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Agricultural technologies popularized for reduction of drudgery and farm profitability

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Abstract
Women in rural areas perform a major part of all agricultural operations like weeding, transplanting, sowing, harvesting, cleaning, storage etc. They work as programmed robots destined for drudgery as they are deprived of technology access, health care access and employment alternatives. Hence, the present study was conducted with an aim to empower farm women with scientific knowledge and gender friendly appropriate technologies developed on the principles of ergonomics through trainings. The training programmes were conducted in Kotur, Marewad, Sulla and Surshettikoppa villages of Dharwad and Hubli taluks of Dharwad distrct from Karnataka state. About 30 fw, 37fw, 33fw and 60fw were the beneficiaries from the selected villages respectively. Thus the total no. of beneficiaries of these training progrmmes was 200 farm women. The results of pre test revealed that the farm women had lesser knowledge regarding improved technologies before the training programmes. The post test scores showed knowledge gain among the farm women. Further, majority of the farm women accepted farm technologies and opined that these are gender friendly, drudgery reducing, convenient and comfortable to use. Hence, The Government and other agricultural institutions should organize intensive training programmes on use of these farm technologies to promote and popularize them. It should give subsidy on purchase improved farm technologies to hasten the adoptability rate among farming community.

Keywords: Impact assessment, popularization, agricultural technologies, knowledge

Introduction
India's population is engaged in agricultural activities. It is a primary activity, which produces food grains and raw materials for industries. India is geographically a vast country so it has various food and non-food crops which are cultivated in three main cropping seasons which are rabi, kharif and summer. Dr. Mukherjee Nagar Agriculture in India is unique in its characteristics, where over 250 different crops are cultivated in its varied agro-climatic regions, unlike 25 to 30 crops grown in many of the developed nations of the world. India with its favorable agro-climatic conditions and rich natural resource base has become the world's largest producer across a range of commodities. Over the last few years, there has been considerable progress in agriculture mechanization. It is generally believed that the benefits of modern technology have been restricted to farmers with large land-holdings. Yet the fact remains that even small farmers are adopting and utilizing selected farm equipments for efficient farm management through custom hiring. But still they have to be educated in this line. Mechanical equipments for various farm operations like sowing, irrigation, plant protection and threshing etc are generally being used by the farming community. Farm women perform hard physical work in plantation of crops, care and management, harvesting, threshing/processing, marketing, child bearing and rearing simultaneously. The farmwomen undergo hard physical drudgery especially while transplanting vegetable in mud with bending position for a long time in rains and scorching sun, harvesting by bending with traditional sickle, weeding by hand in sun, rain and cold for a long hours, drying of produce, standing in scorching sun, winnowing in dust and sun for a long time, with hard physical labour, dehusking/shelling, pounding, grinding of cereals, pulses by hand as well as hand operated chakki. Drudgery is generally conceived as physical and mental strain, agony, monotony and hardship experienced by human beings. However, women report more fatigue than men. So, the plight of the Indian farm woman in this regard is alarming as they work for long hours without leisure, perform multiple roles in family and continue to be constrained by illiteracy, malnutrition and unemployment. This fatigue concerns mental and physical fatigue, sleepiness, feeling tired or emotional exhaustion. Almost all farmwomen suffer from physical drudgery in various operations.

They work as programmed robots destined for drudgery as they are deprived of technology access, health care access and employment alternatives.

Here the intervention of small agricultural tools helps to reduce their drudgery and improve efficiency. Hence it is essential to empower farm women with scientific knowledge and gender friendly appropriate technologies developed on the principles of ergonomics. In this regard AICRP-HSc—Family Resource Management component conducted training programmes at different villages with the following objectives

1. To popularize the drudgery reducing farm technologies among farm women
2. To study the impact the knowledge gain and acceptability of improved farm technologies by farm women

Methodology

Four operational villages of AICRP-Family Resource Management *viz.*, Sulla, Surshettikoppa villages from Hubli taluk and Marewad and Kotur villages from Dharwad taluks were selected for conducting trainings on popularization of agricultural tools and technologies for farm women. About 30 farm women, 37 farm women, 33 farm women and 60 farm women were the beneficiaries from the selected villages respectively. Thus the total no. of beneficiaries of these training programmes was 200 farm women. The statistical analysis like Pre test and Post test index score and 't' test were used for analysis of the data. The acceptability of the farm technologies was assessed on three point Likert scale i.e., agree, neutral and disagree.

Results and discussion

Based on the cropping pattern and needs of the farming community, 13 farm technologies were popularized. And they were categorized as per the farm activity. Under sowing and transplanting activity, two technologies namely sapling transplanter and Naveen dibbler were promoted.

Sapplingtransplanter is used for transplanting vegetable seedlings and it increases the work efficiency and reduces drudgery of women.

Fig 1: Sapling transplanter

Naveen dibbler is Used for dibbling bold seeds like maize, soya bean and for gap filling purpose Both the technologies avoids bending posture which is generally adopted in traditional method.

Fig 2: Naveen dibbler

For reducing the drudgery of farm women while performing the weeding activity, two weeding tools namely Saral kurpi and cycle weeder were popularized. These are manually operated gender friendly tools, which increase the work efficiency of the worker.

Fig 3: Cycle weeder

Cycle weeder operates efficiently when the field is slightly irrigated and is for used for inter culture also. It operates efficiently when the field is slightly irrigated.

Fig 4: Cycle weeder

Under harvesting activity, three tools namely, Serrated sickle, Personal Protective Kit and Vegetable trolley were popularized.

Fig 5: Serrated sickle

Fig 6: Protective kit

Fig 7: Vegetable trolley

Serrated sickle is used by both gender for harvesting wheat, rice, jowar and maize. Used for harvesting wheat, rice, jowar and maize. Comfortable handle reduces stress on palm while cutting fodder and ensures safety against arms and hand injuries

Personal protective kit includes hand gloves, apron and a hat. It prevents risks related to agricultural pesticides and harsh sun/cold/rain. Used while harvesting vegetables and other crops. Vegetable trolley reduces the load of carrying harvested vegetables, musculoskeletal problems and postural discomfort of women workers. It is convenient for harvesting and transportation of vegetables.

To reduce the drudgery of farm women while performing post harvest activities, two technologies i.e., Groundnut stripper and mechanized maize sheller developed by AICRP- FRM component and Spiral grain separator were promoted.

Fig 8: Motorized Groundnut stripper

Fig 9: Mechanised Maize sheller

Fig 10: Spiral grain separator

Groundnut stripper is suitable for stripping of immediately harvested groundnut having the moisture content of 18 to 22 per cent. It has proved the excellence in work output with an average stripping rate of 2.64 Q/day as compared with other models and traditional method of hand stripping (0.84 Q/day)

In Mechanized maize sheller Only dehusked cobs can be deshelled with minimum damage of the seeds. Work efficiency is very high (300 Kg/ hour) as compared to traditional method and hand operated maize sheller.

Spiral grain separator is a manually operated and cost-effective machine used for cleaning round shaped grains like green gram, black gram, soya bean, bengal gram can cleaned. It works on the principle of gravitation.

Further three models of Ground nut decorticators were

popularized. The output capacity of CIAE Bhopal model (21 kg / hour) and UAS, Raichur model is 51 kg per hour. The work output of motorized groundnut decorticator is higher (250 kg/hour) as compared to traditional method. The work out of all three models of ground nut decorticators is significantly higher than traditional method.

Fig 11: Sitting type Groundnut decorticator

Fig 12: Small scale motorized groundnut decorticator

Results and discussion

The Socio-Economic status of the selected villages is represented in the Table 1. The results revealed that than more than half percentage (51%) belonged to middle age followed by old age (39.00%) and young age group (10 %). Majority respondents were educated up to primary school (49.00%) followed illiterates (25%), High school (20 %), PUC(5 %) and only meager percentage of the respondents (1%) degree holders. Majority of respondents belonged to nuclear family (74%) followed by joint family (26%). It was interesting to study that majority of the respondents (61%) were living in pukka house followed by kaccha house (39%).

The acceptability of the sowing/dibbling tools by the selected farmers is depicted in Table 2. Regarding the usage of sappling transplanter, cent per cent of the respondents were of the opinion that it is portable, durable, easily available and cost effective and drudgery reducing tool. Meager percentage of the respondents (7 %) were neutral for the statement that it saves time & labour and reduces drudgery. Amruta S. Patil *et al*., 2015 also found the similar facts in their study, which revealed that the performance evaluation of hand held vegetable transplanter was satisfactory for working on the well prepared mulch bed.

Further, the selected respondents agreed that Naveen dibler is portable and durable. Majority of the respondents were neutral for the statement that it is comfortable and convenient to use. This probably because they need time to get acquainted with the use tool. The acceptability of the weeding tools by the selected farmers is shown in Table 3 regarding usage of Saral Kurpi the respondents opined that it is portable, durable and cost effective. Further, they expressed that it increases work efficiency and saves time. The study on par with the results of the study conducted by Hasalkar *et al*., 2004 [8].

Similar opinion was expressed for acceptability of cycle weeder too. THIS finding is supported by the findings of the study conducted by Adetola, O. A., 2019 [1].

The acceptability of the Harvesting tools (Serrated sickle, Vegetable trolley and Personal Protective Kit) is depicted in Table 4. The farm women expressed that serrated sickle is portable, durable, cost effective and convenient to use. The study is in line with the findings of the study conducted by Santosh Ahlawat 2018. who also found that sickle was highly acceptable by the farmers.

Further with respect to the usage of the Personal Protective Kit, cent per cent of the respondents were agreed with all particulars like it is comfortable & convenient to use, Saves time and labour, Drudgery reducing, Portable, Durable, Cost effective and. Similar results were found by Mahesh Maske *et al*., 2020 [4]. His results revealed that ninety per cent of the women labourers expressed that the cotton harvesting bag was more economical and comfortable.

Table 5. Shows that Acceptability of the different groundnut decorticators (CIAE Bhopal model, UAS, Raichur model and Motorized groundnut decorticator) by the selected farmers, The farm women opined that the work out of all three models of ground nut decorticators is significantly higher than traditional method, hence they save time and labour cost. These results are on par with the results of the study conducted by Santosh Ahlawat 2018. who found that decorticators were highly accepted by the farmers.

Similar opinion was expressed by the farm women with respect to other post harvest technologies Shows in Table 6. viz., ground nut stripper and mechanized maize sheller.

The spiral grain separator was highly accepted and appreciated as a labourr saving tool by the famers. The similar results were found by Desai R., 2017 [7] which disclosed that majority of the farm women accepted the spiral grain separator and opined that it a cost effective and drudgery reducing technology.

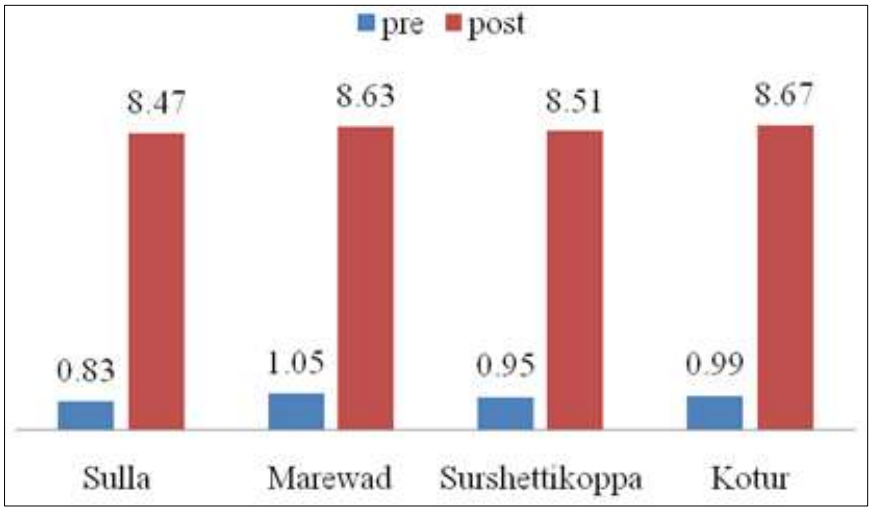
Over all opinion of the farm women regarding popularized improved farm technologies

It is clear from these Tables that majority of the farm women accepted farm technologies and opined that these are gender friendly, drudgery reducing, convenient and comfortable to use. But only with regard to availability of five technologies out of thirteen, namely, Naveen dibbler, Saralkurpi, vegetable trolley, mechanized maize sheller and ground nut decoticators, their opinion was either neutral or disagree. As to purchase these tools order has to be given in advance to respective institutions. Whereas meager percentage of the farm women did not accept the technologies readily as they needed time to accept and get accustomed with new and improved farm technologies

The pre and posttest knowledge scores of farm women regarding improved agricultural tools indicated the significant impact of training programme in gain in knowledge regarding agricultural technologies and tools in respective villages (Fig 1). Similar results were found by Gurupdesh Kaur., 2017 [3] and Desai R., *et al*., 2018 [6]. Therefore, it could be concluded that more number of such training programmes on improved/farmer friendly agricultural tools and technologies may be organized for the benefit of the farm women.

Table 1: General information of the training beneficiaries N =200

Participant	Frequency	Percentage
Age		
Young (<25)	78	39.00
Middle (26-40)	102	51.00
Old (>40)	20	10.00
Education		
Illiterate	50	25.00
Primary school	98	49.00
High school	40	20.00
PUC	10	5.00
Degree	2	1.00
Family type		
Nuclear	148	74.00
Joint	52	26.00
Type of House		
Kaccha house	78	39.00
Pukka house	122	61.00



37.55**, 37.09**, 34.16**, 32.01**
n = 30, n = 32, n = 77, n = 60
**highly significant at 1 %

Fig 1: Pre and posttest knowledge scores of farm women regarding improved agricultural tools, N=200 FW

Table 2: Acceptability of the sowing/dibbling tools by the selected farmers (N=200)

Particulars	Sowing/dibbling tools/technologies					
	Sappling transplanted			Naveen dibbler		
	Agree	Neutral	Disagree	Agree	Neutral	Disagree
Comfortable and convenient to use	188 (94.00)	12 (6.00)	-	92 (46.00)	108 (54.00)	-
Saves time & labour	186 (93.00)	14 (7.00)	-	90 (45.00)	10 (5.00)	-
Drudgery reducing	190 (95.00)	10 (5.00)	-	88 (44.00)	12 (6.00)	-
Portable	200 (100)	-	-	200 (100)	-	-
Durable	200 (100)	-	-	200(100)	-	-
Easily available	200 (100)	-	-	-	58 (29.00)	142 (7100)
Cost effective	200 (100)	-	-	156 (78.00)	44 (22.00)	-
Acceptability of the tool	174 (87.00)	-	-	168 (84.00)	32 (16.00)	-

Table 3: Acceptability of the weeding tools by the selected farmers (N=200)

Particulars	Weeding tools					
	Saral kurpi			Cycle weeder		
	Agree	Neutral	Disagree	Agree	Neutral	Disagree
Drudgery reducing	182 (91.00)	20 (10.00)	-	190 (95%)	10 (5.00)	-
Increases work efficiency and saves time	200 (100)		-	182 (91%)	18 (9.00)	-
Portable	200 (100)	-	-	200 (100%)	-	-
Durable	200 (100)	-	-	200 (100%)	-	-
Easily available	-	-	200 (100%)	200 (100%)	-	-
Cost effective	151 (75.50)	49 (24.50)	-	200 (100%)	173 (86.50)	-
Acceptability of the tool	140 (70%)	60 (30.00)	-	190 (96%)	176 (88.00)	-

Figures in the parentheses indicate percentage

Table 4: Acceptability of the Harvesting tools by the selected farmers (N=200)

Particulars	Harvesting tools								
	Serrated sickle			Vegetable trolley			Personal Protective Kit		
	Agree	Neutral	Disagree	Agree	Neutral	Disagree	Agree	Neutral	Disagree
Comfortable & convenient to use	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Saves time and labour	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Drudgery reducing	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Portable	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Durable	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Easy availability	200 (100)	-	-	-	200 (100)	-	200 (100)	-	-
Cost effective	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Acceptability of the tool	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-

Table 5: Acceptability of the different groundnut decorticators by the selected farmers (N=200)

Particulars	Ground decorticators								
	CIAE Bhopal model			UAS, Raichur model			Motorized groundnut decorticator		
	Agree	Neutral	Disagree	Agree	Neutral	Disagree	Agree	Neutral	Disagree
Comfortable & convenient to use	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Saves time and labour	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Drudgery reducing	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Portable	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Durable	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Easy availability		200 (100)	-	-	-	200 (100)	-	-	200 (100)
Cost effective	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Acceptability of the tool	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-

Table 6: Acceptability of the Post harvest technologies by the selected farmers (N=200)

Particulars	Post harvest technologies											
	Groundnut stripper			Mechanized maize sheller			Spiral grain separator			Groundnut decorticators		
	Agree	Neutral	Disagree	Agree	Neutral	Disagree	Agree	Neutral	Disagree	Agree	Neutral	Disagree
Comfortable and convenient to use	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Saves time and labour	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Drudgery reducing	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Portable	98 (49.00)	60 (30.00)	42 (21.00)	88 (44.00)	60 (30.00)	52 (26.00)	200 (100)	-	-	98 (49.00)	-	-
Durable	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Easy availability	-	-	200 (100)	-	-	200 (100)	200 (100)	-	-	-	-	200 (100)
Cost effective	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-
Acceptability of the tool	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-	200 (100)	-	-

Conclusion

It can concluded from the study that it is essential to empower farm women with scientific knowledge and gender friendly appropriate technologies developed on the principles of ergonomics. Hence, the Government and other agricultural institutions should organize intensive training programmes on use of these farm technologies to promote and popularize them. It should give subsidy on purchase improved farm technologies to hasten the adoptability rate among farming community. It should promote the local fabricators to produce these farm tools in large scale and make them easily available for the farmers/farm women.

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