16	1.19	0.53
OR 1519-2	24.13	15.09	19.61	37.46	1.26	1.17

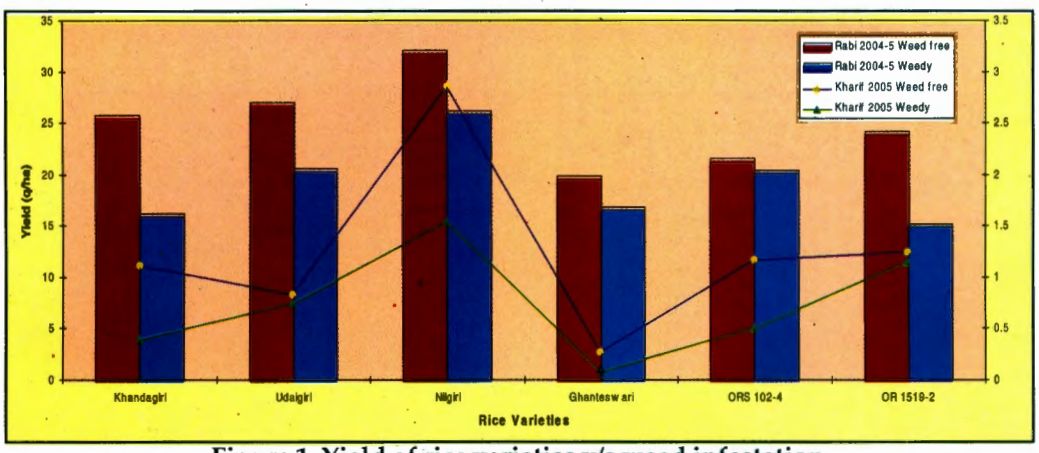


Figure 1: Yield of rice varieties v/s weed infestation

Table 2. Total dry weight (g/m²) of weeds under different varieties of rice 30 days

Varieties	Rabi 2004-5	Kharif 2005
Khandagiri	24.00	120.40
Udaigiri	19.20	119.30
Nilagiri	37.20	100.00
Ghanteswari	28.80	113.60
ORS 102-4	36.80	119.10
OR 1519-2	19.60	145.00

Study on threshold weed density for economic level competition in rice

Many of the weed species found to affect the rice crop under different agro-climatic conditions. Thus, the crop yield varied according to the nature of weed species and their intensity. A field trial was conducted on rice variety Khandgiri on three-weed species namely: *Bulbostylis barbata, Cyperus compressus* and *Perotis indica* with four levels of weed population i.e. Zero, 25, 125 and 625 plants/m² during Kharif and *Mitracarpus verticillatus, Perotis indica* and composite weeds with Zero, 12.5, 25 and 50 plants/m² during Rabi. The experiment was laid out in Randomized Block Design with four replications.

During Rabi (2004-05) no weed specie (*Mitracarpus verticillatus, Perotis indica,* including composite) up to weed population of 12.5 plant/m² had any adverse effect on grain yield of rice. Rather, an advantage in grain yield was recorded over weed free check (Table 3). Further increase in weed density beyond 12.5 plants/ m², however, affected the yield adversely. The yield recorded in kharif 2005 was very poor. The per cent yield loss caused due to *Cyperus compressus* was higher than other weed species at all the levels of weed densities. *Bulbostylis barbata* caused the lowest yield loss.

Table 3. Grain yield (q/ha) of rice and weed dry weight (q/ha) under varying weed densities during Rabi season

Treatments	Rabi 04-05		
	Grain yield (q/ha)	% Yield loss over check	Weed dry weight (q/ha)
Weed free check	18.33	-	0.00
Mitracarpus verticillatus 12.5	24.22	(-) 32.13	5.21
Mitracarpus verticillatus 25	14.90	18.71	7.29
Mitracarpus verticillatus 50	13.97	23.79	8.33
Perotis indica 12.5	23.65	(-) 29.02	5.22
Perotis indica 25	13.51	26.30	7.29
Perotis indica 50	12.56	31.48	7.29
Composite 12.5	18.42	(-) 0.49	5.21
Composite 25	15.55	15.17	5.21
Composite 50	10.69	41.68	7.29

Table 4. Grain yield (q/ha) of rice under varying weed densities during Kharif 2005

Treatments	Yield (q/ha)
Weed free check	2.16
Bulbostylis barbata 25	2.40
Bulbostylis barbata 125	3.08
Bulbostylis barbata 625	3.75
Cyperus compressus 25	3.36
Cyperus compressus 125	2.61
Cyperus compressus 625	1.82
Perotis indica 25	1.59
Perotis indica 125	1.07
Perotis indica 625	1.21

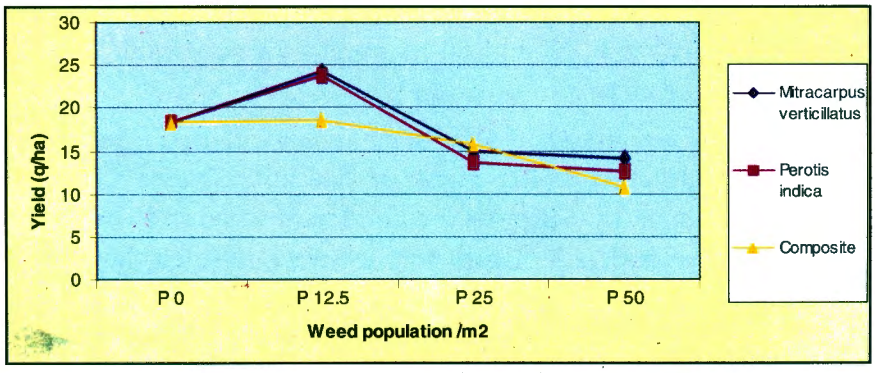


Figure 2. Yield of rice v/s weed population (Rabi 2004-5)

Standardization of weedicide spraying schedule for rainfed rice

The field experiment was initiated in Kharif 2005 using 2 weedicides namely, Butachlor at 2.0kg a.i./ha and Pretelachlor at 1.0kg a.i./ha on rice variety Khandagiri. The experiment was conducted in Randomized Block design with 4 replications. The data on dry weight of weed recorded at 30 DAS revealed that the pre emergence spray of both the herbicides at the date of sowing only was more effective than 5 DAS and 10 DAS (Table 5). The yield recorded during this season, however, was very poor.

Table 5. Grain yield (q/ha) and dry weight (g/m²) of weed at 30 DAS under different herbicide spray scheduling in rice

Treatments	Yield (q/ha)	Weed dry wt. (g/m2)
Butachlor spray at first day of sowing	1.08	37.70
Butachlor spray at 5th day of sowing	0.93	47.30
Butachlor spray at 10th day of sowing	0.67	106.00
Butachlor spray at 15th day of sowing	0.50	105.20
Pretelachlor spray at first day of sowing	1.73	53.00
Pretelachlor spray at 5th day of sowing	0.60	100.00
Pretelachlor spray at 10th day of sowing	0.59	104.70
Pretelachlor spray at 15th day of sowing	0.54	101.30
Weedy check	0.48	114.10

Screening of groundnut genotypes for weed suppression

The field trial was conducted during Rabi 2004-5 and Kharif 2005 aiming to study the six genotypes (Somnath, TAG 24, TG 3, TMV 2, AK 12-24 and Smruti) with reference to their ability to compete with weeds so that weed intensity could be reduced and the women especially working on their own field are relieved to some extent from sharing heavy burden of weeding. The experiment was conducted in Randomized Block Design with three replications. Data in Table 6 revealed that during Rabi 2004-05 and Kharif 2005, variety

Table 6. Pod yield (q/ha) of groundnut varieties in response to weed infestation

Varieties	Weed free		Weedy		Av % Loss	
	Rabi04-05	Kh 05	Rabi04-05	Kh 05	Rabi04-05	Kh 05
Somnath	16.67	17.5	10.83	6.11	35.03	65.09
TAG 24	12.92	6.94	7.22	2.22	44.12	68.01
TG 3	9.86	6.53	9.44	4.16	4.26	36.29
TMV 2	11.25	8.61	5.83	5.83	48.18	32.29
AK 12-24	9.44	7.78	7.36	4.72	22.03	39.33
Smruti	8.33	5.42	3.47	3.06	58.34	43.54

Somnath recorded the highest (16.67 and 17.5 q/ha, respectively) pod yield. The same trend was recorded both under weedy and weed free conditions. During Rabi 2004-05 Variety TG3 recorded the highest tolerance to weed infestation with lowest loss of only 4.26% while in Kharif 2005, TMV 2 recorded the lowest yield loss (32.29%). However the yield level of Kharif 2005 was poor.

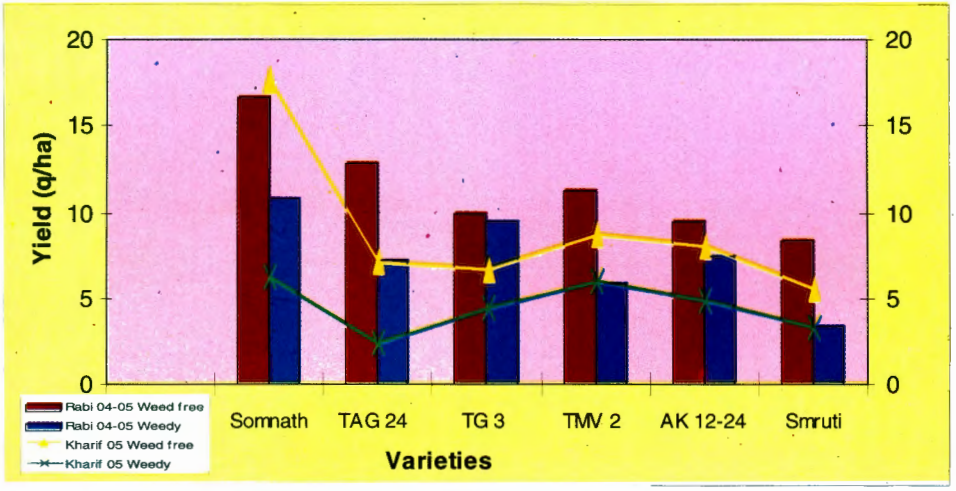


Figure 3. Groundnut yield v/s weed infestation

Table 7. Dry wt (g/m²) of weeds in groundnut varietal trials

Varieties	Rabi 04-05	Kharif 05
Somnath	2.87	80.67
TAG 24	1.37	88.267
TG 3	7.47	88.40
TMV 2	1.13	73.73
AK 12-24	2.00	95.33
Smruti	4.13	82.53

Study on threshold weed density for economic level competition in groundnut

Many of the weed species found to affect the groundnut crop under different agro-climatic conditions. The yield of crop, thus, varies according to the nature of weed species and their intensity. A field trial was conducted on groundnut variety Smruti on three-weed species namely- *Bulbostylis barbata*, *Cyperus compressus* and *Perotis indica* with four levels of weed population i.e. Zero, 25, 125 and 625 plants/m² during Kharif and *Mitracarpus verticillatus*, *Perotis indica* and composite weeds with weed population Zero, 12.5, 25 and 50 plants/m2 during Rabi. The experiment was laid out in Randomized Block Design with four replications. The data recorded revealed that the yields recorded both during Rabi 2004-05 and Kharif 2005 were very poor (Table 8) and could not be considered for drawing any inference.

Perotis indica weed caused the highest loss (35.27%) to the pod yield and recorded highest weed dry weight (16.67 q/ha) at harvest in both the seasons

Table 8. Pod yield (q/ha) of groundnut and weed dry weight (at harvest) under varying weed densities

Treatments	Pod yield (q/ha)	Dry wt of weeds (q/ha)
Rabi 2004-05		
Weed free check	2.60	0.00
Mitracarpus Verticillatus 12.5	2.50	11.46
Mitracarpus Verticillatus 25	4.06	16.67
Mitracarpus verticillatus 50	4.58	17.71
Perotis indica 12.5	4.27	8.33
Perotis indica 25	5.00	15.63
Perotis indica 50	3.54	21.88
Composite 12.5	2.92	10.42
Composite 25	3.30	11.46
Composite 50	3.30	16.67
Kharif, 2005		
Weed free check	3.54	0.00
Bulbostylis barbata 25	2.71	6.25
Bulbostylis barbata 125	2.60	5.21
Bulbostylis barbata 625	2.81	5.21
Cyperus compressus 25	3.33	3.65
Cyperus compressus 125	4.27	4.17
Cyperus compressus 625	3.23	4.17
Perotis indica 25	1.46	15.62
Perotis indica 125	1.04	16.67
Perotis indica 625	1.56	18.75

Effect of spacing dynamics on the density and growth of weeds in groundnut

For studying inter and intra smothering effect of cover crop i.e. groundnut (var. Smruti), a field experiment was conducted using three levels of area per plant (160, 240 and 320 cm^2) and three levels (2:1, 3:1 and 4:1) of row to plant spacing ratios. The layout was made in Randomized Block design with three replications.

The data recorded on spacing geometry in groundnut revealed that during both the seasons the highest pod yield (7.29 and 4.67q/ha) was achieved in per plant area of 160 cm^2 arranged in 3:1 row to plant ratio (21.9cm x 7.3 cm). The pod yields recorded in Rabi 2004-05 and Kharif 2005 were, however, poor.

Table 9. Pod yield (q/ha) of groundnut under varying levels of planting geometry

Treatments	Pod yield (q/ha)		Total weed wt g/m² (Kharif 04)
	Rabi 04-05	Kharif 05	
S160 R2:1	6.02	3.24	78.27
S160 R3:1	7.29	4.67	91.20
S160 R4:1	6.34	2.30	67.40
S240 R2:1	5.85	2.13	80.39
S240 R3:1	5.51	2.39	71.20
S240 R4:1	5.73	1.65	68.40
S320 R2:1	4.81	2.04	70.13
S320 R3:1	5.96	1.45	107.54
S320 R4:1	4.68	3.51	81.60

In view of the inconsistency of results, the project has been extended by one more year. The results after verification will be compiled for drawing meaningful information on suitability of variety and other weed management practices relevant to farm women.

2.3 Development of a Module for mobilization of rural women for sustainable livelihood through women Self-help Groups (SHGs)

Suman Agarwal

Objectives

- To identify women Self Help Groups (SHGs) involved in different types of entrepreneurial activities related to different production systems.
- To undertake SWOT analysis of the selected women SHGs involved in different entrepreneurial activities related to different production systems.
- To analyze the details about the linkages established by different women SHGs at various levels.

This project has focused on the identification of enterprises run/ managed by Women Self-help groups (SHGs) for their economic upliftment. Strengths and weaknesses of the women SHGs through SWOT analysis have been spelled out in relation to the success and failure of management of enterprises related to different production systems. Participatory approach has been followed to collect the information about the enterprises run by women SHGs. A survey has been undertaken to identify the number of

women SHGs constituted by different organizations in Coastal districts of Orissa state. Women SHGs running in different blocks of Puri district have been selected purposively for screening for SWOT analysis.

Five women SHGs were selected for SWOT analysis. The enterprises run by selected SHGs have been given in Table 10.

Table 10. Women SHGs selected for SWOT analysis and their entrepreneurs

Sl. No.	Name of SHGs	Enterprises run by SHGs
1	Bhagavati	Floriculture+ Mushroom cultivation
2.	Dhaneswari	Vegetable growing+ pisciculture
3.	Basudev	Vegetable growing+ value addition of fruits & vegetables
4.	Sadhicha	Pisciculture + agro-processing
5.	Prerana	Vegetable growing+ floriculture+ badi making

The result of SWOT analysis taken up during 2004-05 for ten groups together with current years result provided a full picture on strengths, weakness, opportunities and threats of the women SHGs.

Strengths

- Ability and Commitment to work
- Positive attitude towards change
- Eagerness to grasp new ideas/practices
- Honesty in dealing with money and work
- Ability to avail the opportunity.
- Management is committed and confident.

Weaknesses

- Delay in decisions making
- Lack of confidence
- Limited budget.
- Inadequate cash flow
- Difficulty in independent movements to far-off places.

Opportunities

- Credit facilities from Banks
- Subsidy facilities on Bank loans
- Training provisions for capacity building from different Govt. & non-Govt. agencies.

Threats

- Product competition/Quality of the product
- Lack of marketing facilities
- No direct marketing experience.
- Market demand very seasonal.

It was found that some of the SHGs are not as successful as others. For this, the identified reasons are

- Inadequate training
- Lack of proper know-how or technology
- Poor quality of the products
- Inferior packing and packaging technology
- Improper preservation and storage facilities
- Poor transport facilities
- Lack of professional marketing expertise

Findings revealed that a group having good linkages with other women's groups, government officers and local business, had founds it easier to sustain and enlarge its business. A group with the ability to form partnerships for marketing, product information, technologies were in a better position to develop its business.

2.4 Popularization of Eco-Friendly Pest Management Technologies for vegetables among Farm Women in Homestead lands

S.K.Srivastava, B.L.Attri & L.P.Sahoo

Fifteen Participatory Validation Trials (Five each on Tomato, Brinjal and Cabbage) were conducted with four varieties of cabbage viz, priya, green samrat, green diamond and Gold Star , four varieties of brinjal viz, Green Star Long, BB-44, Green star and Chandrika and four varieties of tomato viz, Utkal Deepti, Kumari, Jyoti and Samleswari under eco-friendly method and conventional method. Seed material of different varieties, Pheromone trap and Lure, neem Shield and Neem Oil were distributed to the selected farmwomen for participatory validation trial. Data of Participatory Trials were compiled and statistically analysed for the interpretation of the results. Brinjal BB 44 was preferred by farmwomen because it was suitable for transportation. Tomato Kumari was preferred by farmwomen due to good keeping quality. Cabbage Gold Star (Hybrid) was preferred by farmwomen because heads were very solid and do not burst even after several days of

maturity. Highest benefit-cost ratio was found in eco-friendly methods in comparison to conventional methods of pest management.

Thirty nine eco-friendly pest management technologies and ITKs related to vegetables were collected and documented from the farm women of different villages of Orissa and from different organizations located at Bhubaneswar, which are presented in Table 11.

Table 11. List of eco-friendly pest management technologies and ITKs collected from different sources of Orissa

Sl. No.	Name of the eco-friendly pest management technologies	Crop	Pest
1.	Application of kochilla (*Strychnos nuxvomica*) + cow dung compost	Brinjal	Fruit and shoot borer
2.	Inter cropping of cabbage+ tomato (1:1) tomato seedling should be transplanted before 30 days transplanting of cabbage	Cabbage	Diamond back moth
3.	Inter cropping of cabbage + mustard (25:2). First line of mustard 15 days before and second line 25 days after the transplanting of cabbage	Cabbage	Diamond back moth, leaf webber, web worm and aphids
4.	Inter cropping of tomato with marigold (16:1). 40 days old seedling of marigold should be transplanted with tomato	Tomato	Fruit borer
5.	Inter cropping of okra and chilli with marigold & chilli with Ramdana (*Amaranthus*)	Okra and chilli	Mosaic and root knot nematode
6.	Spraying of neem seed kernel extract @ 4% or neem soap @ 10gm/litre of water	Cabbage	Leaf webber, aphid and diamond back moth
7.	Spraying of neem oil 0.03% @ 2.5 lit./ha	All vegetables	Fruit borer insect
8.	Resistant variety, pusa purple long and surti gota	Brinjal	Fruit and shoot borer
9.	Spraying of karada (*Cleistanthus collinus*) plant leaf and bark extract	Brinjal	Fruit and shoot borer
10.	Spraying of 1 kg bael leaf with 10 litre of water or cow dung slurry 1 kg in 10 litre of water	All vegetables	Bacterial blight

Sl. No.	Name of the eco-friendly pest management technologies	Crop	Pest
11.	Broadcasting of 4-5 kg sugar/acre. Ants are attracted to sugar particles and thereafter they feed on the larval form of the pest.	All vegetables	Larval form of the pest
12.	Release of poultry birds early in the morning	Tomato and French bean	Fruit borer
13.	Application of kochilla leaf (*Strychnos nuxvomica*) + karanj leaf + neem leaf + cow dung in the form of compost	All vegetables	Different insect pests
14.	Putting of old fishing net in the periphery of vegetable field	All Vegetables	Non insect pest-poultry folks
15.	Planting of marigold locally called kusum in the periphery of vegetable field or intercrop with okra and brinjal	All vegetables	Different insect pests
16.	Keeping the seed after sun drying in earthen pots sealed with mud and cow dung	All vegetables seed	Storage pest
17.	Dry powder of Karanj+ Neem with water solution	Brinjal and cabbage	Different pests of brinjal and cabbage
18.	Root dip of nursery of vegetables with water solution of Heeng Powder+ Turmeric Powder	All vegetables	Fungal diseases of vegetables
19.	Mixing of cement with the seed of vegetables and keeping in polythenes/ glass bottles/ tin containers	All vegetables seed	Storage pest
20.	Keeping dry sand in container and thereafter vegetable seeds followed by tighting the lid of the container	All vegetables seed	Storage pest
21.	Soaking of neem seed powder overnight and their extract application	Cabbage	Diamond back moth
22.	2-3 soil application of neem and pongamia cake @ 250 kg/ha	Brinjal	Shoot and fruit borer.
23.	Soil application of neem cake @ 250 kg/ha	Cabbage	Diamond back moth
24.	Spraying of neem soap and pongamia soap @ 1%	Tomato cabbage	Tomato fruit borer *Helicoverpa armigera* and diamond back moth

Sl. No.	Name of the eco-friendly pest management technologies	Crop	Pest
25.	Six release of *Trichogramma brasilensis* @ 40,000/ha at weekly intervals with the first release coinciding with 50% flowering along with 3-4 application of Ha NPV @ 250 larval equivalents/ ha. The first spray should coincide with flowering.	Tomato	Tomato fruit borer
26.	Plucking of infested leaf of insect from vegetable crops and spraying of holy water of lord shiva temple which contains curd, milk, ghee, honey and basil leaves	All vegetables	Different insect pests in vegetables
27.	Mixing of ash with the seed of vegetables and keeping in polythenes/ glass bottles/ tin containers	All vegetables seed	Storage pest
28.	Putting bitter guard (karella) seed in cow dung and paste it on the wall inside the house	All vegetables seed	Storage pest
29.	Spraying of Neem seed kernel suspension 5%	All vegetables	Oviposition deterrent, ovicide, antifeedant and insect growth regulator.
30.	Tobacco leaf decoction @ 5 Kg / ha prepared from tobacco dust	All vegetables	Sucking pests and *Helicoverpa*
31.	Spraying of jaggary (4 kg of jaggary dissolved in 8 liters of water acts as the stock solution, which is made to 80 liter will be sufficient for one acre) solution to attract the ant for feeding on pests.	Brinjal and tomato	Eggs and neonate larvae
32.	Spraying of cattle urine + dung extract (cattle urine 12.5 liter + dung 12.5 kg + water 12.5 liter+375 gm limes, after fermentation of four days, stock solution thus obtained is made to 80 liter will be sufficient for one acre) preferably after 3.30 P.M.	Tomato	To repel *Helicoverpa* moths
33.	Spraying of NPV @ 500 L E / ha	Tomato	Helicoverpa
34.	Spraying of green chilli + garlic extract @ 7.5kg chilli extracted in water (4 kg chilli should be drenched in 8 litres of water for	Tomato	Repel *Helicoverpa* to lay eggs

Sl. No.	Name of the eco-friendly pest management technologies	Crop	Pest
	overnight) + 1.25 Kg garlic extracted in kerosene (750 gm pounded garlic made to soak in 200 ml of kerosene for overnight) + 100 gm dissolved detergent, for one hectare.		
35.	Spraying of Baigava/Ratanjyothi (*Jatropha curcas*) leaf extract.	All vegetables	Sucking pests
36.	Spraying of Kochilla (*Strychnos nuxvomica*) seed powder	Brinjal and tomato	Shoot and fruit borer and *Heliothis*
37.	Spraying of cow milk with water	Kitchen garden	Sucking and borer pest
38.	Application of mahua, (*Madhuca longifolia* Koen), cake in seed beds	All vegetables	Nursery pests
39.	Spraying of Water-hyacinth (*Eichhornia crassipes* Solms) leaves extract	Brinjal and tomato	To obtain luxuriant growth & good yield

Under this project thirty-six farmwomen were trained on Eco-friendly pest management technologies, vermicomposting and post harvest technology.

2.5 Empowerment of farmwomen in post harvest handling of vegetables

B.L.Attri & Abha Singh

The knowledge and skill of farmwomen about post harvest handling, storage and transportation of different vegetables was assessed through question-cum-discussion in dichotomous categories. The farmwomen who had knowledge and skill about various techniques were kept in one category and those who did not respond came under the gap category. The farmwomen empowerment programme was conducted in 4 villages of each from separate blocks covering two districts (Table 12). Data were collected from 120 farmwomen on the various aspects of storage, packaging and transportation of various vegetables cultivated in the area. From the analysis of the data it was found that the farmwomen were lacking with various post harvest management techniques and value addition of available fruits/vegetables into different products. A cent percent gap was recorded in knowledge about storage structures like zero energy cool chamber (ZECC), bamboo iceless refrigerator (BIR) and training on storage and value addition (Table 13).

Table 12. Farmwomen empowerment programme

Sl.No.	Village	Block	District	No. of Participants
1.	Hanspara	Nimapara	Puri	30
2.	Garhpadampur	Pipili	Puri	30
3.	Bagalpur	Balipatna	Khurda	30
4.	Mendhasal	Bhubaneswar	Khurda	30

Table 13. Behaviour of the women in post harvest storage of vegetables

N = 120

Sl. No.	Components	Women having capacity	Gap	% Gap
	Knowledge			
1.	Post harvest handling of vegetables	34	86	71.67
2.	Useful to tide over the glut	12	108	90.00
3.	Undergone any training on storage and value addition	00	120	100.00
4.	Storage structures like ZECC and BIR	00	120	100.00
5.	Necessity for storage	20	100	83.34
6.	Change in nutrients	10	110	91.67
7.	Loss in water after harvest	40	80	66.67
8.	Loss in quality after harvest	15	105	87.50
	Skill			
9.	Methods for storage of fresh vegetables	11	109	90.83
10.	Indigenous methods viz., baskets, wrapping in leaves	65	55	45.83

In packaging and transportation of the vegetables to the market the farmwomen were found to have 100% gap in the use of packaging materials like corrugated fibre board boxes (CFB), crates and different packaging techniques. Three varieties of tomato viz., Jyoti, Utkal Kumari and Utkal Deepti were subjected to storage study at ambient, low and cold temperature. It was observed that the quality of the fruit remained better at low (8-10^{0}C) as compared to ambient (28-30^{0}C) and cold temperature. At ambient storage temperature the fruits spoiled after 9-10 days whereas the colour of the fruits stored at low temperature remained unaffected for more than 45 days.

The storage study of different vegetables/fruits like French bean, tomato, carrot, mango and orange was initiated in the newly constructed zero energy cool chamber (ZECC). From the preliminary results it was found that the shelf life, colour and appearance of the materials stored at low temperature and in ZECC are at par. It was found that the temperature inside the ZECC ranged from 25-28^{0}C whereas the ambient temperature ranged from 28-36^0 C.

The study is in progress.

Table 14. Behaviour of women in packaging and transportation of vegetables

N = 120

Sl. No.	Components	Women having capacity	Gap	% Gap
	Knowledge			
1.	Grading	28	92	76.67
2.	Effect on vegetables during transportation	18	102	85.00
3.	Mode of transportation	65	55	48.83
4.	Night time transportation	24	96	80.00
5.	Effect of grading	08	112	93.34
6.	Packaging techniques	00	120	100.00
7.	Effect on quality	06	114	95.00
8.	Effect on cost	18	102	85.00
9.	Use of chemicals	04	116	96.67
10.	Effect of cushioning material	12	108	90.00
	Skill			
11.	Grading followed	15	105	87.50
12.	Packaging material like CFB, Crates	00	120	100.00
13.	Pre-treatments	16	104	86.67
14.	Local packaging material viz., basket, gunny bag, banana leaves	92	28	23.34
15.	Cooling effect	17	103	85.84

2.6 Efficient Resource Management of Women Agricultural Labourers

Sabita Mishra

The data were collected from 200 Women Agricultural Labourers (WALs) of Orissa and Andhra Pradesh. Twenty villages from Cuttack (irrigated) and Dhenkanal district (non-irrigated) of Orissa and 20 villages from Srikakulum (irrigated) and Vishakhapatnam (non-irrigated) districts of Andhra Pradesh were taken for the study.

The comparison between the WALs of Orissa and Andhra Pradesh brought out the following differences. The WALs of Orissa lived in kutcha or semi pucca houses with one or two rooms while 36% of WALs of Andhra Pradesh lived in pucca houses sanctioned by Government under slabbed house scheme. The Orissa WALs had covered up to 20kms to get wage activities while in Andhra Pradesh they went maximum up to 5 km. In lean period, the WALs in Orissa passed time by playing cards or gossiping but in Andhra Pradesh they did some income generating activities.

Table 15. Comparison on employment status of WALs in different seasons in irrigated (Srikakulam) and non-irrigated (Visakhapatnam) districts of Andhra Pradesh

Sl. No.	Srikakulam (n = 50)			Visakhapatnam (n = 50)		
	Areas of engagement	Range of engagement	Percent-age	Areas of engagement	Range of engagement	Percent-age
	Summer					
1.	Harvesting ground nut	10 -20 days	28.00	Sowing paddy	12 -20 days	8.00
2.	Harvesting chilli	10 -45 days	24.00	Sowing sesamum	4-10 days	8.00
3.	Harvesting sesamum	10-15 days	24.00	Bajra Cultivation	3 days	2.00
4.	Harvesting pulses	8-10 days	8.00	Fodder cultivation	8 days	2.00
5.	Harvesting ragi	4-5 days	8.00	Nursery raise for paddy	4days	6.00
6.	Planting sugarcane	10 -12 days	8.00	FYM transportation	2 -8 days	12.00
7.	Weeding of sugarcane	10-12 days	8.00	Transplanting paddy	12-20 days	8.00
8.	Fertilizer application in sugarcane	5-6 days	8.00	-	-	-
9.	Hoeing chilli	15 days	8.00	-	-	-
10.	Hoeing groundnut	10-15 days	12.00	-	-	-
11.	Transplanting paddy	10-15 days	12.00	-	-	-

Sl. No.	Srikakulam (n = 50)			Visakhapatnam (n = 50)		
	Areas of engagement	Range of engagement	Percent-age	Areas of engagement	Range of engagement	Percent-age
	Winter					
1.	Harvesting paddy	10-60 days	68.00	Harvesting paddy	10-40 days	28.00
2.	Harvesting pulses	15-20 days	16.00	Harvesting sugarcane	5-10 days	8.00
3.	Harvesting ground nut	10-15 days	8.00	Sesamum cultivation	4 days	2.00
4.	Sowing pulses	6-20 days	20.00	-	-	-
5.	Sowing groundnut	7-30 days	32.00	-	-	-
6.	Sowing sugarcane	30 days	12.00	-	-	-
7.	Hoeing chilli	15-30 days	12.00	-	-	-
8.	Hoeing groundnut	15-30 days	24.00	-	-	-
9.	Hoeing pulse	6 days	12.00	-	-	-
10.	Transplanting chilli	30 days	16.00	-	-	-
11.	Weeding pulses	15 days	4.00.	-	-	-
12.	Threshing paddy	10-15 days	24.00	-	-	-
	Monsoon					
1.	Transplanting of paddy	20-60 days	68.00	Transplanting of paddy	7-40 days	24.00
2.	Weeding of paddy	10-60 days	52.00	Interculturing	20 days	8.00
3.	-	-	-	Weeding paddy	5-20 days	24.00
4.	-	-	-	Harvesting paddy	10-12 days	8.00

In Orissa, the WALs in non-irrigated districts got only 40 days agricultural work through out the year as rice was the only crop. In other days of the year they kept themselves busy in collection of native materials like kendu, khajuri and salia leaves, fuel and grasses. Cow dung preparation and some family traditions were found. In the similar non-irrigated situation

Table 16. Factors perceived by WALs affecting their employment (Andhra Pradesh)

(n = 100)

Sl. No.	Factors	Whether affecting or not		Contributing to the employment level			Harming the employment level		
		Yes (%)	No (%)	Much (%)	Mode-rate (%)	Little (%)	Much (%)	Mode-rate (%)	Little (%)
1.	Health	33	67	09	11	02	02	08	01
2.	Wage rate	33	67	07	05	02	09	09	01
3.	Family pressure	37	73	07	09	16	05	-	-
4.	Family support	23	77	11	12	-	-	-	-
5.	Use of labour saving devices	14	86	04	05	05	-	-	-
6.	Extent of use of leisure time	21	79	03	13	04	-	01	-
7.	Distance	24	76	04	07	-	05	06	02
8.	Attitude	15	85	05	05	05	-	-	-
9.	Seasonal work	28	72	08	08	04	-	07	01
10.	Contractual work	09	91	-	04	02	-	02	01
11.	Inter-personal relationship	27	73	13	06	08	-	-	-
12.	Other incentives	09	91	03	05	01	-	-	-
13.	Age	29	71	06	09	02	04	08	-
14.	Experience	26	74	10	15	01	-	-	-
15	Skill	29	71	04	17	08	-	-	-
16.	Cultural factors	07	93	02	02	03	-	-	-

of Andhra Pradesh, the WALs got minimum 106 days agricultural wage. Crops like sugarcane, sesamum, bajara, ragi fodder including rice were being cultivated by them. Unlike Orissa, they performed no part time work except grass collection. In Orissa, WALs were found involved in 8 part time works.

Sixteen factors were identified during pilot study having influence on employment. Most of the factors were perceived by WALs of Orissa as unfavourable while in Andhra Pradesh most of the factors had favoured the WALs for gaining employment. The 'wage rate' perceived by WAL was low in comparison to men for which 19% felt it as an 'unfavourable' factor. It did not motivate readily to accept wage employment. On the otherhand some factors like family pressure, skill, interpersonal relationship and experience had favoured 32%, 19%, 27% and 26% WALs respectively in gaining employment. Here family pressure worked as a push factor.

Table 17. Off season activities

Sl. No.	Leisure Utilization	Rank	
		Andhra Pradesh	Orissa
1.	Sleeping	I	II
2.	Chatting with neighbours	I	I
3.	Knitting	IV	VI
4.	Gardening	III	V
5.	Grazing of livestock	II	IV
6.	Play cards	-	III
7.	Watching T.V.	V	VII

Table 18. Training needs of WALs

Sl. No.	Response category	Percentage		Areas of training need	
		Andhra Pradesh	Orissa	Andhra Pradesh	Orissa
1.	Need training	44.00	42.00	- Vegetable production - Improved Agriculture practices - Livestock management - Vocational training for self-employment	- Livestock management - Vegetable production - Backyard poultry farm - Tailoring and stitching
2.	No need of training	56.00	40.00	-	-
3.	Not decided	0.00	18.00	-	-
	Total	**100.00**	**100.00**	-	-

The study investigated the off season activities done by WALs within family and outside.

In off season, the WALs of Orissa were mostly found busy in activities like chatting with neighbours, day time sleeping and playing cards in descending order. Sleeping and chatting with neighbour got I rank of WALs of Andhra Pradesh. Playing cards was not found with them. Very few WALs in Orissa and Andhra Pradesh did watch T.V. So the above T.V. viewing activity got lowest rank in both the states.

During interview the investigator had asked about the training needs of WALs. The respondents (42.00%) of Orissa showed their preference for training. The areas identified by them were livestock management, vegetable production, backyard poultry farm and tailoring and stitching. On the other hand, the WALs (44.00%) in Andhra Pradesh felt the need for training in agriculture and allied fields. They need training on vegetable production, improved agriculture practices, livestock management and vocational training for self-employment.

Table 19. Skills needed by WALs

Sl. No.	Areas of skill	WALs(f)		Total (N = 200)	Percent-age
		Andhra Pradesh (n= 100)	Orissa (n= 100)		
1.	Use of rice transplanter	30	14	44	22.00
2.	Vegetable seed production	17	2	19	9.50
3.	Nursery raising	0	2	2	1.00
4.	Packaging of vegetable product	6	2	8	4.00
5.	Preparation of value added milk products	20	4	24	12.00
6.	Stitching	4	3	7	3.50
7.	Hygienic milking of cows	18	16	34	17.00
8.	No need of skills	5	57	62	31.00
	Total	**100**	**100**	**200**	**100.00**

It is a matter of concern that 31.00% of WALs in both the states had no need for any skill. However, WALs identified seven areas where they needed skills. Highest percentage (22.00%) of WALs needed skill in handling of rice transplanter followed by skill in hygienic milk of cows (17.00%), packaging of vegetable product (4.00%), hygienic preparation of value added milk products (12%), vegetable seed production (9.50%).

Conclusion

Need based tailored made skill training programmes should be conducted to increase the efficiency of WALs which may help them in getting more employment in farm sector. Some

income generating units should be stated in group endeavour to best utilize their lean period. The factors affecting their employment must be addressed through local and programme interventions to increase their efficiency.

2.7 Studies on sustainable aquaculture packages for empowering rural women

P.K.Sahoo & B.N.Sadangi

The project was launched in 3 villages under Khurda district. Five groups consisting of 50 women were involved in the project, having minimum ponds for taking trials. Each group took up trial in minimum two ponds one each for recommended and low cost input package.

Each group maintained two ponds; one with recommended practice and the other one with low cost input package. Inputs were supplied from the project for the recommended package whereas farmwomen managed the other one from their own available resources.

Three ponds covering water area of 0.56ha were stocked with IMC and common carp to increase the rate of production. On experimental basis one pond of 0.35ha water area was taken for fish-cum-duck integrated farming.

Learning by doing was the approach adopted for the farmers. Eight training programmes were conducted from time to time on different aspects such as pond preparation and pond management, record keeping, rearing of one day old chicks and duckling.

The farmers were also trained in all the relevant aspects of nursery viz., assessing plankton level to know the productivity of the pond, netting and sorting of the fry etc., and grow out pond management viz., pond preparation, seed stocking, fertilization and supplementary feeding, fish health management, role of good quality water and soil.

Table 20. Location of trial and selected ponds

Year	Village name	No. of group	No. of women	Caste category (OBC/Genl)	No. of ponds	Pond area (m^2)
2005	Panikata	1	12	Backward	2	1000
		1	4		2	700
	Singri Sasan	3	13	General	4	4048
		2	15	Backward	4	2552.5
	Total	**5**	**50**		**12**	8300.5

Table 21. Harvest of fishes under two packages during 2005

Group	Mean harvest under recommended package (t/ha)	Mean harvest under low cost package (t/ha)	Remark
Group I	0.9	-	Data could not be collected
Group II	2.42	0.8	Recommended package of practice shows better production than locally available inputs
Group III	1.36	1.2	
Group IV	0.6*	0.7	The pond was flooded during the monsoon

Off campus visit-cum-training was also organized at CIFA, CARI and NRCWA. The perception of the women on different ingredients used in the packages will be studied.

Conclusion

Floods, long dry spells and non-availability of suitable ponds posed threats for generation and analysis of data. However yield data and behaviour of women in the trials will be focused in coming season to draw useful implications.

2.8 Database on gender in agriculture

H.K.Dash, P.K.Sahoo & B.L.Attri

Result is based on data collected from 130 households in five villages of two blocks namely Nimapara and Bhubaneswar. The locale in Nimapara comes under irrigated tract with rice-rice as the dominant cropping pattern; the locale in Bhubaneswar blocks is non-irrigated with paddy the only crop being taken up. Out of 130 families covered 70 belonged to scheduled castes while remaining 60 belonged to non-SC community.

Gender participation in different activities

Overall 75.3% of households were found owning some kind of livestock. Regarding gender participation in livestock, crop related and household activities, differences were observed between two categories of households, i.e. SCs and general. The difference could be explained by the structure and occupation of household in SCs families. While participation of men in livestock related activities were found more than that of women, contribution of women in crop related activities, household chores and homestead activities were found

to be higher. Intra-household difference in contribution to crop activities is discernable. It was observed that a woman got engaged on an average for 138 days in a year in crop-related activities including post harvest activities as against only 98 days in case of a man. In case of SC families young and middle aged men, women and elderly women were mostly engaged in agricultural works both as family labour and wage labour and as such had no time to take care of livestock. But as most of the elderly men were not much involved in economic pursuits and they had to look after the livestock and homestead works.

However in case of non-SCs families participation of women in livestock, household and homestead activities were found higher than men. But in farm related activities participation of women was low. Women particularly elderly women had to look after their livestock on the other hand men had higher participation in farm related activities. Elderly men were found involved in different activities in social, economic and political arena.

Access to resources

Access to and control over resources is an important dimension of women empowerment.

It is often argued that earning of income by women makes them empowered. However it was observed that majority (68.5%) of SCs women who worked in the field deposited their day's earnings with their male counterpart. Even many of the women did not have any say in the way their income was spent. This was in sharp contrast to the situation in case of non-SC families. Even though majority of women (84 per cent) in these families were not directly involved in income earning activities, they had access and control over part of the earnings of their male counterpart. About 68 per cent men responded depositing part of their income with women. Majority of women from land owning households could manage to retain part of the income from sale of farm produces and this gave them the much needed control over financial resources. Salient points are;

- Unequal work burden with women shouldering disproportionately more burden
- If number of days engaged in different agricultural activities is any indication, women contribute even more than men to household income.
- Majority of women, despite their contribution to family income, do not have much say in financial decisions.
- Access to financial resources was higher in case of non-SC families as compared to poor SC families despite their direct involvement in income earning activities.
- Gender equality in access to resources and services is important but it must match with the gender role and create opportunities for mutually supportive gender role.

2.9 Refinement of invigoration techniques as suitable to farm women for enhancing planting value of finger millet (*Eluesine coracana*) seeds

L.P.Sahoo

Six month old seeds of finger millet (Ragi) were collected from farmers. The initial vigour of ragi seeds was studied by using vigour index. The average germination was found to be 67% and vigour was 21.5. The seeds were partially aged.

Table 22. Initial vigour of ragi seeds collected from farmers

Replication	Germination %	Vigour Index
1	68.0	23.0
2	66.0	19.2
3	68.0	22.4
Average	**67.3**	**21.5**

After evaluating the initial viability and vigour the seeds were subjected to invigoration treatments both by local methods and recommended methods in three replications. The treatments included Nacl (common salt), Urea and distilled water at 1% and 5% in three different volumes (0.5 V, IV, 2V) and soaked for four different durations (1 hr, 6hr, 12hr, 24hr). The amount of water or liquid absorbed was recorded. The germination and vigour of the invigorated seeds was recorded. The seeds were stored for 6 months after preconditioning. The data will be recorded in 2 months interval and will be compared.

2.10 Standardization of weaning mix using different proportions of sweet potato

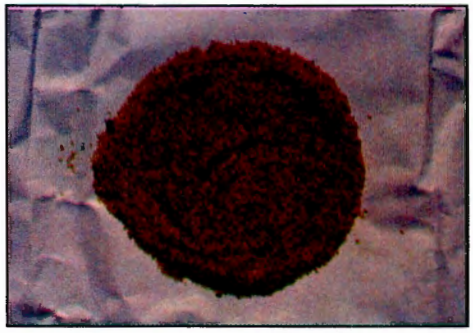
Abha Singh & Archana Mukherjee

Based on common weaning foods used in the project area and availability of locally food materials, some combinations of mix were tried out. For the preparation of mix sweet potato (Gourie variety, rich in vit A), green leaves (amaranths), and potato were dehydrated and kept in airtight containers and polythene bags. It was observed that sweet potato chips and potato chips can be kept in good condition up to one year in air tight containers and green leaves up to 6 months in polythene bags.

Table 23. Shelf-life of important ingredients

Sl. No.	Ingredient for mix	Self Life
01.	Sweet potato chips	1 year
02.	Potato chips	1 year
03.	Green leaves (Amaranthus)	6 months

Sweet potato



Sesame seeds

All weaning mixes both commercial and traditional contain cereals, pulses and/ or oilseeds as base. So based on the locally available materials a weaning mix base was tried out. Along with commonly used materials new combinations were also evaluated. The details of the various combinations of weaning mix bases are given below:

- Flake rice + Wheat + Pulse (Bengal gram and Green gram) + Sesame seeds in the ratio of 3:1: 1:0.25
- Flake rice + Pulse (Bengal gram and Green gram) + Sesame seeds in the ratio of 3: 1: 0.25

Flake rice

Bengal gram dal

- Wheat + Flake rice + Pulse (Bengal gram and Green gram) in the ratio of 3:1:1
- Flake + Ragi + Green gram + Sesame in the ratio of 3:1:1:0.25
- Ragi + Flake rice + Pulse (Bengal gram and Green gram) + Sesame seeds in the ratio of 2:2:1:0.25
- Flake rice +wheat + Pulse (Bengal gram and Green gram)+Sesame seeds in the ratio of 2:1:1:0.25

The prepared weaning mix bases were tested for their keeping quality using airtight containers and hygienic environment. The results indicated that all the above combinations can be stored safely for 4 months.

The best weaning base was selected basing on the assessment of ten mothers on the taste, flavour, texture and appearance of the base.. It was found that the base containing roasted flake powder, roasted wheat power, pulses (0.50 green gram dal + 0.50 bengal gram dal) and sesame seeds powder in the ratio of 2:1:1:0.25 was preferred most. After selection of the base standardization of weaning mix was tried out with various combinations of dehydrated sweet potato powder. Five combinations of sweet potato added weaning mix were prepared using the selected base and tested for their acceptability by mothers on the basis of taste, flavour, texture and appearance. These combinations were as follows:

Wheat

Green gram dal

1. Base + Dehydrated sweet potato power in the proportion of 90:10.
2. Base + Dehydrated sweet potato power in the proportion of 85:15
3. Base + Dehydrated sweet potato power in the proportion of 80:20
4. Base + Dehydrated sweet potato power in the proportion of 75:25.
5. Base + Dehydrated sweet potato power in the proportion of 50:50

The sensory evaluation scores on nine point hedonic scale indicated that the weaning mix containing the selected base and dehydrated sweet potato powder in the proportions of 75:25 got first rank. The children also preferred this combination.

After selecting the most preferred weaning mix, its composition like moisture, protein, fat, total ash and energy value was evaluated. The results indicated that the weaning mix was

Table 24. Sensory evaluation scores on nine point hedonic scale

Sensory quality characteristics	Proportion of Sweet potato added in the weaning mix						
	5%	10%	15%	20%	25%	30%	50%
Appearance	7.8	7.8	7.9	7.8	8.0	8.1	7.4
Flavour	7.9	7.2	7.8	7.2	8.1	7.4	7.9
Texture	8.0	8.0	7.5	7.9	7.9	7.2	7.9
Over all acceptability	7.9	7.6	7.7	7.6	8.0	7.5	7.7

very rich in protein, energy and beta-carotene that are very much required for the growth and development of the children. In coastal rural areas infants are suffering from deficiency of protein, minerals and vitamin A. So this weaning mix will help in combating malnutrition.

Table 25. Nutrient composition of sweet potato added weaning mix rank I (per 100 gm.)

Nutrients	Percentage
Moisture (%)	5.81
Crude protein (%)	10.86
Crude fat (%)	5.89
Total ash (%)	1.95
Crude fibre (%)	2.78
Energy value (Kcal/100 g)	456
Beta carotene	84.54
Dry matter (%)	94.19

The unit cost of the weaning mix was calculated and found within 25 rupees per kilogram. Though the cost calculated on cost of material basis but it can be quite affordable by most of mothers belonging to lower income group as most of the materials used in this are readily available in the home for consumption.

Table 26. Cost of weaning mix base and final weaning mix

Sl. No.		Cost of 100g. (in Rs.)	Cost of 1kg. (in Rs.)
1.	Weaning mix base	2.22	22.20
2.	Sweet potato added weaning mix	2.39	23.90

Value addition of selected weaning mix

Prepared weaning mix was mainly given in the form of gruel by adding sugar and milk. Selected weaning mix was value added in to products like cheela, burfi and laddu to avoid the monotony of the gruel and increase the palatability of the weaning mix.

Transfer of the Technology

After standardization and selection of a suitable nutritionally rich and comparatively cheaper weaning mix it was recommended for use by mothers. The method of preparation and hygiene was disseminated among the mothers by imparting training in the village itself. Two trainings were conducted at villages, wherein 67 mothers participated.

Future prospects

The sweet potato added weaning mix was developed with locally available food materials using very simple methodology and tested in the laboratory. It is a low cost and nutritionally balanced food for the infants. But there is a need to assess the impact of this weaning mix on the health and nutritional status under experimental conditions. For assessing the impact of this weaning mix on the health status of the infants a follow up project will be taken up.

Prepared weaning food

2.11 Involvement of farm women in agriculture and allied activities in the state of Madhya Pradesh

S.P.Singh & Nirmal Kumar

To assess the involvement of farm women in agricultural and allied activities in the State of Madhya Pradesh, twelve districts namely, Balaghat, Shahdol, Rewa, Narsimhpur, Sagar, Guna, chhatarpur, Chhindwara, Dhar, East Nimar and Jhabua districts were selected from all the agro-climatic zones of the State viz., Chhattisgarh plains, Northern hill region of Chhattisgarh, Kymore plateau and Satpura hill, Central Narmada valley, Vindhya plateau, Gird zone, Bundelkhand, Satpura plateau, Malwa plateau, Nimar valley and Jhabua hill zones respectively.

The data of 10059 respondents from 279 villages of the selected districts were analysed for social attributes of the respondents, cropped area under major crops, time spending pattern of the respondents, involvement of respondents in various agricultural activities, tools and equipments used by them, possession, knowledge and operation of selected improved farm tools and implements, making of food items at home for own consumption, physical discomfort faced during agricultural work, training needs, awareness about extension officials and decision making status. The salient findings of the survey are given below:

- Total time spent by the respondents in a day for domestic work including cattle rearing, agricultural work and other related works was 11.9h, out of which, 43.77% of the time was spent for agricultural work. However, during peak season, the time spent by them was 12.5h/day, out of which, 60.8% time was spent for agricultural works.

- Maximum involvement of the respondents was 76.9% in drying and storage followed by 76.4% in interculture, 72.5% in harvesting, 67.6% in sowing/planting, 59.4% in FYM application, 56.0% in carrying crops to threshing yard, 54.2% in cleaning and grading, 52.8% in grain carrying, 51.7% threshing yard, 54.2% in cleaning and grading, 52.8% in grain carrying, 51.7% in preparatory work for seed bed, 47.8% in threshing, 44.8% in seed treatment, 41.1% in fertilizer application, 39.9% in winnowing, 39.2% in shelling/groundnut decortication, 31.5% in irrigation and 18.1% in spraying activities (Table 27)
- Most of the respondents used traditional farm tools/equipment/practice for various farm operations in the state.
- Rice transplanting and harvesting operations involved heavy level of drudgery followed by medium to medium-heavy level in FYM application, preparatory work during seed bed, interculture, threshing, carrying crops to threshing yard and grain carrying operations.
- Wheel hoes were possessed by 17.4% households followed by hand maize shellers by 16.0%, threshers by 14.2%, tractors by 10.0%, tractor operated cultivators by 9.9%, tractor operated seed drills by 8.5%, seed treatment drums by 2.6%, groundnut decorticators by 2.0% and cleaner graders by 0.9%.
- The respondents operated some of improved farm tools and equipments like maize sheller by 13.6% respondents, threshers by 12.4%, wheel hoes by 12.2%, groundnut decorticators by 5.3%, seed treatment drums by 2.8%, cleaner-graders by 1.5% and tractors by 0.8% respondents (Table 28).
- Based on the data regarding operation of the improved farm tools and equipments, the adoption level was worked out to be 4.78% (Table 29).
- Most of the respondents were not aware of safety kit for spraying and seed treatment and hand gloves for threshing operations.
- Most commonly made food items at home by the respondents for home consumption were pickles, semia, papad and nuggets in addition to their domestic routine cooking items. Preparation of all the items was done traditionally.
- The respondents of all categories felt the need of composite training in agriculture. More than 51.0% of respondents were interested in taking training on agricultural related topics.
- About 16% respondents used to take decision by themselves in agricultural related tasks while only 8.3% respondents were involved in the decision making related to financial matters.

Recommendations of the Project

- As major involvements of farm women were found in drying and storage, interculture, harvesting, sowing/planting, cleaning and grading, threshing, seed treatment, fertilizer application, winnowing and shelling/groundnut decortication, the following women friendly improved farm tools and equipments namely, hand rake, wheel hoe/grubber weeder, improved sickle, CIAE and PAU seed drills TNAU four row paddy drum seeder, CRRI four row transplanter, hanging type cleaner, seed treatment drum, fertilizer broadcaster, octagonal tubular maize sheller, sitting type decorticator, spraying safety kit and hand gloves are recommended for introduction among farm women for their awareness to increase their productivity and income, and to reduce the drudgery involved in various operations.
- There is need to impart training to the farm women on agricultural related activities.

Table 27. Category-wise data of farm women regarding their involvement in various agricultural operations in selected districts of Madhya Pradesh

Agriculture Operations	Category-wise involvement in %						
	Land less	Marginal	Small	Semi-Medium	Medium	Large	Mean
Preparatory work for seed-bed preparation	46.1	58.6	52.6	52.5	49.5	43.4	51.7
FYM application in field	51.7	66,4	63.7	60.9	55.4	47.7	59.4
Fertilizer application	29.6	45.3	44.2	43.9	42.9	38.4	41.1
Seed treatment	31.2	47.3	47.7	48.9	47.2	47.3	44.8
Sowing/ Planting	60.5	71.7	68.3	71.5	66.4	62.1	67.6
Interculture	71.8	80.7	78.9	77.9	75.3	66.0	76.4
Irrigation	17.6	34.7	34.5	34.6	35.9	32.3	31.5
Spraying	12.3	19.0	18.4	19.6	20.7	20.3	18.1
Harvesting	68.8	78.5	72.8	73.0	73.3	62.1	72.5
Carrying crops to threshing yard	50.9	62.3	58.4	57.2	55.4	42.2	56.0
Threshing	40.3	52.3	48.9	49.5	50.5	42.2	47.8
Winnowing	33.3	45.8	40.6	41.2	38.8	34.2	39.9
Shelling/ decortication	30.2	37.9	39.3	44.1	46.0	42.8	39.2
Cleaning and grading grains	44.1	56.0	56.6	59.4	52.9	53.9	54.2
Grain carrying	49.1	60.1	52.5	54.1	50.3	42.6	52.8
Drying & storage	56.8	80.3	79.0	84.4	82.9	80.9	76.9
Mean involvement in all the operations	43.4	56.4	53.5	54.1	52.7	47.6	52.0

Table 28. Operation of improved farm tools and equipment by Farm women of different category in Madhya Pradesh

Improved farm tools and equipments	Category-wise data in % of Respondents who operated improved farm tools and equipment						
	Land less	Marginal	Small	Semi-Medium	Medium	Large	Mean
Tractor	0.1	0.7	0.6	1.3	1.4	1.6	0.8
Seed treatment drum	1.7	2.4	2.9	3.2	3.7	4.1	2.8
Wheel hoe	10.5	14.0	13.0	10.8	12.4	12.1	12.2
Maize sheller	9.3	12.4	13.5	15.9	17.0	17.3	13.6
Groundnut decorticator	3.7	5.0	5.5	5.5	7.0	6.5	5.3
Thresher	12.2	13.4	13.4	10.1	14.5	10.3	12.4
Cleaner-grader	0.9	1.4	1.4	1.8	2.0	2.1	1.5

Table 29. Adoption level of improved farm tools and equipments by farm women of Madhya Pradesh

Sl. No.	Operation	Traditional practice/ Tools used	Improved tools and equipment	% of household having improved tools and equipment	% of Women worked with improved tools and equipment
1.	Making ridges for vegetable	Spade	Hand ridger	-	-
2.	Seed treatment	By hand	Seed treatment drum	2.8	2.8
3.	Fertilizer broadcasting	By hand	Fertilizer broadcaster	-	-
4.	Sowing/ planting	By hand	Seed drill/ paddy seeder/ rice transplanter	-	-
5.	Weeding	Hand hoe	Wheel hoe	17.4	12.2
6.	Harvesting	Plain sickle	Serrated sickle	-	-
7.	Threshing	Hand beating	Thresher	14.2	12.4
8.	Cleaning-grading	Supa	Hanging type cleaner/ pedal-cm-power operated cleaner-grader	0.9	1.5
9.	Maize shelling	By hand using sickle	Maize sheller	16.0	13.6
10.	Groundnut decortication	By hand	Groundnut decorticator	2.0	5.3
	Mean			**5.31**	**4.78**

2.12 Ergonomical evaluation of manually operated Cleaner Grader, Seed Drill, Fertilizer Broadcaster and Ridger with women workers

S.P.Singh

Ergonomical evaluation of manually-operated CIAE two row paddy drum seeder with farm women

Plate1 : A Farmwomen operating CIAE two row paddy drum seeder

Ten farm women participated in the study for sowing pre-germinated/ sprouted Kranti variety paddy (Plate 1). Data on ergonomical evaluation of the equipment is given in Table 30. Physiological workload of women workers was higher, i.e., working heart rate 148.6 beats/min and work pulse (increase in heart rate over rest) 58.9 beats/ min as against the acceptable limit of 110 beats/ min and 40 beats/ min, respectively. The higher pull force and physiological workload of women workers suggest that refinement of equipment is needed to make it suitable for women.

Table 30. Data on Ergonomical evaluation of CIAE two row paddy drum seeder with farmwomen

Sl.No.	Particulars	Mean Values
1.	Slot opening, mm	7.70 ± 0.82
2.	Sprout length, mm	3.70 ± 0.67
3.	Average working width, m	0.408 ± 0.01
4.	Sinkage of feet of subject, mm	84.42 ± 9.7
5.	Sinkage of machine, mm	41.00 ± 2.3
6.	Row to row spacing, cm	19.80 ± 0.79
7.	Walking speed of subject, km/ha	0.82 ± 0.23
8.	Area covered, m^2/h	193 ± 50
9.	Pull force, N	160.90 ± 41.9
10.	Heart rate during work, bpm	148.6 ± 6.2
11.	Work pulse, bpm	58.9 ± 10.5

Following observations were recorded during the operation of equipment with women workers in field:

1. The length of handle was more, which needs to be reduced on the basis of anthropometrical data of women.
2. The float type front and support was touching to the soil surface during operation due to sinkage of machine.
3. Soil clogging on float and ground wheel was also noticed.

Ergonomical evaluation of TNAU four row paddy drum seeder with farmwomen

TNAU design manually operated four row paddy drum seeder was used for the study with eleven farm women for sowing pre-germinated/ sprouted Kranti variety paddy (Plate 2). Data on ergonomical evaluation of the equipment is given Table 31. Physiological workload of women workers was higher, i.e., working heart rate 143.5 beats/ min and work pulse 60.9 beats/ min as against the acceptable limit of 110 beats/ min and 40 beats/ min, respectively suggesting the need to provide adequate rest pause to the worker. For continuous operation, two workers may be engaged with the machine.

Plate 2 : A Farmwomen operating TNAU four row paddy drum seeder

The equipment avoided the bending posture, which is adopted during traditional method. A woman worker can easily operate the equipment and hey liked the equipment. Following suggestions are made to improve the performance of the equipment and comfort to the operator.

- There was need of rubber grip over mild steel handle of operating handle of the equipment to avoid the formation of blister on workers' palm during the operation.
- The equipment may have provision to increase or decrease the length of handle for making it more versatile.
- The dia of MS pipe for handle should be of 18mm size in place of 16mm so that it could be strengthened and also proper gripping may be obtained.
- Transport plastic material may be used for drum so that availability of germinated seed in the drum could be easily observed.

Table 31. Data on ergonomical evaluation of manually operated four row rice drum seeder with farm women.

Sl. No	Particulars	Details
1.	Weight of seeder, kg	7.7
2.	Sprouted	2.5
3.	Time required to feed 2.5kg sprouted seed in drums	85
4.	Working width of machine, cm	80.0
5.	Speed f subject, km/h	1.4
6.	Sinkage of feet of subject in field, cm	7.7
7.	Sinkage of machine in field, cm	4.8
8.	Row to row spacing, cm	21.4
9.	Number of hills/m length	6.2
10.	Number of seeds/ hill	2 to 7 (4.8)
11.	Distance between hills, cm	6.9
12.	Turning loss/ turns	11.0
13.	Area covered/h, m^2	917
14.	Working heart rate, beats/ min	143.5
15.	Work pulse, beats/ min	60.9

Ergonomical evaluation of CRRI four row rice transplanter with farm women

Ten women workers participated in the study for transplanting of rice seedlings (mat type nursery) (Plate 3). Data on ergonomical evaluation of the equipment is given in Table 32. Physiological workload of women workers was higher, i.e., working heart rate 148.1 beats/ min and work pulse 61.5 beats/ min as against the acceptable limit of 110 beats/ min and 40 beats/ min, respectively suggesting the need to provide adequate rest pause to the worker. Two workers may be engaged for continuous operation with the machine.

Apart from saving in cardiac cost with the rice transplanter (57%) as compared to traditional, the

Plate 3 : A Farmwomen operating CRRI four row rice transplanter

Table 32. Data on CRRI manually operated four row rice transplanter with women workers

Sl. No	Particulars	Details
1.	Weight of transplanter, kg	22.2
2.	Total weight of equipment including the weight o f seedlings mat, kg	42.6
3.	Working width of machine, cm	92.0
4.	Speed of subject, km/h	0.288
5.	Sinkage of feet of subject in field, cm	9.5 to 11.5
6.	Sinkage of machine in field, cm	5.3
7.	Height of seedling, mm	24
8.	Number of leaves/ seedling	3
9.	Water in field, cm	2 to 5
10.	Number of plants/ hill	2 to 4
11.	Planting depth, cm	4 to 6
12.	Area covered/ h, m^2	255
13.	Working heart rate, beats/ min	61.5
14.	Workplace, beats/ min	61.5
Manual Transplanting		
1.	Area covered/h, m^2	34
2.	Working heart rate, beats/ min	130.4
3.	Work pulse, beats/ min	38.1

equipment avoided the bending posture that is adopted during traditional method. The equipment is considered suitable for women workers for rice transplanting. Following suggestions were observed during the experiment with the equipment for improving the performance.

- There is need of rubber grip over mild steel handle of operating handle of the equipment to avoid the formation of blister on workers' palm during the operation.
- Higher gauge of sheet thickness for seedling tray may be provided or two M.S. channels of size 30 x 10 x 1.5mm may be provided on back of tray to strengthen the tray as to bear about 20 to 25 kg. load of seedling mat.
- The handle length may be reduced to the metacarpal height of women workers.

Ergonomical evaluation of improved sickles with farmwomen

CIAE and KKV, Dapoli make improved sickles were ergonomically evaluated for harvesting paddy crop with twelve farm women and compared with local sickle (Plate 4). The data are

given in Table 33. The working heart rate in operation of CIAE, Dapoli and local sickles was 103.4 beats/ min, 106.9 beats/. min and 105.8 beats/ min, respectively. Corresponding values for work pulse was 18.7 beats/ min, 20.6 beats/ min and 20.3 beats/ min respectively. The data of working heart rate and work pulse of workers were under the acceptable limit of 110 beats/ min and 40 beats/ min, respectively.

Plate 4 : A Farmwomen operating improved sickle (Dapoli make) for harvesting paddy crop

Table 33. Data on ergonomical evaluation of CIAE, Dapoli and Local sickles with women subjects for paddy harvesting

Sl. No.	Particulars	Make of Sickle		
		CIAE	Dapoli	Local
1.	Variety		Kranti Veer	
2.	Weight, g	246.6	194	298.6
3.	Size of sickle, mm	238	195	191
4.	Plant height, cm	61.6 ± 6.3		
5.	Row to row spacing, cm	21.2 5.9		
6.	Plant to plant spacing, cm	18.9 ± 8.9		
7.	No. of tillers/ plant	4.2 ± 1.9		
8.	No. of hill/ m^2	132.2 ± 48.9		
9.	No of hills/ cut	1.5 ± 0.1	1.8 ± 0.3	1.7 ± 0.3
10.	Strokes/ min	36.7 ± 6.1	37.8 ± 6.0	42.8 ± 7.9
11.	No. of times crop hold/ min	5.7 ± 1.1	6.0 ± 1.0	6.6 ± 1.2
12.	Area covered, m^2/h	47.3 ± 7.4	60.7 ± 10.2	65.4 ± 13.1
13.	Working heart rate, beats/ min	103.4 ± 7.4	106.9 ± 9.2	105.8 ± 10.6
14.	Work pulse, beats/ min	18.7 ± 5.5	20.6 ± 4.1	20.3 ± 5.2
15.	Beats/ m^2 of area harvested	23.6	20.4	18.6

Using one-way ANOVA for completely randomized design experiment, there was no significant difference ($F_{tab\text{-}0.05,2,35}$: 3.275 > F_{cal}: 0.517 & 0.44) between work pulse and working heart rate of workers in operation of the entire sickle whereas for area covered, there was a

significant difference ($F_{tab\text{-}0.05,2,35}$: 3.275 < F_{cal}: 9.63). However based on least significant difference (LSD: 11.69), there was no significant difference in area covered amongst Dapoli and local sickle. The slight less (7.7%) area covered with Dapoli sickle in comparison to local sickle may be due to their habit in operating it. Following observations were recorded during harvesting paddy crop with these sickles:

- The handle grip dia is 37mm in CIAE Naveen sickle that is on higher side for farm women as their 5th and 95th percentile of female middle finger palm grip dia are 26mm and 33 mm, respectively.
- The effective handle length excluding ferrule is 107 mm in CIAE Naveen sickle, which is less than the required (it should be about 20% more than 95th percentile of female hand breadth across thumb of 96 mm = 115).

Suggestion

- In case of CIAE sickle, the length and dia of handle needs to be refined.
- Farm women liked Dapoli sickle as its blade curvature is similar to their local sickle.

Maximum aerobic capacity of farm women

Plate 5 : Measurement of Heart rate and oxygen consumption of farm women on tread mill using metamax ambulatory metabolic measurement systems

To predict the aerobic capacity, also called maximal oxygen consumption per min, of farm women, 15 subjects of two age groups (25 to 35 years and 36-45 years) participated. The experiment was planned to conduct the study in lab under controlled conditions. Sub maximal exercise technique was adopted for predicting the aerobic capacity of farm women. Each subject performed the test at three speeds viz., 2.5km/h, 3.5km/h and 4.5km/h under different load viz., 0% slope to 24% slope at interval of 3%. The duration of run at each slope was for 3 min except 4 min for % slope, as they have to start the test run. The heart rate and oxygen consumption was measured using Metamax. Ambulatory Metabolic Measurement System (Plate 5).

Before analyzing the data, the maximum heart rate of each subject was determined using flowing formula, as suggested by Robrgs and Landwehr, 2002. (The surprising History of the "HR max = 220 – age" Equation. Journal of Exercise Physiology on line, 5 (2)]:

Maximum Heart rate of Subject: 205.8 – 0.685 x age

After finding the maximum heart rate of subject, the VO_2 was predicted. The summarized data on predicted VO_2 max are given below:

Age-Group, years	VO2 max,Ml/ kg-body mass/ min
25-35	33.54 ± 4.86
36 – 45	32.65 ± 5.77

2.13 Family based economic security of backward communities through ornamental and integrated fish farming

P.K.Sahoo, H.K.Dash & B.L.Attri

The on-farm trials on ornamental and integrated fish farming were taken up in Nimapara block of Puri district and Balipatana and Balianta blocks of Khurda district, in 2004. During the second year, the programme was intensified by adoption of more water areas. Additional water area of 2.685 ha was covered for different aquaculture activities during the year. One hundred and niety four families were involved against the target of 100 families. The details about the locations, ponds and water area are presented in Table 34.

Table 34. Location of the trial and ponds covered

District	Block	Village	No. of ponds	Water area (ha)	No. of families involved
Puri	Nimapara	Kothi Sahi	5	1.45	66
		Sagada	1	0.33	17
		Mallick Sahi	3	0.15	16
		Chhatahara	3	0.12	6
Khurda	Balipatna	Bagalpur	6	2.73	26
	Baliatna	Gandilo	14	0.875	16
		Rhoedopara	5	0.19	17
		Panchalo	6	0.25	7
		Singrisasan	7	0.59	23
	Total		**50**	**6.685**	**194**

A. Nursery rearing of carp fry:

Seed being the most critical input for the success of the project operation, emphasis was given on carp seed rearing in order to have assured supply of stocking material for grow-out culture. Such practice not only helped in overcoming the problems of long distance transportation of the seed material, but also helped in meeting the requirement of seed of desired species of appropriate size in required quantity. The 11 ponds, covering the total area of 0.285 ha, not only supplied the seed to all the grow-out ponds adopted under the programme, but also provided good income from the sale of leftover seed, the details of which is presented in Table 35.

B. Grow-out carp culture

The technology of carp polyculture was initiated in 42 ponds covering water area of about 4.8 ha during the first year. As per the objective, integrated fish farming with poultry, ducks

Table 35. Details of nursery practices during 2005-06

Village	Pond area (ha)	Species stocked	Survival (%)	Income from sale of leftover fry (Rs)
Gandilo	0.035	C: R: M (2:1:1)	38	4500
	0.04	C: R: M (2:1:1)	17	2000
Rhoedopara	0.04	C: R: M (2:1:1)	36	2500
Panchalo	0.025	C: R: M (2:1:1)	33	1500
Singrisasan	0.02	Mrigal	28	1700
	0.02	Rohu	24	1800
	0.025	Catla	26	2000
Bagalpur	0.02	Catla	21	-
	0.02	Catla	18	-
	0.02	Rohu	15	-
	0.02	Mrigal	24	-

and horticulture was emphasized. As much as 93.7% total water area was covered under integrated fish farming with ducks and poultry, though the adoption was limited to only 22 ponds out of 42 ponds. During this year as many as 9 ponds were stocked with three IMC and common carp in 4.58 ha water area.

C. Integrated fish farming

In order to effectively utilize the pond resources and reduce the cost of production, approach of integrated farming was adopted in 28 ponds in 5.01 ha water area in 2005.

Fish-cum-poultry integration

During the year fish-cum-poultry farming was demonstrated with two varieties of poultry *viz.*, Grama Priya and Vanraja, obtained from Regional Center of Central Avian Research Institute, Bhubaneswar, and Central Poultry Breeding Farm, Bhubaneswar, @ 500 nos/ha water area. The birds started laying eggs after 17 weeks. Male ducks were sold @ Rs.60/- per bird and @ Rs.100/- per cock. Chicks of 4-day old were vaccinated for Ranikhet (RD) disease. Second vaccination against R_2B was given to 12 weeks old chicks.

Fish-cum-duck integration

Fish-cum-duck integration was demonstrated with Khaki-Campbell and Desi varieties, with ducklings obtained from Regional Center of Central Avian Research Institute, Bhubaneswar. Demonstrations on duck care, feed management, vaccinations, etc. from time to time were held. Ducks of 12-14 weeks were vaccinated against plague disease.

Mushroom-fish integration:

Paddy straw mushroom culture was demonstrated in three villages, for four units, out of these two are running successfully for whole year except two months of winter season. Farmers put at a time five beds. From each bed they get 1.250kg mushroom approximately, which is sold @ Rs.40/kg yielding a profit of Rs.35/-from each bed

Horticulture-fish integration

Dykes of community ponds in two villages which had remained completely unutilized have been put to cultivation of horticultural crops such as banana and drumstick and winter vegetables in the first year of the project. Banana had come to fruiting stage and was sold every month. Winter Vegetables were not very successful due to unfavorable weather conditions. New vegetables like capsicum, red cabbage, broccoli were introduced in six pond dykes. Aquatic weeds, duck and poultry wastes were used as manure for the horticulture plantation.

Ornamental fish production

Ornamental fish production was taken up in five villages of Nimapara block of Puri district involving 7 groups having 35 beneficiaries. Live bearers like guppy, molly and sword tail, and egg layers like rosy barb were used. Besides ornamental fish production seven participants were trained in aquarium preparation. Two of them have started selling aquaria in small scale. Ornamental units are giving a continuous income to the family. Each unit on an average generated income of Rs.500 per months.

The harvest of fish, selling of birds and eggs are in progress. So total income from the integration for the year 2005-06 has not yet been consolidated.

Learning by doing being the main approach, each and every activity was performed by the

Table 36. Total income from different sources in 2004-05

Sl. No.	Particulars	Amount (in Rs.)
1	Nursery rearing of carp fry (Rs)	16,500.00
2	Fish sold	2,67,400.00
3	Selling of poultry birds and eggs	17,400.00
4	Selling of ducks and eggs	49,700.00
5	Mushroom-fish integration	Demonstration only
6	Horticulture-fish	5825.00
7	Ornamental fish (Mainly training)	2400.00
	Total	**3,59,225.00**

active participation of the farmers. Under the project 14 training programmes were arranged and total 198farmers were trained.

The production level by local method was only 0.2 tonnes/ha. The highest production under the project was 4.33 tonnes/ha and the average production was 1.63 tonnes/ha in a culture period of about 8 months.

Different activities like pre-stocking pond preparation with application of bleaching powder for predatory and weed fish control, seed acclimatization and stocking, assessment of pond productivity by plankton population and transparency, sampling of fry, conditioning and oxygen packing, application of fertilizers and lime, feed management based on biomass estimation, harvesting etc. in case of nursery rearing of fry and grow-out carp culture ponds; and growing methodologies for different species of ornamental fish species including management of brood stocks and offspring related to aquaculture and integrated system were demonstrated and carried out. Besides, training were also imparted with regards to management of ducks and chicks, including vaccination and treatment against excessive physiological stress of the birds, feeding and maintenance of sanitary condition. The above-mentioned demonstrations/ trainings were conducted to sensitize the participants and develop their skills.

Technologies of carp seed rearing, carp polyculture, integrated fish farming and ornamental fish culture have been disseminated to the participating families based on resource availability of the respective farm families.

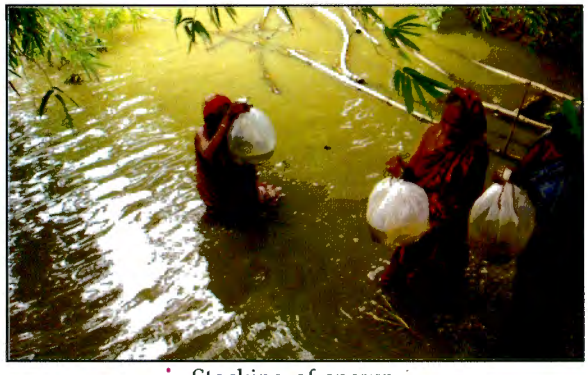
2.14 Involving women in aquaculture - A step towards economic and nutritional security

P.K.Sahoo & H.K.Dash

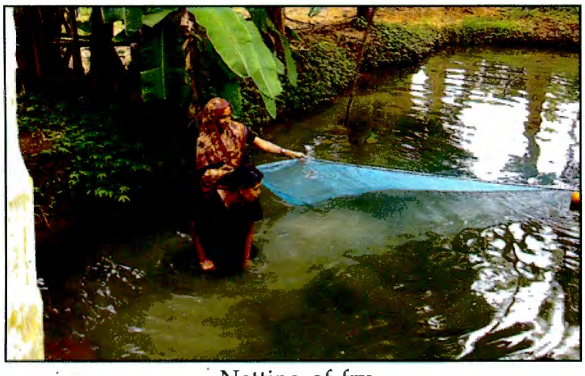
Carp seed rearing

Considering good quality fry is an essential ingredients for enhancing fish production emphasis was laid to empower women in carp seed production and generate income.

Assessment of plankton level



Stocking of spawn



Netting of fry

Sorting of fry

Sampling of fry

Survivility of fry

Conditioning of fry

Counting of fry

Outcomes of nursery rearing

Experiment of nursery rearing involving rural women yielded encouraging results in terms of increased fry production as well as additional income for the participating women.

Table 37. Progress in nursery

Year	No. of ponds	Area (ha)	Species stocked	No. of women involved	Fry production (in lakh)	Income (Rs.)	Other benefits
1st	4	0.21	Monoculture of C,R,M	10	0.2	2000	Only for demonst-ration
2nd	12	0.50	Polyculture of IMC	80	5.1	35100	2.0 ha water area stocked
3rd	14	0.54	-do-	86	4.9	45800	2.6 ha water area stocked

In the 3rd year, 86 women took up nursery rearing in 14 ponds with total water area of 0.54 ha. Nursery rearing yielded about Rs.45800.00 from sale of fry. A maximum income of Rs.9700/- could be obtained from a pond of 0.06ha. On an average, an income of Rs.3270/- per pond was obtained.

On-farm demonstrations

Demonstration on netting, sorting, counting of fry, conditioning of fish fry in happa, poly packing of fry with oxygen, assessment of growth and survival of fry, assessment of plankton concentration in water and recording the water transparency and water temperature were conducted.

Carp poly-culture

Under the project, 240 women from 142 households were motivated to participate in aquaculture and practice poly-culture in their ponds. The productive use of derelict water bodies were tried with the involvement of women through aquaculture.

Harvesting of fish

In the third year about 5.4ha water area was stocked with Indian Major Carps i.e. catla, rohu and mrigal. Necessary support services related to carp poly culture were provided and monitoring of the activities undertaken.

Table 38. Area under carp culture

Year	No. of villages under the project	No. of ponds adopted	Water area (ha)	No. of women beneficiaries
1st	8	56	4.2	195
2nd	11	64	5.4	240
3rd	11	64	5.4	240

Freshwater prawn culture

As a part of our effort to popularize various aquaculture technologies, freshwater prawn (Macrobrachium rosenbergii) PL was stocked in few ponds along with composite carp culture. They were reared for 6-8 months and harvested with average weight 54.5gm

Integrated fish farming

In 3rd year of the project women favoured fish-cum-poultry integration than the fish-cum-duck integration in spite of good income from the later one. This was due to some socio-economic constraints like conflict among the participating members in case of community ponds, resistance for growing ducks for prolonged period due to use of pond water for domestic purpose, low market acceptability of duck meat

and eggs as compared to poultry in the region, risks of poaching and attack to the ducks by predatory animals, poor economic status of the farm families to provide required quantity of feed to the ducks, the beneficiaries showed more interest towards the fish-cum-poultry integrated farming. So this farming practice had increased from one pond of 0.02ha water area to seven ponds of 0.57ha water area.

Distribution of i.ntegrated fish farming is given in Table No. 39.

Table 39. Performance of different integration

Year	Type of integration	No. of ponds	Water area (ha)	Variety supplied	No. of birds supplied
2005-06	Fish-duck	3	0.2	Desi	100
	Fish-poultry	7	0.57	Gram Priya	360
	Total	**10**	**0.77**		**460**

Birds totaling 460 were supplied in the month of December 2005 to the participating families.

The same poultry variety 'Gram Priya' was also supplied like last year. But duck variety 'Khaki-campbell' was not available. Alternatively, Desi types were supplied. From April, the birds have started laying eggs.

The project has helped to achieve high yield through scientific management of unutilized and under utilized backyard and community ponds. As mentioned the average fish yield of the ponds under project has gone up to 2.88t/ha with the highest yield recording 5.8 t/ha, whereas the mean production was 0.125t/ha prior to adoption of the ponds. The income generated in second year from the integrated ponds is summarized in Table 40.

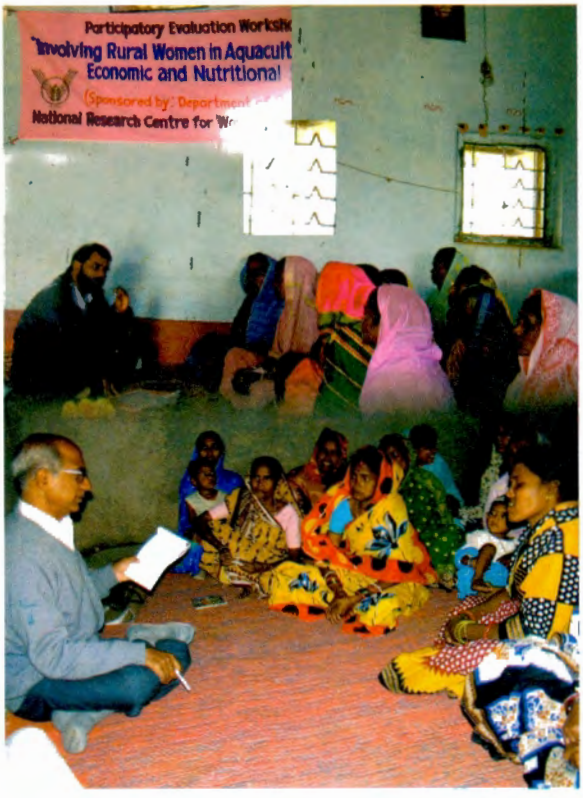
Table 40. Economic gain

Year	Type of integration	No. of ponds	Total area (ha)	Total economic gain from ponds (Rs)	Economic gain per ha (Rs)
2005-2006	Fish-cum-duck	03	0.2ha	23,000/-	1,15,000/-
	Fish-cum-poultry	07	0.57ha	42,000/-	73,685/-

Field demonstrations were conducted on eight different aspects like nursery raising of IMC, composite carp culture, culture of silver barb, fish-cum-duck integration, fish-cum-poultry integration, freshwater prawn culture, fish processing and value addition, and vaccination of 21 days old chicks, under the project

Training

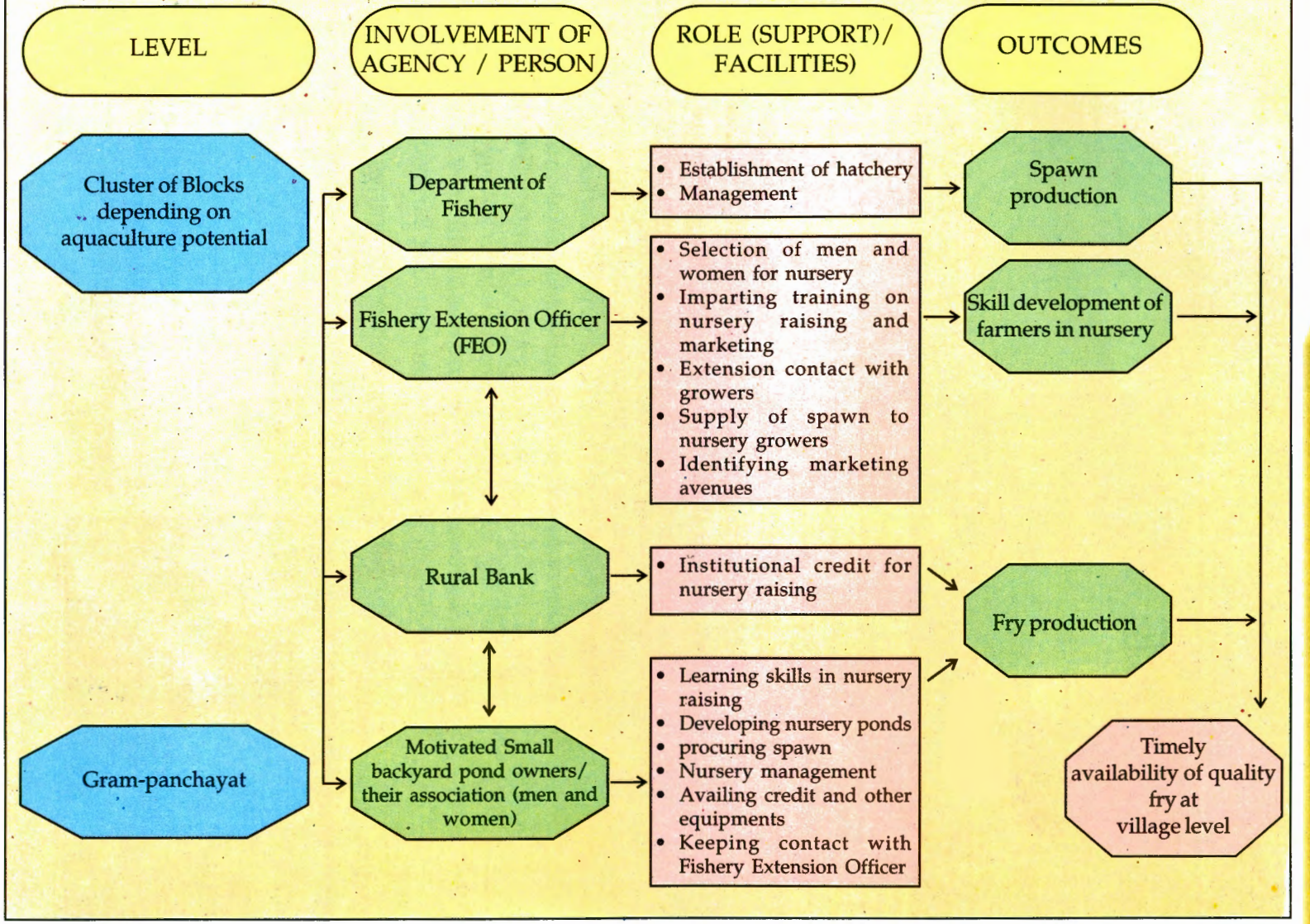
Nine training programs were conducted on different aspects like, nursery pond preparation and management, value addition of fish (fish cutlet, fish and prawn pickle), breeding of Indian Major Carps, in which 156 women participated. Two workshops were also conducted on "Participatory evaluation on nursery rearing" and "Participatory evaluation on carp poly culture". In both the workshops 95 women participated and a model entitled "Extension model for production of fingerlings at village level" was developed by using small backyard ponds. It is assumed that timely availability of good quality fry at reasonable rate would lead to expansion of aquaculture activities in rural areas.



The model envisages spawn production by the department of fishery taking cluster of blocks depending on aquaculture potential of the area and fry production at panchayat level involving women.

The model identifies important role of fishery extension officers (FEO) in matters of selection and training of interested persons in nursery rearing technology, their linkage with different institutions like rural banks for credit support and other services.

SCHEMATIC EXTENSION MODEL FOR PRODUCTION OF FINGERLINGS AT VILLAGE LEVEL



3.1 Trainers' Trainings

The centre organized trainers' training programmes for the Scientists/ Extension functionaries of the ICAR Institutes/SAUs/State Departments of Agriculture, Horticulture, Animal Husbandry and Fishery to sensitize them on the productive roles of women farmers and to train them on application of appropriate technologies in agriculture and allied fields 85 participants attend the training.

Organic farming for sustainable food security for NGOs; Gender specific technologies for value addition in horticulture produce: a blend of indigenous and modern knowledge; Food and Nutritional Security of farm families through environmentally sound technologies; Enhancing quality seed production involving farmwomen; Agri-business for Rural Women - Challenges and Prospectives; Entrepreneurship Development among Farmwomen

3.2 Farmer's and Farmwomen Trainings

Under different projects 757 farmwomen were trained on Low cost storage structures in rural area ; Storage and value addition of fruits and vegetables; Eco-friendly pest management Technologies, Vermicomposting; Post Harvest technology for farmwomen; Fish processing; Preparation of sweet potato based weaning mix; Post-harvest handling of vegetables; Improved Farm Equipments for Rural Women.

4. CONSULTANCY

Consultancy is one of the important activities of the Centre. The Centre is having multi-disciplinary experts who provide consultacny services to various organizations, agecies and clientele in -

- Development of project proposals for funding agencies;
- Development of training modules on gender issues;
- Strategies for women empowerment;
- Promoting family food security;
- Gender analysis and gender mainstreaming; and
- Evaluation of gender based projects.

During the year 2005-06 the centre bagged the following consultancy work:

1. A mid-term evaluaiton of STEP project on Women Dairy Cooperative Societies in Bhadrak and Balasore district of Orissa implemented by OMFED, Orissa from the Ministry of Women and Child Development, Government of India.
2. Evaluation of the STEP project on Women Dairy Project, Sambalpur-II being impleneted by Orissa state Cooperative Milk Producers Federations Ltd. (OMFED), Bhubaneswar from the Ministry of Women and Child Development, Government of India.

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डॉ सबिता मिश्रा, । 2005 । पौषणिक सुरक्षा तथा अधिक आय के लिए धान पुआल मशरूम । तकनीकी बुलेटिन, संख्या 33 । केन्द्रीय चावल अनुसंधान संस्थान, भारतीय कृषि अनुसंधान परिषद, कटक, उड़ीसा ।

Congress/Conference/Seminar/Workshop/Short Course Papers:

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Books/ Proceedings Published:

Proceedings of National Workshop on "Role of Women in Mechanized Farming" published by Director, National Research Centre for Women in Agriculture, Bhubaneswar.

Proceedings of National Seminar on "Gender Mainstreaming in Agricultural Research, Extension and Training – Priorities and Problems" published by Director, National Research Centre for Women in Agriculture, Bhubaneswar.

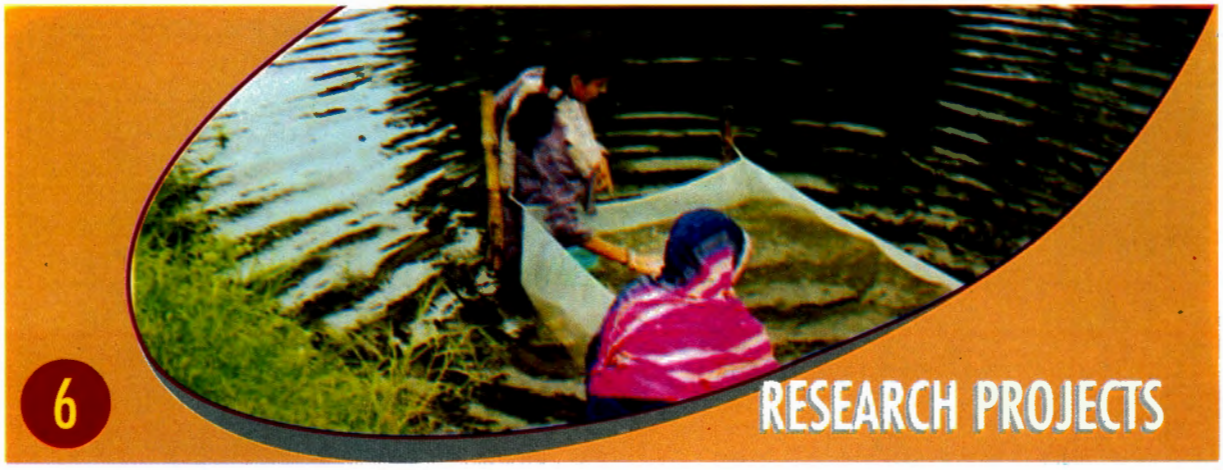
"Training Module for Gender sensitization in Agriculture" published by Director, National Research Centre for Women in Agriculture, Bhubaneswar.

Training Compendium :

1. Organic farming for sustainable food security for NGOs
2. Gender specific technologies for value addition in horticulture produce: A blend of indigenous and modern knowledge
3. Food and Nutritional Security of farm families through environmentally sound technologies
4. Enhancing quality seed production involving farmwomen
5. Agri-business for Rural Women - Challenges and Prospectives
6. Entrepreneurship development among farmwomen
7. Gender analysis and its application to agricultural research and extension.

Radio Talks/ TV Programme/ Newspaper Coverage

Activity	Title	Date
Radio talk	A talk on "Chhatu Chasare Atma Nijukti" (Oriya language) by Dr.Sabita Mishra	20.10.05
	A talk on "Jala Bisuddhikarana" (Oriya language) by Dr.Sabita Mishra	22.02.06
TV talk	A DDK programme on "Shrama Laghabare Krushi Yantrapati" (Oriya language) by Dr.Sabita Mishra	02.11. 05



6 RESEARCH PROJECTS

Sl. No.	Name of the project	Date of launching	Investigators
	Main Centre		
	Projects Concluded (2005-06)		
1.	Popularization of eco-friendly pest management technologies for vegetables among farm women in homestead lands	December, 2002	Dr. S.K.Srivastava, Dr. B.L.Attri, Mrs. Laxmi Priya Sahoo
2.	Approaches to engendering agricultural research and extension – on networking mode	February, 2004	Dr. Hema Pandey, Dr. Indu Grover, Dr. P.S. Geethakutty, Dr. B.N.Sadangi
3.	Standardization of weaning mix using different proportions of sweet potato	December, 2003	Mrs. Abha Singh, Dr. Archana Mukherjee
4.	Efficient resource management of women agricultural labourers	December, 2003	Dr. Sabita Mishra
	On-Going Projects		
5.	Studies on eco-friendly weed management	January, 2004	Dr. M.P.S. Arya
6.	Micro propagation of pointed gourd (*Trichosanthes dioica* Roxb) for empowerment of Women	January, 2004	Dr. Bharati Killadi, Dr. Archana Mukherjee
7.	Development of modules for mobilization of rural women for sustainable livelihood through Women Self Help groups	January, 2004	Dr. Suman Agarwal
8.	Studies on sustainable aquaculture packages for empowering rural women		Dr. P.K.Sahoo & Dr. B.N.Sadangi
9.	Refinement of invigoration techniques as suitable to farm women for enhancing planting value of finger millet (*Eluesine coracana*) seeds	October, 2004	Mrs.Laxmi Priya Sahoo
10.	Empowerment of Farmwomen in post harvest handling of vegetables	October, 2004	Dr.B.L.Attri & Mrs.Abha Singh

Sl. No.	Name of the project	Date of launching	Investigators
11.	Database on gender in Agriculture	February, 2004	Dr.H.K.Dash, Dr.P.K.Sahoo & Dr.B.L.Attri
	New Projects approved by RAC to be launched in April, 2006		
12.	Designing gender sensitive extension model and testing its efficacy	Will be launched onJune, 2006	Dr.B.N.Sadangi, Dr. Sabita Mishra, Dr. H.K.Dash, Dr. P.K.Sahoo, Dr. S.K.Srivastva, Mrs. L.P.Sahoo & Mrs. Abha Singh
13.	Empowering farm women for family sustenance	April, 2006	Dr.M.P.S.Arya, Dr.S.K.Srivastava, Dr.B.L.Attri, Dr Sabita Mishra, Mrs. Abha Singh, Dr Naresh Babu & Mrs. L.P. Sahoo
14.	Livelihood security through entrepre neurial activity among farm families	April, 2006	Dr.Suman Agarwal & Mrs. Geeta Saha
15.	Refinement and Development of Eco-friendly management technology of Brinjal Shoot and Fruit Borer (*Leucinodes orbonalis* Guence) appropriate for farmwomen	Will be launched on June, 2006	Dr.S.K.Srivastava, Dr. Naresh Babu
16.	Standardization of gender specific technologies in banana and papaya	Will be launched onJune, 2006	Dr.Naresh Babu & Dr. B. L. Attri & Dr. S.K. Srivastava
17.	Mechanization of rice sector and impact on gender	Will be launched on June, 2006	Dr.H.K.Dash
18.	Involving women in aquaculture – A step towards economic and nutritional security		Dr.P.K.Sahoo & Dr.H.K.Dash
19.	Family based economic security of backward communities through ornamental and integrated fish farming		Dr.P.K.Sahoo, Dr.B.L.Attri & Dr.H.K.Dash
20.	Involvement of farm women in agriculture and allied activities in the state of Madhya Pradesh		Er.S.P.Singh & Sh.Nirmal Kumar
21.	Ergonomical evaluation of manually operated Cleaner Grader, Seed Drill, Fertilizer Broad-caster and Ridger with women workers		Er.S.P.Singh
22.	Introduction of Women friendly improved farm tools and implements in selected village of Madhya Pradesh		Er.S.P. Singh & Dr.R.S. Singh

7 PARTICIPATION IN SEMINARS/ WORKSHOPS/ CONFERENCES

- Dr.Hema Pandey, Director and all other scientists of National Research Centre for Women in Agriculture attended National Seminar on Gender Mainstreaming in Agricultural Research, Extension and Training: Priorities and Problems, Organized by NRC for Women in Agriculture, Bhubaneswar, Orissa, from 25th - 27th October 2005.
- Dr.Hema Pandey, Director and Dr.Naresh Babu, Senior Scientist (Hort.) attended a International Seminar on "Aloe vera", organized by International Aloe Science Council Inc., USA and Yeturu Bio-tech Limited on 5th and 6th November, 2005 at Hyderabad.
- Er.S.P. Singh, Senior Scientist (FMP) attended "Farmers' awareness campaign" at Betul on 14.11.2005 organized by the Indian Society of Agribusiness professional, New Delhi and World Vision, Betul. A talk was delivered on "Women friendly improved farm tools and equipments for farm women".
- Er.S.P. Singh, Senior Scientist (FMP) participated in National Seminar on "Innovative Technology for Rural Development" at Bhopal organized by the Institution of Engineers (India), MP State Centre and RRL, Bhopal from December 10-11, 2005 and presented a paper entitled "Improved farm tools and equipments for women workers for increased productivity and reduced drudgery".
- Dr.M.P.S. Arya, Principal Scientist (Agronomy) and Dr. S.K. Srivastava, Senior Scientist (Entomology) attended workshop on "Technology Management: Prospects and Profits" Organized by DSIR and Consultancy

Development Centre New Delhi and Kalinga Institute of Industrial Technology (KIIT), Bhubaneswar at KIIT Bhubaneswar, Orissa on 27th January 2006.

- Dr. B.N. Sadangi, Principal Scientist (AE) attended a Twenty Forth National workshop on "Planning and Management of Agriculture Extension Training" from 14-15 February, 2006 in National Agriculture Science Centre, IARI, Pusa, New Delhi and presented three model training courses for the approval of the Directorate of Extension and participated in the proceeding.
- Er.S.P. Singh, Senior Scientist (FMP) participated in Hindi Workshop on "कृषि उत्पादन, वृद्धि एवं स्थायित्व हेतु काली मिट्टी में जल एवं मृदा प्रबन्धन तकनीक" at CIAE, Bhopal on 14.02.2006, and presented a paper entitled मध्य प्रदेश के गांवों में उपलब्ध पानी के साधन एवं सिंचार्स में महिलाओं की भागीदारी - एक अवलोकन ।
- Dr.Hema Pandey, Director and Dr. B.N. Sadangi, Principal Scientist (AE) attended the International Conference on Social Science Perspectives in Agricultural Research and Development from 15-18 February, 2006 held at IARI, New Delhi and presented a paper on "Gender issues in farming systems for equity and nutritional security".
- Dr.B.N. Sadangi, Principal Scientist (AE) and Dr. Suman Agarwal, Principal Scientist (HDRM) attended National Workshop under "Higher Education Link" project – Gender studies' organized by H.A.U. in collaboration with British Council and DFID, held at CCSHAU, Hissar, on 24th and 25th March 2006.
- Mrs L.P.Sahoo, Scientist (Seed Tech.) attended National seminar on "Prosperity through quality seeds" at ANGRAU, Hyderabad and presented a paper on "Evaluation of efficacy of dried red chilli (*Capsicum annum*) for storing green gram (*Vigna radiata*) seeds"
- Dr. Naresh Babu, Senior Scientist (Hort.), Mrs.L.P.Sahoo, Scientist (Seed Tech) and Mrs.Abha Singh, Scientist (Food & Nutrition) attended Hindi workshop on "Unnat Karya Kushalata Hetu Samekit Sansthaniya Tanawab Prabandhan" on 16.05.2006 at Hyderabad and presented a paper entitled *Karya Kushalata Evam Karya Nispadan Mein Sansthaniya Tanav Kee Bhoomika.*

8 OTHER ACTIVITIES

Organisation of ICAR sponsored Short Course

The center organized for the first time an ICAR sponsored short course on "**Gender analysis and its application to agricultural research and extension**" from 3-12 August, 2005. Twenty three teachers, scientist and extension functionaries of ICAR and SAUs attended the short course. Dr. B. Senapati, Vice-Chancellor, Orissa University of Agriculture and Technology, Bhubaneswar inaugurated the short course and Dr. Hema Pandey, Director, NRCWA presided the opening session. Dr. B.N. Sadangi, Principal Scientist (AE) was the Course Director.

Celebration of 'Hindi Chetna Diwas'

Hindi Chetna Diwas was celebrated on 14th September, 2005 in the Centre. On this occasion, two competitions like, debate in Hindi and Hindi dictation were organized. Director, NRCWA, in her inaugural address appealed to all the staff to use Hindi language as much as possible for promotion of Rajbhasa.

National Seminar

National Seminar on "**Gender Mainstreaming in Agricultural Research, Extension and Training – Priorities and Problems**" was held on 25 – 27th October, 2005 at National Research Centre for Women in Agriculture, Bhubaneswar.

Women in Agriculture Day, 4th December 2005

Organized **"Women in Agriculture Day"**, on 4th December 2005, in NRCWA. wherein 45 farmwomen participated. Emphasis was given for food and nutrition security, good health and proper intake of food .Farm women were given exposure on bio-fertilizers, seed production, storage and other aspects related to food and nutrition security.

Regional Exhibition

NRCWA Sub-centre at CIAE, Bhopal participated in महिला सम्मेलन organized by Directorate of Women and Child Development at Bhopal on 8th March, 2006. Women friendly improved farm tools and equipments were exhibited for creating awareness among women of self help groups.

Staff Research Council

Staff Research Council Meeting was held on 28th December, 2005. During the meeting progress of on-going projects was reviewed and six new research projects were approved.

Research Advisory Committee

Seventh Research Advisory Committee meeting of the centre was held on 20-21st March, 2006.

Institute Management Committee

Seventh Institute Management Committee Meeting of Centre was held on 22nd March, 2006.

10. DISTINGUISHED VISITORS

Name of Visitors	Designation	Date of visit
Dr.C. Prasad	Former Deputy D.G., ICAR, & President VARDAN	25-27 October, 2005
Dr. G. Singh	Vice Chancellor, Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya	25-27 October, 2005
Dr. R.K. Samanta	Joint Director National Academy of Agricultural Research Management	25-27 October, 2005

11. DEPARTMENTAL PROMOTION COMMITTEE

Sl.No.	Name	Designation
1	Dr P.K. Sahoo	Scientist (Sr.Scale) to Senior Scientist, (Fish & Fishery)
2.	Mrs.Bishnupriya Moharana	Junior Clerk to Senior Clerk

12. WELCOME TO NEW COLLEAGUE

Name	Designation
Dr Naresh Babu	Senior Scientist (Horticulture)

13. HUMAN RESOURCE DEVELOPMENT

- Dr. B.L.Attri and Dr P.K Sahoo attended FAO sponsored organizational capacity building programme on *"Gender and Women in Agriculture and Rural Development Livelihoods"* at M.S. Swaminathan Research Foundation, Chennai from 7th- 10th Nov., 2005.

- Dr Naresh Babu and Mrs Laxmi Priya Sahoo attended an ICAR Short Course on "Gender Analysis and its Application to Agricultural Research and Extension" from 03.08.2005 to 12.08.2005(Ten days) organized at NRCWA, Bhubaneswar.

- Mrs Abha Singh, Scientist (Food & Nutrition), attended Winter School on "Attitudinal orientation of scientist for organizational productivity" organized by Division of Extension, IARI from 17th August to 6th September, 2005.

14. PERSONNEL

As on 31.3.2006		
Sl.No.	Name	Designation
1.	Dr Hema Pandey	Director
2.	Dr B.N. Sadangi	Principal Scientist (Agril Extn.)
3.	Dr M.P.S Arya	Principal Scientist (Agronomy)
4.	Dr Suman Agarwal	Principal Scientist (HDRM)
5.	Dr S.K. Srivastava	Senior Scientist (Entomology)
6.	Dr B.L. Attri	Senior Scientist (Horticulture)
7.	Dr P.K. Sahoo	Senior Scientist (Fish & Fishery)
8.	Dr Sabita Mishra	Senior Scientist (Agril Extn.)
9.	Er.S.P.Singh	Senior Scientist (FMP) *
10.	Dr.Naresh Babu	Senior Scientist (Horticulture)
11.	Dr H.K. Dash	Scientist (Agril. Economics)
12.	Mrs.L.P. Sahoo	Scientist (Seed Technology)
13.	Mrs. Abha Singh	Scientist (Food & Nutrition)
14.	Mrs. Geeta Saha	Technical Officer (T-5)
15.	Mrs. Nidhi Agarwal	T-4
16.	Shri B.C. Sahu	T-2
17.	Shri Mata Prasad	Assistant Administrative Officer
18.	Shri V. Ganesh Kumar	Personal Assistant
19.	Shri. M. Radhakrishnan	Senior Clerk
20.	Ms. Rina Das	Stenographer Gr-III
21.	Mrs. Parisima Sen	Stenographer Gr-III
22.	Mrs. Bishnupriya Moharana	Senior Clerk
23.	Shri. Biswanath Biswala	S.S.G.1