Technical Bulletin -37

Empowering Women Farmers through promotion of Gender Friendly Farm Equipment

Under The Project PRERANA

1. INTRODUCTION

India, one of the world's largest and fastest growing economies, is also paradoxically home toover one-third of the world's poor. Poverty in India is overwhelmingly a rural and regional phenomenon, with sharp social and occupational characteristics with inter-generational etchings. Most of the poor in Indiawork in agriculture for their subsistence. As per the Census of 2011, 60 per cent of the Indian population depends on agriculture for their livelihoods. An inter-mingling of multiple phenomenon has given rise to deep farming distress in the rural populace: including land fragmentation, limited technical skills resulting in traditional agricultural practices, lack of crop diversification as well as tapping existing opportunities in cash crops, rising cost of agricultural inputs, non-existent market linkages, lack of irrigation infrastructure as well as institutional support for the most vulnerable farming groups.

The marginalized farming population in Central and Eastern India mostly have food security (when they are sure that they will get at least two meals a day) for 6-9 months in a year. For the rest of the year they have to eat less, sometimes skip a meal and look for wage employment or migrate. As a result of all these they have to lead a life of abject deprivation and insecurity. Within this broad framework of rural land based livelihoods, the condition of women is worse in terms of the general quality of life in the society and share of decision making power, ownership of assets, income and food within a family. Food shortages affect women most, both physically as well as emotionally. As homemakers and rearers of small children, they bear the emotional trauma of coping with hungry children, and are most likely to take less or go without food in times of shortages.

Women play a pivotal role in agriculture as agricultural labour, farmers, co-farmers, family labour and as managers of farms and agri-entrepreneurs. Their involvement in different operations of major crops- land preparation, seed selection and seedling production, sowing, applying manure, fertilizer and pesticide, weeding, transplanting, threshing, winnowing and harvesting; in livestock production, fish processing, collection of non-timber forest produce (NTFP) has been widely recognized. Despite being the backbone of agricultural economy in developing regions, they remain relatively an unattended group. Less access to education and technology, a host of other socio-economic factors have had an adverse impact on the lives of women farmers and they have often not been able to take advantage of opportunities from new technologies, markets, or contract farming. Rural-urban migration, growing pressure on land, water, agro-biodiversity and firewood and natural disasters associated with climate change have also affected them. Globally, women produce more than 50 per cent of humanity's food supply. In Asia, they perform up to 90 per cent of the work in rice fields and 65-70 per cent works in other crops. After the harvest, rural women are almost entirely responsible for storage, handling, stocking and processing. Though they are involved in many such agricultural activities still the identity of women as farmers is rarely recognized within their community.It is also found that many rural women are using inadequately designed and poorly made hand-tools.They are doing farm activities in traditional way with whatever tools available at home. Further it has resulted in increasing their drudgery in agriculture production Whatever the reason for this neglect, the importance of developing farming technologies relevant to women has only recently been recognized.

Beyond the societal barriers experienced by women farmers in their day to day lives, women from all ethnic communities are overburdened with work (mostly nonproductive, as defined by the society), face cultural barriers that limit their access to decision making processes, and inhibit their access to external opportunities such as technologies and training activities.

It is evident that wrong choice of technology and equipment has resulted in increasing the drudgery of women farmers in agriculture activities. Drudgery in farming operations is an important gender issue and efforts are under way to develop and popularize such tools and equipment among women farming community.

1.1. Drudgery

It is the Tedious, menial, or unpleasant work can be termed as drudgery. Drudgery is generally conceived as physical and mental strain, agony, fatigue, monotony and hardship experienced by human being, while all these result in decline in performance of men and women alike. The plight of women in this regard is alarming as they are constrained by illiteracy, poor health, unemployment, low technical know-how and skills.The farm women put in hard physical labour beyond their capacity. A continuous work affects adversely their mental and physical well-being. In relation to drudgery faced by farm women in different farm activities, based on opinion of farm women it has been reported that maximum degrees of drudgery perceived by the respondent were in rice transplanting and harvesting followed by manure application, preparatory work during seedbed, weeding, sowing, irrigation, fertilizer application, pesticide dusting, carrying crops to threshing, threshing, and grain carrying operations (Sirohi, 1996, and Singh et al, 2006).

1.2. Need for drudgery reduction

The quality of work life of women in agriculture, livestock and fisheries are characterized by long hours of work, awkward postures and drudgery experiences at work due to work load and unsuitable farming equipments. The education level was very poor and there was less awareness about using different agricultural implements. There were more drudgery and stress among the farm women found in the field. They adopt very awkward static posture squatting, bending, sitting and performed task repetitively which was responsible for musculoskeletal disorders and leads to occupational health hazards. They need more attention for better health and productivity. Above all women friendly ergonomically designed farm tools or implements should be designed to reduce drudgery and health hazards. This also leads in the direction of women empowerment.

Human power plays a great importance in agriculture system since agrarian and they are involved in various farm operations. Hence in the design of farm tools and equipment, everything known about operator is very important, as they have to work with the designed/developed equipment. It is reported that many agricultural projects aimed at men with the assumption that they will somehow automatically benefit women though the ergonomical characteristics of women are different than men workers. The contribution of women is very high in the farm sector as they are involved in majority of

farm operations and are therefore subjected to extra harsh conditions of work that leads to drudgery. Introducing women friendly improved farm tools and equipment can reduce drudgery in farm operations.

Farm women performing back breaking tasks in traditional method leads to drudgery and creates occupational health hazards. Due to lack of awareness and knowledge, farmwomen lack information about women friendly farm tools and equipment. Farm mechanization has become essential for timely operation of agricultural activities leading to increase production and productivity besides reducing drudgery. It also enables efficient utilization of agricultural inputs and reduces the cost of production. This could be suitably addressed through introduction of women friendly ergonomically designed farm tools and equipment through well designed and targeted interventions. A project has been conceived in a collaborative mode funded by Mahindra & Mahindra, with the partnership of ICAR-CIWA-PRADAN. This project entitled **'Empowering women farmers through promotion of gender friendly farm equipment'** intends to use a combination of carefully sequenced supports to reduce the women's drudgery issues in paddy, ragi (millet) and vegetables based farm operations, increase their work efficiency and income. Demonstration of the farm tools and implements was organized for familiarizing with the operation, repair and maintenance of tools.

1.3. Importance of Gender Friendly Farm Tools

Agriculture is the main occupation of rural families. Rural women are helping to 'feed the world' using inadequately designed and poorly made hand tools, and lack the income, credit and training needed to shift to more efficient and productive technologies. While some progress had been made in improving post harvesting equipment for women, little has been done to provide better tools and implements used in agricultural production. The farmwomen are engaged in the most tedious and back-breaking tasks in crop fields. Traditionally women were using manually operated farm tools and equipment. Their work life is characterized by long hours of work, awkward postures and drudgery experiences due to workload and unsuitable farming equipments. Of late, it has been realized that the needs of men and women with respect to technologies differ because of the differences in preference, priorities and working environment.

In agriculture, both men and women perform the farm operations, but still the women workers do not use machines as mostly these have been developed keeping male anthropometry in mind. These equipments are not suitable for women as the ergonomic characteristics (aerobic capacity, strength, anthropometry, physiological workload, work preference, clothing patterns and safety issues) of farmwomen differ from that of men. The drudgery of women is more pronounced in paddy based farm operations. This could be suitably addressed through introduction of women friendly ergonomically designed farm tools and equipment through well designed and targeted interventions. It was observed that in Odisha, there has been an increasing trend in participation of women in agricultural labour force. Majority of them are employed on a seasonal and often casual or temporary basis. They largely use traditional methods/ tools as many of the farm equipments are not suitable and are subject to extreme drudgeries. Therefore, to address the drudgery and occupational health hazards & safety issues and increase work efficiency of farm women, gender friendly tools &

equipment should be made available with respect to specific crops, need based locations and anthropometry of women farmers.

1.4. Why in Odisha?

Agriculture in Odisha is the mainstay of majority of the population and thus, holds the key to socioeconomic development of the State. It suffers from frequent natural calamities like cyclones, drought and flash floods. This farming sector still provides employment to more than 60% of the population directly or indirectly, making it the largest employment sector of the State. Hence, development in agriculture sector is vital to set the pace of development in the State. Out of the total population, the total female workers were 15,84,529 and the per cent of female workers in agriculture was 60.47 per cent (Census,2011). They are performing back breaking tasks in traditional method which leads to drudgery and create occupational health hazards among the farmwomen.

Due to lack of awareness and knowledge, they lack information about women friendly farm tools and equipment. Farm mechanization has become utterly essential for timely operation of agricultural activities leading to increase in production and productivity besides reducing drudgery of labour associated with farm activities. It also enables efficient utilization of agricultural inputs and reduces the cost of production. This could be suitably addressed through introduction of women friendly ergonomically designed farm tools and equipment through well designed and targeted interventions.

The programme **"Empowering Women Farmers through promotion of Gender Friendly Farm Equipment"** therefore intends to use a combination of carefully sequenced supports to reduce the women's drudgery issues in paddy and vegetables based farm operations, increase work efficiency and enhance their income. The locale of the project interventions would be two selected districts in Odisha.

1.5. Objectives

- To study the participation of women and use of existing tools and equipment in rice and vegetable cropping system.
- To identify the technological needs and gaps in rice and vegetable cropping system.
- To introduce women friendly tools and equipment for regular usage in the targeted area through capacity building programme.
- To assess the drudgery reduction parameters for impact evaluation.

1.6. Partnering Institutions-Three agencies:ICAR-Central Institute for Women in Agriculture (ICAR-CIWA), Mahindra Group and PRADAN will be the partners for successful implementation of this Programme/ Project.

1.6.1. Role of ICAR-Central Institute for Women in agriculture (CIWA): For technical support and skill training, ICAR-CIWA will conduct (related to the chosen

farm tools) different capacity building programme for various stakeholders. The trainings will be designed according to the needs of end users so that, the participants will be inspired, motivated and oriented towards efficient use of women friendly farm tools. During the training, the women will be encouraged to self-reflect on their situation, work collectively in groups and visualize farm operations in a business perspective. On-farm skill demonstration by resource farmers, refresher trainings at cluster level, interactive session with scientists, exposure visits and linkage with service/ repair centers etc. will be taken care of by the Institute. The Institute will also be responsible for monitoring and impact assessment of the programme.

1.6.2. Role of PRADAN: Based on the local contexts and needs, women friendly technologies will be disseminated by PRADAN to the stakeholders through appropriate support, skill training and create mechanism for repair and maintenance.

1.6.3. Role of Mahindra Group: The major role is funding support and supply of gender friendly farm tools. Experience sharing workshops will be organized, both at the state level and at the district level to capture best practices, successes and challenges faced in the implementation process.

1.7. Expected Output

- Drudgery reduction of farm women through improved farm tools and equipment.
- Improved knowledge and skill for enhancing their capability.

1.8. Expected Outcome

- Societal mainstreaming of farmwomen through gender friendly technology adoption.
- Augmenting work efficiency through capacity building and provision of women friendly farm tools and equipment in rice and vegetable based farming system.
- Improving agro-practices in farm sector through gender inclusive technology adoption.

2. METHODOLOGY

In order to reach the objectives of the present study, a detailed plan of work and sequential procedure were followed. The selection of samples and sampling technique, selection of tools for data collection and analysis of data were also described for the study. This study was organized under following sub headings to depict the plan of work and sequential procedure.

2.1. Research Design
2.2. Selection of Samples/ locale
2.3. Strategy of Project implementation
2.4. Activities Undertaken
2.5. Baseline Survey
2.6. End-line Survey
2.7. Impact Evaluation

2.1. Research Design

The research design is the specification of methods and procedures used for acquiring information needed for the study. It is the arrangement of the conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. In fact the research design is the conceptual structure within which research was conducted. It is the plan that specifies the sources and types of information relevant to the research problem, approached for gathering and analysis of data. In a study, research design is needed because it facilitates the smooth sailing of the various research operations. Hence in the present study both descriptive and experimental research designs were planned.

Descriptive designs were chosen to find out the demographic profile of the rural women for both baseline and end-line data collection with the help of interview schedule. The base line data collected in two parts which included village level information- part | (information about village, possessions of farm tools and equipments, tractor/animal operated machines, hand operated tools and implements etc.) and information of farm women- part || (general information, information on paddy cultivation, women involved in paddy cultivation, tools and equipment used in paddy cultivation, information about improved farm tools and equipment, prevalence of occupational health hazards during farming activities. The end line data collection includes general information about farm women, women involved in paddy, millet and vegetable cultivation, tools and equipment used in paddy cultivation, information about improved farm tools/ implements/ machineries, effectiveness of improved farm tools/implements/machineries, occupational health hazards of farm women during farm activities and women friendliness of agricultural technology were assessed with the help of standardized questionnaire.

Experimental design were planned to study the measurements of different anthropometric parameters of the respondents such as: Height (in cm), Shoulder height (in cm), Eye level height (in cm), Maximum vertical reach (in cm), Maximum horizontal reach (in cm) and weight (in kg) for the rationalization of the design of agricultural hand tools and equipment which leads to better efficiency and more human comfort.

2.2. Selection of samples/ locale

This collaborative participatory approach has been initiated with PRADAN for implementation of the PRERANA project at field level in two districts (Koraput and Mayurbhanj located at northern and southern part of Odisha. One block from each districts such as Jasipur block of Mayurbhanj and Lamtaput block of Koraput district where paddy and vegetables are the major crops cultivated by the farm families.

A total of 42 villages covering 1800 farm women were selected as respondents/subjects for getting benefits through women friendly farm technologies. To conduct pilot study 180 respondents among 900 households covering 20 villages were selected randomly for baseline and end line data collection.

Lamtaput block of Koraput was identified and 21 villages from 8 Panchayats of reaching a total of 1042 Households were selected randomly for the study. Among

those 18 villages are supported by Mahindra while the rest 3 are from individual online donors. Improved farming technologies like System of Rice Intensification (SRI) in paddy, System of finger Millet Intensification (SFMI) in millet, Line transplantation, improved practices, use of organic products and new farm mechanizations (seed treatment drum, Weeder, marker, Sprayer, etc.) both for food crops as well as vegetables have been introduced in those villages. In Jashipur block of Mayurbhanj 900 numbers of farm women in 18 numbers of villages of 4 Grampanchayets were selected randomly for the study. Along with that it attracts 3 donor funded villages of another two Grampanchayets covering 150 farm women. All 21 villages have selected. Total 1050 farm women have identified. To train these all farm women six numbers of master trainers have identified.

In Koraput agriculture is the primary occupation of the major households selected for study. They mostly cultivate paddy during kharif season. The land under cultivation are mostly rainfed areas whereas a very few area has been covered under irrigation for paddy cultivation. The major crops grown by the farm families/tribal families are paddy, ragi and vegetables. The major horticultural crops such as mango, jackfruit, lemon, tamarind, banana, cashew nut including spices are grown in the orchards. It is also observed that the barrel lands were converted to cultivable lands through intervention of agro-forestry such as eucalyptus, acacia etc. which give a huge remuneration through its products and by products.

Agriculture is the primary occupation of the major households in Mayurbhanj selected for study. They mostly cultivate paddy during Kharif season. The land under cultivation are mostly rain fed areas whereas a very few area has been covered under irrigation for paddy cultivation. The major crops grown by the farm families/tribal families are paddy, minor cereals, oilseed, tubers and vegetables. The major horticultural crops such as mango, jackfruit, litchi, tamarind etc. It is also observed that the barrel lands were converted to cultivable lands through intervention of agro-forestry such as Sal, Mahua, cashew nut etc. which give a huge remuneration through its products and by products.

2.3. Strategy of Project implementation

2.3.1. Roll out and strategy meeting at ICAR-CIWA

A roll out and strategy meeting was held on 24 November, 2017 at ICAR-CIWA between two partners ICAR-CIWA and PRADAN regarding strategy of project implementation which includes Selection of villages, Questionnaire finalization for census and sample, Selection of Master trainer, Technical skills training to Master trainers, Baseline data collection, Equipment and tool finalization, Vendor finalisation, Purchase of gender friendly farm tools , POP finalisation, Promotion of repair & service centers and Impact assessment of project at different level of duration with Consultancy mode in Baseline and End line survey.

S. No.	Strategy of Project Implementation	Role & Responsibility performed by Agencies
1.	Identification of locale (Two districts covering 36 villages)	PRADAN identified 36 villages across the 2 districts where there are existing Self Help Groups and a level of agriculture development in the identified villages. The total population size will be of 150 SHGs comprising 1800 families. Random sampling method followed to select the samples in consultation with ICAR-CIWA for the purpose of the study to determine the efficacy of the intervention.
2.	Linkages, site identification and formation of working team	ICAR-CIWA,PRADAN and Mahindra
3.	Preparation of Package of Practices (POP)/ Modules of region specific cropping system (Paddy and vegetables)	Implementing agencies in consultation with ICAR-CIWA and Mahindra
4.	Provision of procurements of requisite tools/ equipments for custom hiring and locale specific selected enterprises small machinery/ tools/equipments, as grant from the project	ICAR-CIWA (Provision of list of tools) Mahindra (Procurement)
5.	Skilling of working team operating at village ICAR-CIWA and PRADAN level and demonstration of farm worthy technologies	ICAR-CIWA and PRADAN
6.	Involving grass root organizations at every stage of project implementation as facilitator and sustainability in the post project period.	PRADAN

2.3.2. Progress of the Project

Farm mechanization has become essential for timely operation of agricultural activities leading to increase production and productivity besides reducing drudgery. It also enables efficient utilization of agricultural inputs and reduces the cost of production. This project intends to use a combination of carefully sequenced supports to reduce the women's drudgery issues in paddy, ragi (millet) and vegetables based farm operations, increase their work efficiency and income. One block from each districts of Koraput and Mayurbhanj in Odisha were selected as the locales for this study. The role ICAR-CIWA was to give technical support and skill training, and to conduct (related to the chosen farm tools) different capacity building programme for various stakeholders. According to the MoU, PRADAN identified 36 villages across the 2 districts where

there are existing Self Help Groups and a level of agriculture development in the identified villages. A pilot study was conducted by PRADAN thorough selecting 180 respondents from each block. In addition to baseline data some specific information viz., women's involvement in rice farming, mechanization in paddy cultivation, use of improved farm tools and equipments, prevalence of occupational health hazards during farming activities were also composed. Before collecting data, skill based training of Master Trainers were organized for ensuring technical support at ICAR-CIWA. The trainings designed according to the needs of end users so that, the participants will be inspired, motivated and oriented towards efficient use of women friendly farm tools. During the field training, the women were encouraged to self-reflect on their situation, work collectively in groups and visualize farm operations in a business perspective. On-farm skill demonstration by resource farmers. master trainers, interactive session with scientists, exposure visits were also organized by the Institute. In addition to this the Institute is also be monitoring the timely progress of programme.

2.3.3. Review meeting at ICAR-CIWA

A Review meeting was held on 20 March, 2018 at ICAR-CIWA between three partners ICAR-CIWA, PRADAN and MAHINDRA regarding review strategy of project implementation from time to time which includes selection of Master Trainer (11 nos) based on basic profile such as: educational qualification, field experience, basic knowledge of tools and demographics, technical skills training to master trainers Regarding collection of baseline data, sampling methodology, vendor finalization, purchase of gender friendly farm tools, package of practices finalization, tool demonstrations and training (two phase at location), promotion of repair & service centers, co-ordination of next meeting, impact assessment of project at different level of duration with consultancy mode for both baseline and end line survey. One representative from each partner organization made presentations on their ongoing activities and the targets of this project.

Review meeting of PRERNA at ICAR-CIWA

2.4. Activities Undertaken

The project covers 42 villages which includes 6 villages for online donors from Lamtaput and Jashipr.

Lamtaput – Lamtaput block is spread across 21 villages in 8 Panchayats in Koraput district reaching a total of 1042 Households. out of 21 villages, 3 villages were selected for modern equipment and all of the 21 villages implemented the common equipment tools that helped in drudgery reduction of women. To implement “PRERANA” project on ground four Master Trainers were identified and groomed. The Master Trainers had a round of meeting cum training on implements at Bhubaneswar conducted by CIWA. The Master trainer were enthusiastic about their work at the ground level after understanding the purpose of “PRERANA”.

Jashipur- In Jashipur block “PRERNA” was piloted with 900 numbers of farm women in 18 numbers of villages of 4 Gram panchayats. Along with that 3 villages were funded by online donor covering 150 farm women. To train and provide support to these 1050 farm women a total of 6 master trainers were identified and groomed by PRADAN and CIWA. After need assessment at field level and discussion

between ICAR-CIWA and PRADAN 14 farm implements were finalized for procurement and introduction at village level.

2.4.1. Preparation of schedule for collection of Baseline Data

For collection of Baseline data survey format was prepared with the support of consultation of partners. Training-cum- orientation of master trainer on baseline survey, methodology to carry out the survey conducted. The sample formats filled by the master trainer Checked after initial survey and sharing of the analysis, got the input to improve it further.

2.4.2. Finalizing women friendly tools and vendor

ICAR-CIWA has been play an important role in finalizing the tools to be procured for the project for reducing drudgery. In this context list of vendor finalized and visited physically their workshop for quality checks up of the farm tools and implements with women's perspective.

Keeping in the view of the agricultural practices at two different districts, total 14 types of farm implements have identified and purchased are given below:

1. Seed Treatment Drum
2. Dry Land weeder
3. Paddy marker
4. Mandwa weeder
5. Battery sprayer
6. Improved sickle
7. Manual paddy winnower
8. Pedal operated thresher
9. Power thresher cum winnower

10. Power weeder cum ridger
11. Fertilizer sprader
12. Power sprayer
13. Parboiling unit
14. Hanging type double screen grain sever

2.4.2.1. Flex or wall paintings are done in every custom hiring center for awareness and transparency

2.4.3. The inauguration of PRERNA project

After the state level launching workshop, at field level it was inaugurated at the village level in Jashipur block of Mayurbhanj district. The event was attended by farm women of Jashipur block and all partners Mahindra & Mahindra, ICAR-CIWA and PRADAN. The scientist from ICAR-CIWA introduced farm tools to the women and demonstrated its uses. There was discussion about the way project will be implemented, Custom hiring Centre (CHC) and the modalities of establishing and sustainability of the custom hiring centre.

Inauguration of PRERNA project at Jashipur block, Mayurbhanj

2.4.4. Training of Master Trainers

Before collecting data, skill based training of 11 Master Trainers were organized for ensuring technical support at ICAR-CIWA. The trainings designed according to the needs of end users so that, the participants will be inspired, motivated and oriented towards efficient use of women friendly farm tools. Training on maintenance of farm tool was a pressing need. The scientists of ICAR-CIWA imparted the skills through a training to master trainers on maintenance of tools and an exposure of other farm tools for farm women was also organised to OUAT, Bhubaneswar. Along with this the orientation and handholding support to master trainers was also done by PRADAN so that they have an enhanced understanding about the project and their role in it.

2.4.5. Preparation of package of practices (POP)/modules for region specific cropping system for paddy and vegetable

The PRADAN teams have prepared the POP for two locations and conducted training around this to the farm women. PRADAN teams also ensured the POP was followed by the farm women with support of the master trainer.

2.4.6. Provision of procurement of requisite tools/equipment for custom hiring-

Both PRADAN and CIWA after mutual discussion finalised the list of equipment to be procured in November meeting after analysing the context, tools mentioned in MoU and the budget. For this Vendors were identified jointly by PRADAN and CIWA. Vendor finalization was done based on some parameters like quotation, price, quality of tools, timeliness of supply. Both PRADAN and CIWA jointly visited the vendor to check the quality. The purchase order was placed and 13 types of farm tools was procured from the listed 14 types. The vendor was not supplied by the vendor in spite of rigorous follow up within the time frame.

2.4.7. Skilling of working team at village level and demonstration of farm worthy technologies

PRADAN has identified specific professional from each team to spearhead the project. Both the professionals were oriented around the project by PRADAN and CIWA. They have also attended the central training at CIWA for Master trainers. Along with these 11 master trainers were identified and groomed to support the villages at ground level in the work like conducting baseline and end line survey, creating awareness and use of tools, ensuring crop POP etc.

2.4.8. Conducting Front Line demonstrations

Training by CIWA in two villages of both at Lamtaput and Jashipur locations along with Master Trainers & villagers. Meeting was held to understand about the purpose of implementing “PRERANA” project along with demonstration of use of post harvest implements at village level. During the field training, the women were encouraged to

self-reflect on their situation, work collectively in groups and visualize farm operations in a business perspective.

- Demonstration of Women friendly tools and equipment, assembling of spare parts, repairing and maintenance of tools and record keeping at Gopalput Village, Lamtaput Block, Koraput on 25 June, 2018 and Badnoi, Khandabandha, Rugudi, Kadadiha Village, Jashipur Block, Mayurbhanj during 28-29 June, 2018 were carried out.
- Training cum demonstration of the farm tools and implements related to harvesting and post harvest operation activities at Ektali, Badadal, Kalika Prasad, Khandabandha, Kadadiha villages of Jashipur Block, Mayurbhanj during 19-20 November, 2018 and Kadam,Gopalput Village Lamtaput block, Koraput on 29 November, 2018 were carried out.

Training & demonstration of farm tools and implements at Koraput and Mayurbhanj

Training & demonstration of farm tools and implements at Koraput

2.4.9. Involving grassroots organisation at every stage of project implementation as facilitator and sustainability in the post project period

Starting from concept seeding about the “PRERNA” project, baseline survey to physical execution we have involved the community based organisations like SHG, village level organisation /cluster level federation. They have played an active role in selection of master trainer, participated in different training programme for crop Package of Practices (POP), use of different tools, finalising the place for Custom hiring centre (CHC), fixing norms for CHC, monitoring the progress etc.

2.4.10. Record Keeping

PRADAN professionals ensured register maintenance for record keeping through master trainers.

2.4.11. Engagement with master trainers

PRADAN professionals conducted fortnightly meetings with the master trainers to plan strategy and take a stock of the progress. Villages were distributed among the master trainers and a calendar of implementation plan was prepared and strictly adhered to Master trainers were provided with two level of trainings on the farm equipment and its usage. The master trainers in turn trained the farm women on it.

2.4.12. Custom Hiring Centre (CHC)

In each village custom hiring centre was identified and set up by the cluster or Village level organization. A flex was also prepared where the farm implements and its uses was mentioned. The flex was distributed in all villages supported by PRERNA and it was displayed at the CHC. As per the last recorded data the farm implements were used for 1389 days generating a revenue of Rs. 10,010/-.

2.5. Baseline Survey

The format for baseline survey was finalised by ICAR-CIWA with the support of PRADAN. The master trainers were then oriented around the format and were given the responsibility to collect data in the given format. In the first phase 8 villages were surveyed and the samples were sent to ICAR- CIWA for checking. Though sample size

of 360 was decided on a total of 360 formats were filled up. The survey analysis was presented by ICAR- CIWA in the last review meeting at Lamtaput.

2.6. End-line Survey

ICAR-CIWA prepared the end line survey format. CIWA conducted training at ICAR-CIWA, Bhubaneswar with the master trainers about the end line format. The end line data collection includes general information about farm women, women involved in paddy, millet and vegetable cultivation, tools and equipment used in paddy cultivation, information about improved farm tools/implements/machineries, effectiveness of improved farm tools/implements/machineries, occupational health hazards of farm women during farm activities and women friendliness of agricultural technology were assessed with the help of standardized questionnaire.

End line survey has completed in both the locations i.e Jashipur and Lamtatput with 360 sample of farm women. The formats were given to ICAR-CIWA for final analysis and report.

2.7. Impact Evaluation

An impact evaluation study will conducted to understand the efficacy and the impact of the programme on the beneficiaries. This exercise will be for a randomly selected sample of beneficiaries by ICAR-CIWA.

3. Findings

This chapter deals with the findings of the present investigation and discussion in accordance with the objectives set forth for the study. The discussion of the present study has been based on comparison results of both baseline and end-line data collection which helps in drawing the generalization of this research. It is beyond the doubt that the tribal women of Odisha especially from Koraput and Mayurbhanj district follow traditional practices in paddy and vegetable cultivation. They are using old/traditional tools and equipment to perform various activities which are not suitable and women friendly due to its heavy weight or other features matching to physiology of men. They perform very tedious task leads to drudgery and occupational health hazards. Due to these reason they suffer from various health related issues. A part from these they spent huge amount of money towards wage for manual work. Therefore, there is a need for introducing drudgery reducing technologies for increasing working efficiency and enhancing income of tribal women.

3.1. Baseline Survey

3.1.1. Village level information (Part-|)

Information on Koraput district

The Koraput district is located between 18 degree 13’ and 19 degree 10’ North Latitudes and 82 degree 5’ and 83 degree 23’ East Longitudes. On the extreme North

it is bounded by Nabarangpur district, on the West by Bastar district of Chhattisgarh State, on the South by the district of Malkangiri and on the East by the districts of Vizianagaram and Srikakulam of Andhra Pradesh State. Its area is 8,807 km^2. Koraput comes under Eastern Ghat Highland Agro climatic Zone. Most part of the Koraput district is undulated and many parts of Jeypore Sub-Division are plain lands. Climatic condition of the district is warm and humid. Average annual rainfall of the district is 1567 mm. Mean Maximum Summer temperature is 34.1^0 C and Mean Minimum Winter temperature is 10.4^0 C. The district economy mainly depends on agriculture and which mainly depends on rainfall. The rainfall depends on South-West monsoon. Out of total cropping area of 296000 ha in Koraput, irrigation potential in *Kharif* is 30.71 per cent and in *Rabi* is 21.51 per cent. Generally crops grown during Rabi like *Paddy, Wheat, Maize, Ragi, Mung, Biri, Groundnut, Mustard, Field Pea, Sunflower* etc. needs assured irrigation.

Jeypore tract of the Koraput district is known as one of the centres of origin of rice. The people of Koraput district, notably the tribals have generated and conserved many indigenous cultivars of rice that are suitable for both dryland and wetland cultivation. The Food and Agricultural Organisation (FAO) in 2012 recognised the service of the communities of Koraput in ensuring food security by declaring the Koraput district as a Global Agricultural Heritage Site. The district has a population density of 156 inhabitants per square kilometre (400/sq mi). Its population growth rate over the decade 2001-2011 was 16.63 per cent. Koraput has a sex ratio of 1031 females for every 1000 males, and a literacy rate of 49.21 per cent.

Agriculture is the primary occupation of the major households selected for study. They mostly cultivate paddy during kharif season. The land under cultivation are mostly rain fed areas whereas a very few area has been covered under irrigation for paddy cultivation. The major crops grown by the farm families/tribal families are paddy,ragi and vegetables. The major horticultural crops such as mango, jackfruit, lemon, tamarind, banana, cashew nut including spices are grown in the orchards. It is also observed that the barrel lands were converted to cultivable lands through intervention of agro-forestry such as eucalyptus, acacia etc. which give a huge remuneration through its products and by products.

Possession of farm tools and implements operated by electricity/ tractor/ animal/ human

It was found that the majority of the population depend upon agriculture in the selected village. They adopt traditional practices at field level. Both the farmers and farm women use traditional tools and equipment used for cultivation, harvesting and post harvest activities. Due the uneven surface of land and undulating plateau, they depend the tools and equipment which are operated by animals and human as source of power. Apart from these some of the farm families possessed tractor or power operated farm tools and equipment. About 69.7 per cent possessed spade, 76 per cent had khurpi and 94.4 per cent had traditional sickle for various agricultural operation. For preparation of land 27 per cent had traditional plough operated animals as well as human being in some parts of the district. Less than 10 per cent had tractor, disel engine, motor pump, power tiller, sprayer etc.

Information on Mayurbhanj district

As of 2011, the Mayurbhanj district is it is the third-most-populous district of Odisha (outof 30), after Ganjam and Cuttack. Mayurbhanj is land-locked with a geographical area of 10,418 km^2 (4,022 sq mi). This district is located in 21.933° in North Latitude and 86.733° East longitude. It is bounded in the northeast by Jhargram district of West Bengal, West Singhbhum and East Singhbhum districts of Jharkhand in the northwest, Balasore district in the southeast and Keonjhar in the southwest. The district has a population density of 241 inhabitants per square kilometre (620/sq mi). Its population growth rate over the decade 2001-2011 was 13.06 per cent. Mayurbhanj has a sex ratio of 1006 females for every 1000 males and a literacy rate of 63.98 per cent. In 2006 the Ministry of Panchayati Raj named Mayurbhanj one of the country's 250 most backward districts (out of a total of 640). It is one of the 19 districts in Odisha currently receiving funds from the Backward Regions Grant Fund Programme (BRGF). Mayurbhanj has 49 per cent (about 12.2 lakh) population engaged in either main or marginal works. 56 per cent male and 42 per cent female population are working population. 32 per cent of total male population are main (full time) workers and 23 per cent are marginal (part time) workers. For women 11 per cent of total female population are main and 30 per cent are marginal workers.

Climatic condition of the district is tropical in nature. The average annual temperature is 26.80^0 C and the annual rainfall of the district is 1596 mm. The district economy mainly depends on agriculture and which mainly depends on rainfall. The rainfall depends on South-West monsoon. Generally crops grown during *Kharif* and *Rabi* season are *Paddy, Ragi, Green gram, Black gram, Groundnut, Mustard, Chickpea, Sunflower* and different kinds of vegetables .

Agriculture is the primary occupation of the major households selected for study. They mostly cultivate paddy during Kharif season. The land under cultivation are mostly rain fed areas whereas a very few area has been covered under irrigation for paddy cultivation. The major crops grown by the farm families/tribal families are paddy, minor cereals, oilseed, tubers and vegetables. The major horticultural crops such as mango, jackfruit, litchi, tamarind etc. It is also observed that the barrel lands were converted to cultivable lands through intervention of agro-forestry such as *Sal, Mahua, cashew nut* etc. which give a huge remuneration through its products and by products.

Possession of farm tools and implements operated by electricity/ tractor/ animal/ human

It was found that the majority of the population depend upon agriculture in the selected village. They adopt traditional practices at field level. Both the farmers and farm women use traditional tools and equipment used for cultivation, harvesting and post harvest activities. The farmers depend upon the tools and equipment which are operated by animals as source of power. Apart from these some of the farm families possessed tractor or power operated farm tools and equipment. About 98 per cent possessed spade, 26 per cent had khurpi and all of the respondents had traditional sickle for various agricultural operation. For preparation of land 78 per cent had traditional plough operated animals Less than 10 per cent had tractor, disel engine, pump set, power tiller, sprayer etc.

3.1.2. Information of farm women in agriculture (Part-||)

General Profile of Women Involved in paddy cultivation in Koraput and Mayurbhanj district

Most of the respondents belong to tribal community and depend upon the agriculture as their primary occupation. The age of the selected respondents vary from 21 to 52 years. Majority of them functional literate whereas less than 10 percent completed their high school education. The average size of land holding is 2-3 acres. The lands are owned by the head of the family or in the name of their male counterpart or husband. The farm families depend upon the monsoon and they cultivate paddy in *Kharif* season. In some of the areas they opted for due to facility of irrigation. During *Rabi* season they grow millet and vegetables including tubers and green leafy vegetables.

Women involved in paddy cultivation in Koraput and Mayurbhanj district

The data pertaining to the activities carried out in paddy cultivation were gathered in terms of time spent (hours) per day and time spent during the kharif and rabi season. The data revealed from Koraput district revealed that majority time of the women farmers spent in the weeding operation (50.5 %) followed by land preparation (11.6 %), harvesting(10.6%) transplanting (8.6 %). Rest of the operations take up approximately 18.7 per cent of their time. On an average 738.84 hours of work is put in by the women in kharif season for paddy cultivation. Where as in mayurbhanj majority time of the women farmers spent in the harvesting operation (20.1%) followed by (17.8%) and weeding (16.1 %), Rest of the operations take up approximately 45.8 percent of their time. On an average 811.5 hours of work is put in by the women in kharif seaso for paddy cultivation.The following table and fig. given below depicting the activities and time spent by women for cultivation of paddy during Kharif season in Koraput and Mayurbhanj district.

Table 1.Women involved in paddy cultivation in Koraput and Mayurbhanj

Activities	Average hours /day in kharif (Koraput)	Percent (n=180) (koraput)	Average hours /day in kharif (Mayurbhanj)	Percent (n=180) (Mayurbhanj)
Weeding	373.3	50.5	130.7	16.1
Land prepration	85.4	11.6	144.4	17.8
Harvesting	78.6	10.6	163.5	20.1
Transplanting	63.4	8.6	59.6	7.3
Carrying seedling	32.2	4.4	12.3	1.5
Uprooting	30.6	4.1	34.3	4.2
Threshing	23.4	3.2	100.1	12.3
Winnowing	12.7	1.7	51.4	6.3
Spraying chemicals	8.6	1.2	11.6	1.4
Seed treatment	8.0	1.1	5.8	0.7
Nursery raising	6.6	0.9	10.5	1.3
Prepration of chemical solutions	5.3	0.7	4.8	0.6
Drying	4.7	0.6	4.1	0.5
Fertilizer broadcasting	3.3	0.4	18.6	2.3
Sowing	2.8	0.4	32.3	4.0

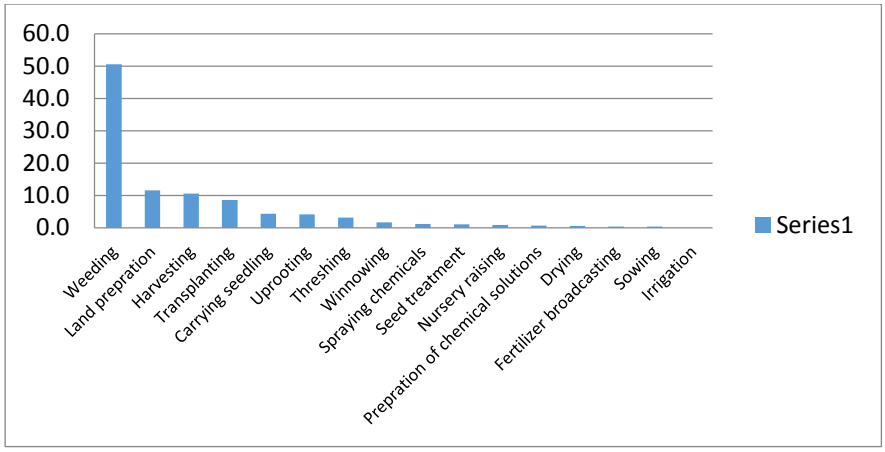

Fig 1.Women involved in paddy cultivation in Koraput

Time spent by women in different month during Kharif in Koraput

It has been observed that women spent maximum time during June for field preparation, and sowing related activities followed by August for interculture activities. During September they gave more time for harvesting and post harvest activities whereas in October they spent less time other post harvest such as storage activities.

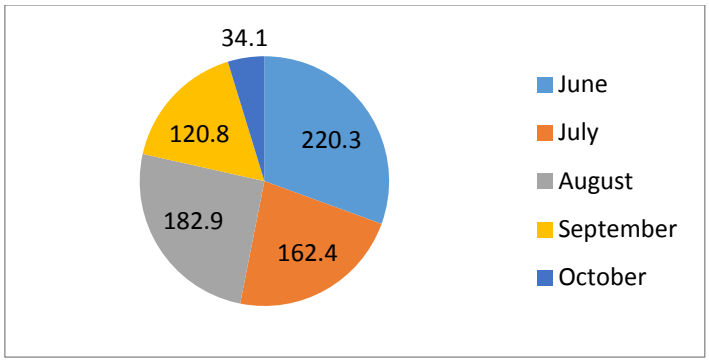

Fig 2. Time spent by women in different month during Kharif in Koraput

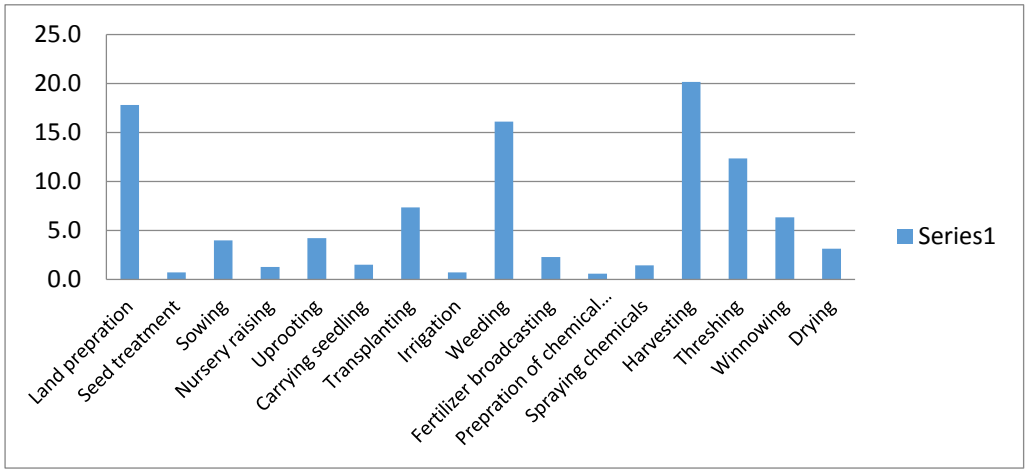

Fig 3.Women involved in paddy cultivation in Mayurbhanj

Time spent by women in different month during Kharif in Mayurbhanj

It has been observed that women spent 88.3 hours /day during June for field preparation and sowing related activities. They spent maximum time during July for sowing and transplanting related activities followed by August for interculture activities. During September they gave less time for interculture activities whereas in October they spent more time in harvesting and post harvest activities.

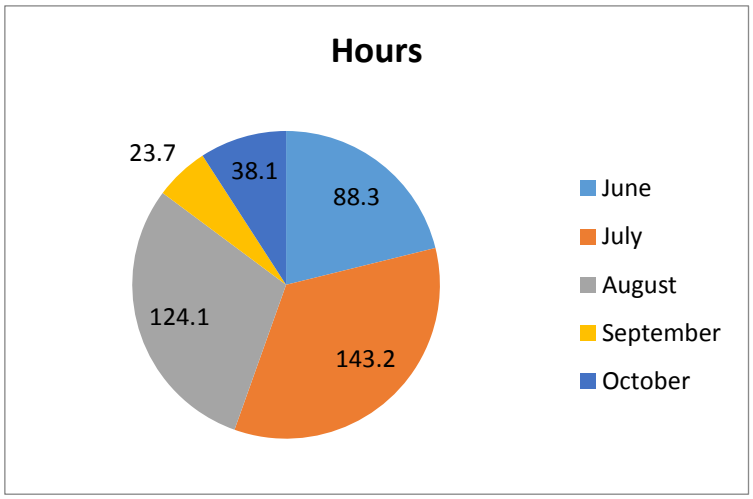

Fig 4. Time spent by women in different month during Kharif in Mayurbhanj

Information on Tools and equipment used in production activities in Koraput and Mayurbhanj districts

The data related the participation of women in different production activities in paddy cultivation and the existing tools and equipment by them were collected from the respondents. The data revealed that more than 85 percent women actively participated in Land prepration, FYM application, interculture activities such as uprooting, transplanting, weeding and harvesting in production process. Of the total 70.8 per cent women involved in seed treatment and 73.6 per cent in nursery raising activities. Farm women's participation in application of fertilizer, sowing and irrigation is very less as compared to other activities.

Table 2. Information on Tools and equipment used in production activities in Koraput and Mayurbhanj district

Production	Percent (n=360)
Land prepration	86.4
FYM application	86.1
Fertilizer application	45.8
Seed treatment	70.8
Nursery raising	73.6
Sowing	32.2
Uprooting	86.7
Transplanting	86.1
Weeding	86.7
Irrigation	22.2

Use of pump for irrigation	20.3
Harvesting	85.8

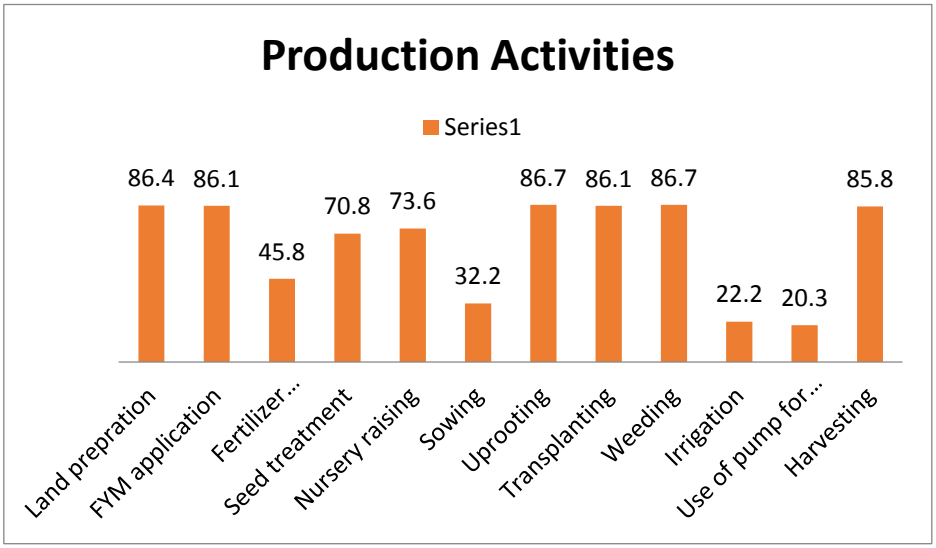

Fig 5. Information on Tools and equipment used in production activities in Koraput and Mayurbhanj districts

Information on Tools and equipment used in post harvest activities in Koraput and Mayurbhanj districts

The data related to the participation of women in post harvest activities in paddy cultivation data revealed that more than 75 per cent of women participated in drying activity. About 54 per cent of them involved in threshing of paddy in traditional process i.e beating bundles on a wood log or on a hard surface. Winnowing was done by 41 per cent of women . About 44 per cent women performed cleaning and grading activities followed for storing them in gunny bags.

Table 3. Information on Tools and equipment used in post harvest activities in Koraput and Mayurbhanj districts

Post harvest activities	Percent (n=360)
Threshing	53.3
Winnowing	40.6
Drying	75.8
Parboiling	70.6
Cleaning and grading	43.9
Storage in gunny bag	40.0
Any other	0.3

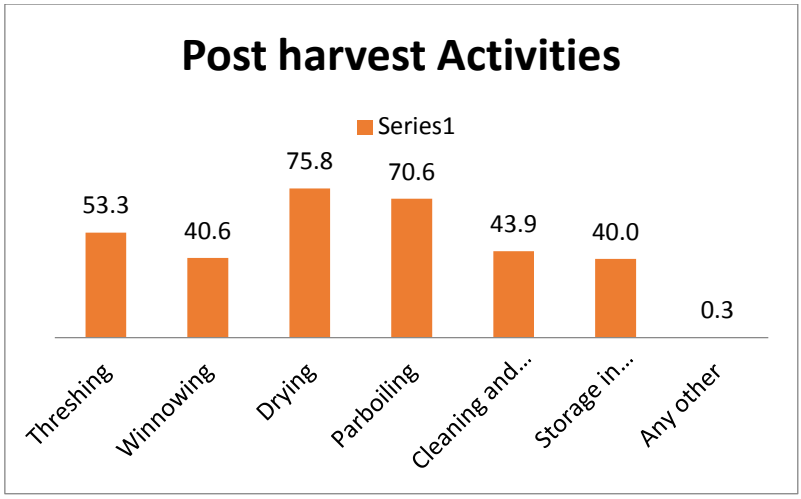

Fig 6.Information on Tools and equipment used in post harvest activities in Koraput and Mayurbhanj districts

Tools used for Production and post harvest activities in Koraput and Mayurbhanj districts

It has been observed that the women farmers from both district used traditional farm tools and equipment for cultivation of paddy. Land preparation is a major activity done by men with the help of women. In this case majority of them used wooden plough which is being used by them since their generation to generation. The tractor used for land preparation activities is about 2 per cent only. The activities such as seed treatment, FYM application , weeding, uprooting etc. were done by bare hands which is most drudgery prone and created injuries in palm and nails. For post harvesting activities most of them followed their traditional practices for threshing, winnowing, cleaning grains and parboiling etc.

Table 4. List of tools used for production activities

Activities	**Tools/ Equipment**	**Percentage (n=360)**
Land prepration	Plough	85.8
	Tractor	1.9
	Both	19.2
FYM application	Bucket	91.9
Fertilizer application	by hand	39.4
Seed treatment	By hand	25.8
	Spade/ Fowda	19.4
Nursery raising	spade	13.3
	By hand	26.4
Uprooting	By hand	48.3
Transplanting	By hand	29.7
	By rope	45.3
Weeding	By hand	78.3

	weeder	7.8
Irrigation	By hand	2.5
	By pipe	3.1
Use of pump for irrigation	Pump	15.0
Harvesting	Sickle	80.0

Table 5. List of tools used for post harvest activities

Activities	**Tools/ Equipment**	**Percentage (n=360)**
Threshing	Bullock	38.3
	By hand	12.5
	Tractor	3.1
Winnowing	Traditional	29.4
	Winnower	6.4
Drying	Traditional	50.0
Cleaning and grading	Traditional	78.9
	Seive	36.7
Storage	Gunny bag	81.1
Parboiling	Traditional	68.3
	Drum	10.0

Information about improved farm tools/implements/ machineries in Koraput and Mayurbhanj

The following table depicted that About (64.4%) have Hand winnower followed by Mandwa weeder (49.4%), Two/four row paddy transplanter (8.9%), Finger weeder (8.3 %), Paddy drum seeder (8.3 %) and seed treatment drum (5.6 %). They also have information about these tools and they operated various activities with these tools. Rest of the respondent did not have information about these improved tools for drudgery reduction of farm women where as in Mayurbhanj (43.9%) have seed treatment drum followed by Mandwa weeder (28.3%), Hand winnower (17.8%), Two/four row paddy transplanter (5.6%), Paddy drum seeder (3.3 %) and Fertilizer broadcaster (2.8%). They also have information about these tools and they operated various activities with these tools. Rest of the respondent did not have information about these improved tools for drudgery reduction of farm women

Table 6. Information about improved farm tools/implements/ machineries in Koraput and Mayurbhanj

Tools	**Possession in Percentage Koraput (n=180)**	**Possession in Percentage Mayurbhanj (n=180)**
Fertilizer broadcastor	0.6	2.8
Seed treatment drum	5.6	43.9
Paddy drum seeder	8.3	3.3
Two/Four row paddy transplanter	8.9	5.6
Mandwa weeder	49.4	28.3
Finger weeder	8.3	0.0

Improved Sickle	0.0	0.0
Pedal operated thresher	1.1	2.2
Hand winnower	64.4	17.8
Hanging type grain cleaner	2.8	0.0
Sac holder	0.0	0.0
Parboiling drum	0.6	0.0

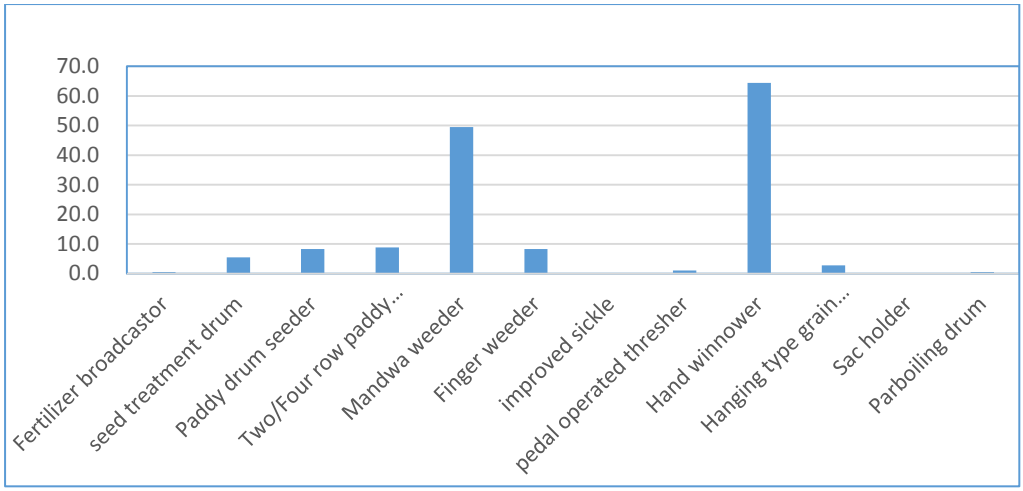

Fig. 7. Information about improved farm tools/implements/ machineries in Koraput

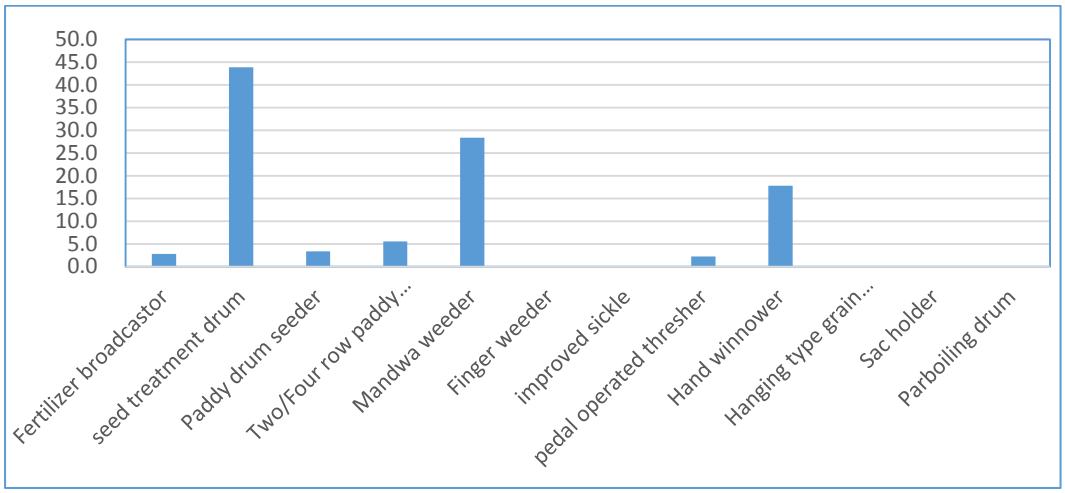

Fig. 8. Information about improved farm tools/implements/ machineries in Mayurbhanj

Occupational hazards during farm activities in Koraput and Mayurbhanj

Table 7. Occupational hazards during farm activities in Koraput and Mayurbhanj

SN	Health Problems	KORAPUT (n=180)			MAYURBHANJ (n=180)		
		Never (%)	Sometimes (%)	Repeatedly (%)	Never (%)	Sometimes (%)	Repeatedly (%)
1.	**Pain**						
	Light pain in body part	0	81.1	7.2	5.6	32.2	30.6
	Pain in neck	0	62.8	5.6	3.9	35.0	29.4
	Pain in hand	0	73.9	4.4	8.3	33.3	26.7
	Pain in back	0	62.2	5.6	4.4	40.6	23.3
	Pain in shoulder	0	59.4	6.7	5	36.7	26.7
2.	**Injuries/ cuts etc.**						
	Crushing of fingers	0	75.6	7.2	3.9	40.6	23.9
	Cut in lower body parts	0	51.7	5	4.4	40.6	23.3
	Bruises in palms	0	53.9	5.6	5	36.7	26.7
	Injuries due to weeding	0	45.6	6.7	4.4	38.3	25.6
	Injuries while bundling crops	0	43.9	7.8	3.3	38.3	26.7
	Blisters	0	43.9	6.7	3.9	39.4	25.0
3.	**Burning**						
	Skin	0	46.1	5.6	4.4	44.4	19.4
	Eyes	0	50.6	6.1	3.9	38.3	26.1
	Nose	0	46.1	5.6	4.4	35.6	28.3
	Face	0	44.4	6.1	3.3	38.9	26.1
4.	**Bites**						
	Snake bite	0	43.9	6.7	4.4	35.0	28.9
	Scorpion bite	0	47.2	6.7	3.9	42.2	22.2
	Insects bite	0	43.9	5.6	5.6	37.2	25.6
5.	**Due to environment**						
a	**Effect due to very cold**						
	Tears from eyes due to severe cold	0	45.0	6.7	5	36.7	26.7
	Senseless	0	43.9	5	4.4	33.3	30.6
	Blood from nose	0	45.0	5.6	2.8	37.8	27.8
b	**Effect Due to very hot climate**						
	Affected by Loo	0	48.9	6.1	4.4	39.4	24.4
c.	**Polluted environment due to dust**						
	Water from nose	0	78.3	7.8	3.9	30.0	34.4
	Burning in eyes	0	48.9	5.6	3.3	40.6	24.4
	Difficulties in breathing	0	52.2	6.7	4.4	37.2	26.1
	Choked nose	0	55.0	5.6	3.9	40.6	23.9

The data pertaining incidences of occupational health hazards collected from Koraput district revealed that The majority of the respondents (67.88%) having light pain in body parts such as pain in neck, back, hand and shoulder. Only (6 %) having pain repeatedly in these body parts. Crushing of fingers, cut in lower body parts, bruises in

palms, injuries due to weeding, injuries while bundling crops, blisters were very common and it happened sometimes (52.44%) and repeatedly (6.5%) due to monotonous work with repetitive moments of hands, palm etc. Burning in skin, eyes, nose and face sometimes (46.8%) and repeatedly (5.85 %).Snake bite, scorpion bite, insect bites also happened sometimes (45%) and repeatedly (15.27%) while working in the field. Women farmers face problem in the field due to environment such as tears from eyes due to severe cold, senseless, blood from nose, affected by loo, water from nose, burning in eyes, difficulties in breathing, chocked nose etc. while working in the field sometimes (52.15 %) and repeatedly (6.14 %).The data related to occupational health hazards also collected from Mayurbhanj district revealed that (35.56 %) respondents having light pain in body parts such as pain in neck, back, hand and shoulder sometimes.(27.34 %) having pain repeatedly in these body parts. Among them most of them have severe pain lower back and shoulder. Crushing of fingers, cut in lower body parts, bruises in palms, injuries due to weeding, injuries while bunding crops, blisters were very common and it happened sometimes (38.98%) and repeatedly (25.2%) due to monotonous work with repetitive moments of hands, palm etc.Burning in skin, eyes, nose and face sometimes (39.3 %) and repeatedly (24.97 %).Snake bite, scorpion bite insect bites (38.13%) also happened sometimes and repeatedly (25.56%) while working in the field.Sometimes (36.95%) and repeatedly (27.28 %) they face problems due to environment while working in the field such as tears from eyes due to severe cold, senseless, blood from nose, affected by loo, water from nose, burning in eyes, difficulties in breathing, chocked nose etc.

Measurement of Anthropometric Parameters

Anthropometrics is the study of human body measurements. Many disciplines make use of anthropometry; advances have been made in medicine, anthropology, military science, criminology, engineering and design with its application. Its earliest practical use was the development of a system to identify criminals in France in the late nineteenth century by Alphonse Bertillon (Akintilo, A. 2001). Anthropologists use historical anthropometry to understand economic and social changes in a culture. (Cuff, 2004). Anthropometry involves systematic measurement of the physical characteristics of human body, primarily dimensional descriptors of body size and shape. The anthropometric data are used in ergonomics as reference data in planning ergonomic workplace layouts, to specify the physical dimensions of equipment, evaluating a wide range of products from clothing to spacecraft to “fit the task to the man” (Grandjean, 1980), thus enhancing operational ability, safety, convenience and comfort while performing tasks without augmenting work efficiency and reducing work cost (Verghese et al. 1989). The anthropometric measurements based upon area of application mentioned as basic body size descriptors, key dimensions for sizing and design of personal items, clothing and personal equipment pattern, dimensions used to develop manikins or test dummies, dimensions useful for the design and sizing of load carrying equipment, dimensions recommended for use in standards. The human geometry and the geometry of the product must be suitably fitted together (Kreifeldt, 1991) for safety as well as for functional reasons. Thus appropriate anthropometric applications are necessary for a ‘human compatible’ designed product. Anthropometry is the approach, which deals with the measurements of the human external body dimensions in static and dynamic conditions (Chakrabarti, 1997). Anthropometric data

are fundamental to the design of safe and usable products (Norris and Wilson, 1997), and the benefits of using these data in designing process are widely recognized. Gite and Yadav (1989) reported that in Indian agriculture, hand tools, animal-drawn equipment and tractor/power operated machinery are extensively used for various operations. The equipment are either operated or controlled by human workers. Use of anthropometric data can help in the proper design of equipment for better efficiency and more human comfort. They identified 52 body dimensions for the design of the equipment and proposed that extensive surveys should be carried out in different regions of the country to generate the necessary data useful in farm machinery design. Anthropometric data of female agricultural workers are also important for the rationalization of the design of agricultural hand tools and equipment (Philip GS, Tewari VK, 2000, Tewari VK 2004).

Keeping these above in view we have also measured anthropometric parameters of the respondents at both the district. The data pertaining these are given below.

Anthropometric Parameters in Koraput and Mayurbhanj

Table 8. Anthropometric Parameters in Koraput and Mayurbhanj

Parameters	Mean Koraput (n=180)	Mean Mayurbhanj (n=180)
height (in cm)	148.7	150.0
Shoulder height (in cm)	124.6	120.1
eye level height (in cm)	132.8	97.4
maximum vertical reach (in cm)	157.6	80.2
maximum horizontal reach (in cm)	108.8	67.1
weight (in kg)	40.9	57.0

This study documented the mean and percentile range of static and dynamic anthropometric measurements and to provide a comprehensive data for use by nutritionist and ergonomic practitioners who are engaged in designing and evaluating mechanized technologies for women. Various body dimensions in standing and sitting positions, reach measurements, determinants of body fat and Body Mass Index (BMI) were recorded for women working in the agricultural domain.

3.2. End-line Survey

Information of farm women in agriculture

The data from the pilot study revealed that both in Koraput and Mayurbhanj agriculture is the primary occupation. Majority of the households mostly cultivate paddy during *kharif* and *rabi* season. Apart from the rice, horticultural crops such as mango, jackfruit, lemon, tamarind, banana, cashew nut including spices are predominantly grown. Majority of the respondents possessed traditional sickle (95%) and spade (76%) for various agricultural operation. For preparation of land 27 per cent had traditional plough operated animals as well as human being in some parts of the district. Less than 10 per cent had tractor, disel engine, motor pump, power tiller, sprayer etc.

Majority time of the women farmers spent in the weeding operation (50.5%) followed by land preparation (11.6%), harvesting (10.6%). Transplanting was the most tedious and drudgery prone task performed by women. On an average 738.84 hours of work is put in by the women in kharif season for paddy cultivation. It has been observed that women spent maximum time during June for field preparation, and sowing related activities followed by August for intercultural activities. During September they gave more time for harvesting and post harvest activities whereas in October they spent less time other post harvest such as storage activities. The incidences related to occupational injuries, hazards were also documented. The physical problem such as pain in body parts were also reported by the respondents while working in the field. Most of them have severe pain in lower back and shoulder.

Tools and equipment used in paddy cultivation

The data revealed that before the invention of women friendly tools in Mayurbhanj and Koraput district they were following traditional practices. In both the district women farmers were actively participated in different production and post harvest related activities. But after intervention of those they have adopted those tools and equipment. The respondent told that some of the implement such as marker, transplanter, thresher, improved sickle, winnower, hanging type grain cleaner, seed treatment drum are very useful for production and post harvest related activities. In Mayurbhanj invention of Parboiling drum was successful and they have adopted it for preparation of parboiled rice. The Problems or fatigue / difficulties due to work was also collected and showed that the improved tools were very easy to operate with no or less difficulty. Whereas the tools related to traditional method were difficult to operate or used by the women farmers (Table.9). The data from the (Table.10) depicted that in Koraput also the women were doing very tedious task traditionally. After intervention of the improved tools and equipment they have adopted the markers, transplanter for transplanting, mandwa weeder and finger weeder for weeding in paddy and vegetables, sickle for harvesting, thresher and winnower for harvesting and post harvest operation, hanging type grain cleaner for cleaning grains in a large number. They also expresses those were less difficult to operate at filed level by them. It also increased their work efficiency.

Information about improved farm tools/implements/machineries in Mayurbhanj and Koraput

Table -9. Information about improved farm tools/implements/machineries

	Name of the tools	MAYURBHANJ (%) (n=180)		KORAPUT (%) (n=180)	
		Possession	**Operated**	**Possession**	**Operated**
1.	Fertilizer broadcaster	1.7	0.0	2.8	0.0
2.	Seed treatment drum	8.3	**90.0**	**44.4**	**85.6**
3.	Paddy drum seeder	8.3	0.0	4.4	0.0
4.	Two/Four row paddy transplanter	8.9	0.0	6.7	0.0
5.	Mandwa weeder	**50.0**	**96.1**	**27.8**	**97.2**
6.	Finger weeder	8.3	**93.3**	**3.9**	**95.6**

7.	Improved sickle	**22.2**	**97.8**	**12.2**	**96.7**
8.	Pedal operated thresher	2.2	**96.1**	**1.7**	**96.7**
9.	Hand winnower	**63.9**	**93.9**	**21.7**	**97.2**
10.	Hanging type grain cleaner	2.8	**93.3**	**1.7**	**96.7**
11.	Parboiling drum	8.9	**91.1**	0.0	0.0

The data given in above (table 9) revealed that after imparted the training and demonstration at field level they gained knowledge and skill which helped them to operate the tools and implements at field level. Among the beneficiaries of Mayurbhanj about half of the only possed weeder and hand winnower. But more than 90 per cent of them operated those tools from Custom hiring centre with paying nominal fee. Similarly in Koraput also possession of tools and implements were very less. But about 95 per cent of the operted those tools after the intervention of the project.

It has been observed that women farmer are now a bit pro on use of farm tools. Women farmer for the first time, were able to access and control over farm tools. It has been observed that in tribal pockets women farmers are breaking stereo types of using sprayer. They enjoyed their work by using improved farm tools/ implements/ machineries at their field in many times. They have used the tools according their size of field and requirement. From the following (table-10) it can be seen that some of the tools such a Weeder, Threshers, Winnower, Improved Sickle were used more than four or five times as of their needs.

Frequency of using improved farm tools/ implements/ machineries in Mayurbhanj and Koraput

Table -10. Frequency of using improved farm tools/implements/machineries

	Use of improved farm tools and equipment	**MAYURBHANJ and KORAPUT (in Frequency n=360)**				
	Name of the tools	**Two times**	**Three times**	**Four times**	**Five times**	**> Five times**
1.	Seed treatment drum	74	**144**	99	37	6
2.	Mandwa weeder	52	**103**	**120**	61	24
3.	Finger weeder	46	**106**	**121**	76	11
4.	Improved sickle	-	47	**80**	**108**	**124**
5.	Pedal operated thresher	-	72	**121**	**110**	59
6.	Hand winnower	17	60	**129**	**107**	47
7.	Hanging type grain cleaner	26	54	**111**	**110**	59
8.	Parboiling drum	26	97	-	-	-

The effectiveness of the tools and how did the women farmers feel overall by using the tool were also studied by collecting data. The data revealed that half of the respondent expressed their happiness towards improved. Output/ productivity of the tools and

implements were more than 90 percent in case of all the 14 tools (11 tools are hand operated and 3 tools are power operated) distributed in CHC. Majority of the respondents expressed their happiness towards improved tools. All of them were expressed that tools are efficient to reduce drudgery of both farm men and women, reduce workload of women, and boost efficiency and productivity of both the genders and also work with less and easily accessible inputs. These have been adoptable with the existing skill of both the genders and having potential of contributing to any livelihood component of farm men and women. About 60 percent of them expressed that dry land weeder, SRI marker and battery operated sprayer are most effective whereas about 46 percent respondent told that Mandwa weeder, Pedal thresher, Winnower, Hanging type grain cleaner were more effective, very easy to handle, required little time and energy. These also save time and money. About 40 per cent respondent told that Mandwa weeder, Pedal thresher, Winnower, Hanging type grain cleaner were more effective, these are very easy to handle, required little time and energy. It also save time and money (Table-11).

Effectiveness of tools in Mayurbhanj and Koraput

Table -11. Effectiveness of tools

Sl no.	Name of the tools	Effectiveness (n=360)				
		Not	Less	Effective	More	Most
1.	Seed treatment drum	0	0	23.1	47.5	29.4
2.	Mandwa weeder	0	0	13.9	46.7	39.4
3.	Finger weeder	0	0	18.3	45.0	36.7
4.	Dryland Weeder	0	0	11.5	28.5	60
5.	Improved sickle	0	0	16.9	50.8	32.2
6.	Pedal operated thresher	0	0	18.6	45.3	36.1
7.	Hand winnower	0	0	17.2	46.9	35.8
8.	Hanging type grain cleaner	0	0	15.8	48.9	35.3
9.	Parboiling drum	0	0	15.6	46.4	38.1
10.	Battery Operated Sprayers	0	0	9.5	28.5	62
11.	SRI Marker	0	0	22.6	35.4	42

Table -12. Effectiveness of tools in terms of time and cost saving

		MAYURBHANJ and KORAPUT (n=360)				
Sl No	Name of the tools	Cost saving (frequency)	%	Time saving (frequency)	%	Any Other frequency (%)
1.	Seed treatment drum	-		351	**97.5**	Protect from disease -335 (93.1)
2.	Mandwa Weeder	-		336	**93.3**	Loosening soil -65 (18.0)
3.	Finger weeder	148	41.1	165	**45.8**	No injuries 47 (13.1)
4.	Improved serrated sickle	-	-	323	**89.7**	No injuries 39 (10.8)

5.	Pedal operated thresher	83	23.1	232	**64.4**	Easy work and no injury-45 (12.5)
6.	Hand winnower	203	56.4	143	39.7	Easy work and No injuries 56 (15.6)
7.	Hanging type grain cleaner	21	5.8	192	**53.3**	Easy work-67 (18.6)
8.	Parboiling drum	21	0.0	136	**37.8**	Fuel saving-23 (6.4)

The data given in(table-12) revealed that the tools and implements they have hired from CHC at their respective villages were very much helpful for operating tasks at field level. Earlier they used to hire labourers for accomplishing their work. For these they had to pay the labour charges. Now they were able to save money and also time. Most of the revealed that they save their time and finishes their task within targeted periods. The time they save were utilized as leisure time. In Mayurbhanj they used the time for household work, nutrition garden, poultry farming and collecting forest produces. In case Koraput they also utilize their leisure time for animal rearing, mushroom cultivation, kitchen garden and backyard poutry. More than 90 per cent of the women farmers expressed that Seed treatment drum helped them in protection from diseseas. Whereas other women said that the rate of injuries decreased due to these improved tools and implements and were very easy to operate.

Overall Ranking of Improved Farm Tools and Equipments In Mayurbhanj and Koraput

Table-13. Overall ranking of improved farm tools and equipments (n=360)

Sl No	Name of the tools	Rank 4 (in %)	Rank 3 (in %)	Rank 2 (in %)	Rank1 (in %)
1.	Seed treatment drum	20	45	22.22	12.78
2.	Marker	10.83	41.94	33.89	13.33
3.	Mandwa Weeder	11.11	35.28	38.89	14.72
4.	Dryland weeder	17.78	41.39	33.61	7.22
5.	Power operated ridger cum weeder	15.28	39.72	33.61	11.39
6.	Sprayer (Battery)	13.89	44.17	35.56	6.39
7.	Sprayer (Power)	12.22	44.72	32.50	10.56
8.	Improved serrated sickle	12.78	42.78	36.39	8.06
9.	Pedal operated thresher	15.83	44.44	31.11	8.61
10.	power operated thresher cum winnower	13.06	45.83	35.83	5.28
11.	Hand winnower	18.89	46.39	31.39	3.33
12.	Hanging type grain cleaner	15	42.78	33.33	8.89
13.	Parboiling drum	8.61	43.33	34.72	13.33
14.	Ragi thresher	5	15.56	9.44	20.00

The data related to overall ranking of improved farm tools and equipments were collected from the respondents from Mayurbhanj and Koraput. The data revealed that 20 per cent farm women reported Ragi thresher as Rank 1 followed by Mandwa Weeder (14.72%), Parboiling drum and Marker (13.33 %), Seed treatment drum (12.78 %), Power operated ridger cum weeder (11.39 %), Sprayer (Power) (10.56 %), Hanging type grain cleaner (8.89 %),Pedal operated thresher (8.61 %), Improved serrated sickle (8.06 %), Dryland weeder (7.22 %), Sprayer (Battery) (6.39 %), power operated thresher cum winnower (5.28 %) and Hand winnower (3.33 %). Similarly 38.89 per cent farm women reported Mandwa Weeder as Rank 2 followed by Improved serrated sickle (36.39 %), power operated thresher cum winnower (35.83 %), Sprayer (Battery) (35.56 %), Parboiling drum (34.72 %), (Marker (33.89 %), Dryland weeder and Power operated ridger cum weeder (33.61 %), Hanging type grain cleaner (33.33 %), Sprayer (Power) (32.50 %), Hand winnower (31.39 %), Pedal operated thresher (31.11 %), Seed treatment drum (22.22 %) and Ragi thresher (9.44 %). Similarly 46.39 per cent farm women reported Hand winnower as Rank 3 followed by power operated thresher cum winnower (45.83 %), Seed treatment drum (45 %), Sprayer (Power) (44.72 %),Pedal operated thresher (44.44 %), Sprayer (Battery) (44.17 %), Parboiling drum (43.33 %), Improved serrated sickle and Hanging type grain cleaner (42.78 %), Marker (41.94 %), Dryland weeder (41.39 %), Power operated ridger cum weeder (39.72 %), Mandwa Weeder (35.28 %) and Ragi thresher (15.56 %). Similarly 20 per cent farm women reported Seed treatment drum as Rank 4 followed by Hand winnower (18.89 %), Dryland weeder (17.78 %), Pedal operated thresher (15.83 %) and Power operated ridger cum weeder (15.28 %).

Incidences of Occupational Health hazards In Mayurbhanj and Koraput

- The data related to occupational health hazards also collected from Mayurbhanj district revealed that (13.33%) respondents having light pain in body parts such as pain in neck, back, hand and shoulder sometimes. Nine per cent having pain repeatedly in these body parts.
- Crushing of fingers, cut in lower body parts, bruises in palms, injuries due to weeding, injuries while bunding crops, blisters were very common and it happened sometimes (15.64%) and repeatedly (8.88%) due to monotonous work with repetitive moments of hands, palm etc.
- Burning in skin, eyes, nose and face sometimes (16.11 %) and repeatedly (10.83 %).
- Snake bite, scorpion bite and insect bites also happened sometimes (17.22 %) and repeatedly (12.77 %) while working in the field.
- Sometimes (16.94 %) and repeatedly (11.94 %) they face problems due to environment such as tears from eyes due to severe cold, senseless, blood from nose, affected by loo, water from nose, burning in eyes, difficulties in breathing, chocked nose etc. while working in the field.
- The data related to occupational health hazards also collected from Koraput district revealed that (34.67 %) respondents having light pain in body parts such as pain in

neck, back, hand and shoulder sometimes. Only (1.99 %) having pain repeatedly in these body parts.

- Crushing of fingers, cut in lower body parts, bruises in palms, injuries due to weeding, injuries while bunding crops, blisters were very common and it happened sometimes (25.64%) and repeatedly (2.03 %) due to monotonous work with repetitive moments of hands, palm etc.
- Burning in skin, eyes, nose and face sometimes (18.89 %) and repeatedly (2.08 %).
- Snake bite, scorpion bite and insect bites also happened sometimes (15.55 %) and repeatedly (2.03 %) while working in the field.
- Sometimes (20.34 %) and repeatedly (2.22 %) they face problems due to environment such as tears from eyes due to severe cold, senseless, blood from nose, affected by loo, water from nose, burning in eyes, difficulties in breathing, chocked nose etc. while working in the field.

Prevention of Occupational Health hazards In Mayurbhanj And Koraput by using improved farm tools and equipments

The Prevention of Occupational Health hazards In Mayurbhanj and Koraput by using improved farm tools and equipments were studied by collecting data. The data (Table no. 14) revealed that In Mayurbhanj Light pain in body part prevented by using mandwa weeder (76.6%) followed by paddy thresher (22.7 %), Pain in neck prevented by using mandwa weeder (89.4 %), Pain in hand prevented by using paddy winnower (30.5 %) followed by pedal operated thresher (28.8 %), Pain in back prevented by using mandwa weeder (61.6 %), Pain in shoulder prevented by using mandwa weeder (70.5 %) followed by pedal operated thresher (28.8 %),Crushing of fingers prevented by using Improved sickle (89.4 %), Cut in lower body parts prevented by using mandwa weeder (13.3 %) followed by Improved sickle (11.1 %), Bruises in palms prevented by using gloves (18.3 %),Injuries due to weeding prevented by using mandwa weeder (53.3 %) followed by improved sickle (46.6 %), Injuries while making crop bundles prevented by using gloves (87.3 %), Blisters prevented by using mandwa weeder (18.3 %), Burning in skin prevented by using mask (80.5 %) followed by full shirt (13.3 %), Burning in eyes prevented by using glass (97.7 %), Burning in nose prevented by using seed treatment drum (52.2 %) followed by mask (45.5 %), Burning in face prevented by using mask (51.1 %), Snake bite prevented by using mandwa weeder (100 %), Scorpion bite prevented by using mandwa weeder (69.4 %) followed by pedal operated thresher (30.5 %), Insect bite prevented by using mandwa weeder (96.6 %), Tears from eyes due to severe cold prevented by using glass (14.4 %), Senseless prevented by using cap (81.1 %), Blood from nose prevented by using cap (81.1 %), Affected by loo prevented by using cap & full shirt (11.11 %), Water from nose prevented by using glass (11.6 %) followed by paddy winnower (9.9 %), Burning in eyes prevented by using winnower (46.0 %) followed by glass (38.8 %), seed treatment drum (9.4 %), Difficulties in breathing prevented by using sprayer (48.3 %) followed by mask (20.5 %) and Chocked nose prevented by using sprayer (20.5 %) where as In Koraput Light pain in body part prevented by using paddy thresher (49.4 %) followed by mandwa weeder (36.6%), sprayer (9.4 %), Pain in neck prevented by using mandwa weeder (91.6 %), Pain in hand prevented by using pedal operated

thresher (61.5 %) followed by paddy winnower (23.8 %), Pain in back prevented by using mandwa weeder (74.4 %) followed by marker (18.3 %), Pain in shoulder prevented by using pedal operated thresher (61.4 %) followed by mandwa weeder (21.6 %), marker (10.5 %), Crushing of fingers prevented by using Improved sickle (92.7 %), Cut in lower body parts prevented by using mandwa weeder (68.3 %) followed by Improved sickle (27.7 %), Bruises in palms prevented by using gloves (85.5 %), Injuries due to weeding prevented by using improved sickle (68.8 %) followed by mandwa weeder (30.0 %), Injuries while making crop bundles prevented by using mandwa weeder (70.5 %) followed by gloves (28.3 %), Blisters prevented by using mandwa weeder (88.3 %), Burning in skin prevented by using full shirt (63.3 %) followed by mask (24.4 %) , Burning in eyes prevented by using glass (95.5 %), Burning in nose prevented by using mask (71.6 %) followed by seed treatment drum (24.4 %) , Burning in face prevented by using mask (98.3 %), Snake bite prevented by using mandwa weeder (80.5 %), Scorpion bite prevented by using mandwa weeder (70.5 %) followed by pedal operated thresher (11.1 %), Insect bite prevented by using mandwa weeder (80.0 %),Tears from eyes due to severe cold prevented by using glass (73.8 %), Senseless prevented by using cap (90.0 %), Blood from nose prevented by using cap (89.4 %), Affected by loo prevented by using cap & full shirt (57.20 %) followed by umbrella (17.7 %), Water from nose prevented by using glass (62.7 %) followed by paddy winnower (24.3 %), Burning in eyes prevented by using glass (67.7 %) followed by seed treatment drum (23.8 %), Difficulties in breathing prevented by using mask (92.7 %) and Chocked nose prevented by using sprayer (93.8 %).

Table-14. Prevention of Occupational Health hazards In Mayurbhanj and Koraput by using improved farm tools and equipments

Health Hazards/ Problems	**Equipment which help you to prevent the hazard**	
Sl.no.	**Mayurbhanj (n=180)**	**Koraput (n=180)**
Light pain in body part	Mandwa weeder- 138 (76.6 %) Paddy thresher- 41 (22.7%) Battery sprayer-1 (0.5%)	Paddy thresher-89 (49.4 %) Mandwa weeder- 66 (36.6 %) Sprayer-17 (9.4 %) Marker-8 (4.4 %)
Pain in neck	Mandwa weeder-161 (89.4 %) Paddy thresher-5 (2.7%)	Mandwa weeder-165 (91.6 %) Marker-14 (7.7 %) Paddy thresher-1 (0.5 %)
Pain in hand	Paddy winnower-55 (30.5 %) Pedal operated thresher-52 (28.8 %) Mandwa weeder-11 (6.1 %)	Pedal operated thresher-111 (61.5 %) Paddy winnower- 43 (23.8 %) Mandwa weeder-14 (7.7 %) Marker-8 (4.4 %) Thresher-2 (1.1 %)
Pain in back	Mandwa weeder-111 (61.6 %) Battery sprayer-2 (1.1 %)	Mandwa weeder-134 (74.4 %) Marker-33 (18.3 %) Paddy winnower-4 (2.2 %) Battery sprayer-3 (1.6 %)
Pain in shoulder	Mandwa weeder-127 (70.5%)	Pedal operated thresher-110 (61.4 %)

	Pedal operated thresher-52 (28.8%)	Mandwa weeder-39 (21.6 %) Marker-19 (10.5 %) Battery operated sprayer-4 (2.2 %) Hand winnower-2 (1.1 %)
Crushing of fingers	Improved sickle-161 (89.4%)	Improved sickle-167 (92.7 %) Mandwa weeder-12 (6.6 %)
Cut in lower body parts	Mandwa weeder-24 (13.3 %) Improved sickle-20 (11.1%)	Mandwa weeder-123 (68.3 %) Improved sickle-50 (27.7 %)
Bruises in palms	Gloves-33 (18.3%) Mandaw weeder-2 (1.1%)	Gloves-154 (85.5 %) Mandwa weeder-17 (9.4 %)
Injuries due to weeding	Mandwa weeder-96 (53.3%) Improved sickle-84(46.6%)	Improved sickle-124 (68.8 %) Mandwa weeder-54 (30.0 %) Marker-2 (1.1 %)
Injuries While making crops bundles	Gloves-87 (87.3%) Mandwa weeder-20 (11.1 %)	Mandwa weeder-127 (70.5 %) Gloves-51 (28.3 %)
Blisters	Mandwa weeder-33 (18.3%) Gloves- 3 (1.6%)	Mandwa weeder-159 (88.3 %) Gloves-13 (7.2 %)
Burning in skin	Mask-145 (80.5 %) Full shirt-24 (13.3 %) Sprayer-8 (4.4 %) Battery sprayer- 2 (1.1 %) Gloves-1 (0.5 %)	Full shirt-114 (63.3 %) Mask-44 (24.4 %) Battery sprayer-17 (9.3 %) Gloves-4 (2.2%)
Burning in eyes	Glass-176 (97.7 %)	Glass-172 (95.5 %) Mask-5 (2.7 %) Sprayer-2 (1.1 %)
Burning in nose	Seed treatment drum-94 (52.2 %) Mask-82 (45.5 %)	Mask-129 (71.6 %) Seed treatment drum-44 (24.4 %) Glass-5 (2.7 %)
Burning in face	Mask-92 (51.1 %)	Mask-177 (98.3 %), Glass-1 (0.5 %)
Snake bite	Mandwa weeder-180 (100 %)	Mandwa weeder-145 (80.5 %)
Scorpion bite	Mandwa weeder-125 (69.4 %) Pedal operated thresher-55 (30.5 %)	Mandwa weeder-127 (70.5 %) Pedal operated thresher-20 (11.1 %)
Insects bite	Mandwa weeder-174 (96.6 %) Gloves-6 (3.3 %)	Mandwa weeder-144 (80.0 %) Gloves-3 (1.6 %)
Tears from eyes due to severe cold	Glass-14 (7.7 %)	Glass-133 (73.8 %) Mask-3 (1.6 %) Mandwa weeder-1 (0.5 %)
Senseless	Cap-146 (81.1 %) Cap & full shirt-13 (7.2%)	Cap-162 (90.0 %) Mandwa weeder-2 (1.1 %)
Blood from nose	Cap-146 (81.1 %) Cap & full shirt-13 (7.2%)	Cap-161 (89.4 %) Mandwa weeder-2 (1.1 %)
Affected by by Loo	Cap & full shirt-20 (11.11%)	Cap, full shirt-103 (57.2 %) Umbrella- 32 (17.7 %) Umbrella, full shirt-4 (2.2 %) Mandwa weeder-2 (1.1 %)

Water from nose	Glass-21 (11.6 %) Paddy winnower-18 (9.9%) Paddy thresher-2 (1.1 %)	Glass-113 (62.7 %) Paddy winnower-44 (24.3 %) Mask-13 (7.2 %) Dry land weeder-2 (1.1 %) Paddy thresher-2 (1.1 %)
Burning in eyes	Winnower-82 (46.0 %) Glass-70 (38.8 %) Seed treatment drum-17 (9.4 %) Mask-2 (1.1 %) Thresher-1 (0.5 %)	Glass-122 (67.7 %) Seed treatment drum -43 (23.8 %) Mask-4 (2.2 %) Paddy thresher-4 (2.2 %) Winnower-2 (1.1 %) Sprayer-1 (0.5 %)
Difficulties in breathing	Sprayer-87 (48.3 %) Mask-37 (20.5 %) Winnower-2 (1.1 %)	Mask-167 (92.7 %) Sprayer-7 (3.8 %) Winnower-4 (2.2 %)
Choked nose	Sprayer-37 (20.5 %) Mask-1 (0.5 %)	Sprayer-169 (93.8 %) Mask-9 (5.0 %)

Women friendliness of agricultural technology In Mayurbhanj and Koraput

The data related to Women friendliness of agricultural technology in Mayurbhanj and Koraput were collected from the respondents. The data revealed that in Mayurbhanj district 100 per cent farm women reported that the agricultural technology such as: it fulfill the location specific needs of both the genders, compatible with the existing socio-cultural climate of the society, it is simple to understand by both farm men and women, it is easy to handle and operate by both farm men and women, it is efficient to reduce drudgery of both farm men and women, it reduce workload of women, it boost efficiency and productivity of both the genders, it adoptable with the existing skill of both the genders and it is having potential of contributing to any livelihood component of farm men and women were women friendly followed by it work with less and easily accessible inputs (99.44 %), it is easily accessible and affordable to both the genders (98.89 %), it is generated by considering the preferences of both the genders and it consider physical parameters of both the genders (94.44 %) and it is having potential of contributing to any livelihood component of farm men and women (85.56 %) whereas in Koraput all the agricultural technology such as: it is generated by considering the preferences of both the genders, it consider physical parameters of both the genders, it fulfill the location specific needs of both the genders, it is compatible with the existing socio-cultural climate of the society, it is easily accessible and affordable to both the genders, it is simple to understand by both farm men and women, it is easy to handle and operate by both farm men and women, it is efficient to reduce drudgery of both farm men and women, it reduce workload of women, it boost efficiency and productivity of both the genders, it work with less and easily accessible inputs, it is adoptable with the existing skill of both the genders, it is flexible to get modified according to the needs of both the genders and it is having potential of contributing to any livelihood component of farm men and women were reported 100 per cent women friendly.

Table 15. Women friendliness of agricultural technology in Mayurbhanj and Koraput

sl. no	Statements	Mayurbhanj (%) (n=180)	Koraput (%) (n=180)
1	Is it generated by considering the preferences of both the genders?	94.44	100.00
2	Does it consider physical parameters of both the genders?	94.44	100.00
3	Does it fulfill the location specific needs of both the genders?	100.00	100.00
4	Is it compatible with the existing socio-cultural climate of the society?	100.00	100.00
5	Is it easily accessible and affordable to both the genders?	98.89	100.00
6	Is it simple to understand by both farm men and women?	100.00	100.00
7	Is it easy to handle and operate by both farm men and women?	100.00	100.00
8	Is it efficient to reduce drudgery of both farm men and women?	100.00	100.00
9	Does it reduce workload of women?	100.00	100.00
10	Does it boost efficiency and productivity of both the genders?	100.00	100.00
11	Does it work with less and easily accessible inputs?	99.44	100.00
12	Is it adoptable with the existing skill of both the genders?	100.00	100.00
13	Is it flexible to get modified according to the needs of both the genders?	100.00	100.00
14	Is it having potential of contributing to any livelihood component of farm men and women?	85.56	100.00

3.3. Outcome after End-Line Survey

A glance of Drudgery reduction by using different Farm implements

Transformation is not a one day practice, neither a random outcome. It takes proper planning, taking ownership over the planning and execution to see the body fatigue gone. Leisure time to think and knowledge to share brought them the recognition of a farmer, and this was the transformation promised to them.

Earlier manual weeding was their tradition but now mechanization is their new tradition adopted. Before the use of implements the women prayed and hope that this journey will bring a new beginning and prosperity in women hood.

Yes, they smiled, they laughed not because they haven't earlier but because their work got easier through this journey.

***"With use of battery sprayer, my hand pain has reduced drastically and my work got finished within 30 minutes. Last year, I had experience of shoulder pain after spraying",* said**

Bhagabati Malik, Jashipur

***"I hire tools from CHC, I came to know about its uses during training and hence I am using it. I even told my neighbors' about the benefits of it",* said**

Parbati Malik, Jashipur

It has become easier for me, now I don't have to sit whole day weeding grass on field", said

Kamla Malik, Dabuguda Panchayat, Lamtaput

This is a story of Dabuguda village, one of the villages under "PRERNA" project. Agriculture across Lamtaput block and all over Odisha is the mainstay of majority of the population. Women play an important role in agriculture however they are not recognized as a farmer. Also, with less tools and implements, they usually did weeding or any farm practices with hands which increased their drudgery. Most of the farm implements were made and use for men looking at the physical, strength, etc. So, "PRERNA" not only wanted to give identity to the women as a farmer but also introduced gender friendly farm equipments. The implements were made in such a way that it was easier to use for women and hence drudgery was reduced.

After "PRERNA" people got to know the use of farm implements, benefits after which women of those villages started using the implements at a very large scale. More women were involved and showed interest. Focus of the intervention was around women, their role in agriculture and their specific issues. Gradually women have started realizing them as farmer.

"*Earlier,it takes2 months to carry out weeding in ginger plot of 1 acre land, however, this year after using power weeder, it took me hardly 3 hours in a seven days gap"* said

Chanchala Malik, Lamtaput

Some excitements among women farmers noticed

- Women farmer are now a bit pro on use of farm tools. Women farmers excited in using power equipments
- Adoption of improved practices in paddy and millet –SRI & SFMI(System of finger millet intensification)
- Women farmer for the first time has access and control over farm tools, started using.

- In tribal pockets women farmers are breaking stereo types of using sprayer. Earlier the use of tools was only the male members.
- Drudgery reduction and work transfer from women to men due to farm implements
- Women farmers are enjoying the farm tools as it gave them leisure time
- A sense of togetherness through collective use of tool.

Key outcome of the project:

1. It is a joint learning on various women friendly farm tools that has been useful in drudgery reduction of a farm woman.
2. In the project we demonstrated 42 CHCs, run and maintained by farm women of two tribal dominated blocks of Odisha.
3. This project largely introduced a variety of farm tools directly to the farm women, that helped to change the picture of access and control of farm women over farm tools rather only control of men.

Recommendation on Farm tool:

Farm women of Jashipur and Lamtatput have used all types of farm tool during different stages of agriculture in kharif and rabi season. Some farm tools have fitted well in their POPs like seed treatment drum, ridger, weeder, improve sickle; some tools need to map with their practices like paddy winnower, double screen siever, thresher, parboiling drum; farm tools like battery sprayer, power weeder, power sprayer were accepted largely by farm women as for the first time they have operated such power equipment by themselves.

Battery Sprayer and Weeders are liked by most of the farm women whereas manual paddy winnower is the least preferred. Spraying was a dependent (as only man has the control on it) and painful (manual spray) to a farm woman but battery sprayer has largely sorted out these two problems. Weeding is another time taking, laborious work for a farm woman; mandwa weeder made weeding easy and it saves time also. Most of the unique village households, only farm woman is available for winnowing work. Here manual winnower requires at least two people to operate. Machine can be power operated.

Challenges

One of the major challenges in piloting of the project was the time span. Any kind of equipment introduction also needs technology and knowledge transfer to the community. The implementing agency had only one crop cycle to actually demonstrate the tools. A longer project period would have allowed the implementing agency to actually empower community with the knowledge, would have given time and space for the community to share their experiences of using various tools with each other.

Some of the tools were given very less in number. For example, the seed treatment drum. One seed treatment drum was provided to one producer group of 40 members. Normally all the farmers do the seed treatment at a time as for paddy they are dependent on rain. So one seed treatment drum is not sufficient for 40 farmers in one go.

Recommendations for policy change

It will be helpful if the equipments are available in government departments at subsidised rate so that farm women can access it easily. Presently all the equipments are not available locally in sufficient numbers.

4.CONCLUSION

It is concluded from the end line survey that the tribal women of Odisha especially from Koraput and Mayurbhanj district followed traditional practices in paddy and vegetable cultivation. They were using old/traditional tools and equipment to perform various activities which are not suitable and women friendly due to its heavy weight or other features matching to physiology of men. They perform very tedious task leads to drudgery and occupational health hazards. Due to these reason they suffer from various health related issues. A part from these they spent huge amount of money towards wage for manual work. After the intervention of drudgery reducing women friendly tools and implements at Jashipur block of Mayurbhanj and Lamtaput block of Koraput they got awareness. It also changed their knowledge, skill and attitude which helped them use the improved tools at their field level. By using these they were able to save their energy, tome and money. They got enough leisure time which were utilized by them in other household and allied activities. That also encourage them to get engage for income generation activities in agriculture and allied sectors. Most of them satisfied with the tools and implements provided by their CHCs.

"Technology is one of the key drivers of female economic empowerment, but the fields that women choose to participate in are still decidedly gendered." –
Weili Dai