Impact of extension education on improving knowledge of sustainable technical agricultural practices

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Abstract: Agriculture is considered as a critical sector in the world economy. However, especially in developing countries, agriculture is dominated by small farmers and often fails to achieve its full productive potential. A major problem faced by small farmers is their poor knowledge of sustainable agricultural practices. This study was designed so as to measure the knowledge index of paddy farmers before and after the scientific intervention that was offered to them in India to find out the knowledge index of farmers involved in paddy cultivation and to provide them technical training thereby finding out impact of the training on knowledge level of the farmers. A validated knowledge scale was used to test the knowledge index of 100 farmers before the offering of the scientific support. The knowledge index was found to be extremely low for 55% of farmers (score: 0-18), medium (from 19 to 36) for the 42% of the total sample, whereas only for 3% of the participants the level of knowledge was high (score: 37-55). Scientific intervention was administered to improve farmer's knowledge level regarding improved agricultural practices and latest technologies. Then, a post test was conducted and the knowledge index was calculated. Significant differences were found for knowledge index between pre test and post test for both male (mean difference=31.28) and female farmers (mean difference=33.96). A linear trend was observed in five categories of knowledge for men as well as for women paddy producers. Thus, the results prove the hypothesis that there is an impact of extension education on improving knowledge of sustainable agricultural practices.

Keywords: Knowledge index, improved agricultural practices, impact of extension education

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1 Introduction

Agriculture is considered as a critical sector in the world economy. It contributes 24% of global Gross Domestic Product and provides employment to 22% of world's population (FAOSTATS, 2010). In most of the developing countries agriculture is mainly practiced by small holders for self-consumption of products, serving thereby the food needs of many rural families. Over 80% of arable land is dominated by these small holder farmers and most often do not produce enough. Yield in agriculture production is low, putting at risk the food security.

Paddy (*Oryza Sativa* L.) as a major staple food is vital for the nutrition of much of the population in Asia, as well as in Latin America and the Caribbean and in Africa; it is central to the food security of over half the world's population. Developing countries account for 95% of the total production, with China and India alone responsible for nearly half of the world output (Crawford and Shen, 1998; FAOSTATS, 2001). Paddy is one of the important cereal crops in India which occupies one third of the total cultivated area (Rajanna et al., 2009).

Women play an important role in agriculture. Gender data analysis in the agricultural labour force suggests that women constitute over 32% of the total agricultural labor force in the world. The world wide

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food production contributed by women is 43.88% (FAOSTATS, 2010). In India women carry out as much as 80% of the work in paddy production (Singh et al., 2004; Singh and Tiwari, 2009; Chayal and Dhaka, 2010). Nevertheless evidences throughout the developing countries show that women's farming knowledge and skill levels remain very low. Women agricultural workers occupy very low positions in the agrarian hierarchy. Key reasons are the lack of technical advice they received on production and marketing, cultural practices and skills related to training in farming technologies and socio-economic factors. No worthwhile change is possible without considering gender issues and without women and men accepting the change. So long as gender is an important indicator of economic, social and political roles, there will be a need for special policies targeted at rural men as well as women equally for education and training, technology transfer and credit (Rizwana and Paris, 2009).

With the increasing sophistication of science, it is necessary for farmers to understand the risks and benefits associated with those scientific advancements which are central to the increasing and sustained agricultural production. Amongst the numerous problems confronting small holder farmers are poor agricultural practices and management, injudicious use of fertilisers, inadequate plant protection practices, ignorant of post harvest management and negligible use of latest technologies / drudgery reduction aspects. This was also supported by the studies conducted by Hosseini et al. (2011), Lagat et al. (2008), Theodor (2001), Singh et al. (2009), Osabnomen and Okoedo (2011), Okoedo and Aphunu (2011) and Kirby (2002).

Agricultural information is of central importance in enhancing agricultural productivity, facilitating poverty alleviation and rural urban-migration among rural youth. Sustainability is a key issue for economic security in the longer term, and depends on many interacting factors both within and outside the tasks of crop production (Twomlow et al., 2008). Sustainability is a key issue for economic security in the longer term, and depends on many interacting factors both within and outside the tasks of crop production (Steve et al., 2001). The success in promoting rapid improvements in livelihoods and food security through on-farm investments depends on small-scale farmers having good access to relevant knowledge. This requires the provision of effective knowledge-generation and dissemination systems, aiming to strengthen links among farmers, agricultural educators, researchers, and extension workers.

Therefore, to achieve this goal and keep all aforesaid mentioned facts in view, the present study was carried out in India to find out the knowledge level index of male as well as female farmers involved in paddy cultivation and to provide them extension education thereby finding out impact of the extension education on knowledge level of the farmers.

2 Materials and methods

2.1 Research design

The study was carried out as a descriptive and exploratory research. The descriptive character of this research was dictated from the survey's purpose, as the main aim was to accurately describe a situation (the level of farmers' knowledge) and to test the associations between variables (Singh, 2000). The exploratory research design was chosen as it describes, explores, records, analyzes and interprets conditions that exist. This type of research involves some type of comparison or contrast and attempts to discover relationships between existing non-manipulated variables. It also describes, what will happen when certain variables are carefully controlled or manipulated (Kothari, 1990). The data were collected in pre test and post test design to find out knowledge gain after extension education programme. The extension education programme encompasses a package of awareness generation programme, skill development training, method and result demonstration, group discussions regarding sustainable agricultural practices of paddy cultivation in a formal setting.

The extension education programme was progressed from the awareness generation in a mass selected from village collectively for men and women farmers regarding the sustainable agricultural practices. Then, who are paddy growers and shown their keen interest regarding the subject were selected and it came out to be

50 men farmers and 50 women farmers those who were growing paddy or related directly or indirectly to the paddy growing process. The process of selecting the sample is described in detail in the next section 2.2. Pre test of each selected farmers was carried out on the developed instrument (Section 2.3). An extension education programme then conducted which was comprised of skill development training, method and result demonstration, group discussion to provide an intense, deeper and wider knowledge of subject sustainable agricultural practices of paddy cultivation in a formal setting.

2.2 Selection of sample

Random sampling design was used to select a sample of male ($n_1 = 50$) and female paddy growing farmers ($n_1 = 50$) from marginal and small (2.5 - 5.0 acres) category of farmers in northern India. The sample size was equally selected because female farmers are also an indispensable part of crop production system in India but their literacy rate and participation in awareness programs are significantly lower compared with that of male farmers. Therefore, an equal sample from each sex was selected to make the knowledge level comparable.

2.3 Development of instrument

A personal interview schedule was used to collect the data. It was comprised of two parts viz. General information (name, age, village, literacy level, crops grown, land holding size, etc.) and Knowledge scale to find out knowledge index of farmers regarding sustainable agricultural practices and management, fertilizer use and efficiency, plant protection practices, post harvest management and latest technologies / drudgery reduction aspects in paddy cultivation. Knowledge test used in the measurements of knowledge level proved to be useful in a variety of research problems. The objective of determining level of knowledge of the respondents requires a standardized knowledge test. For quantitative measurements the concept of scaling method is mostly used. The level of knowledge of the respondents is determined in terms of whether they possess good, medium or low knowledge. This is measured by giving scores to answers for each item in the test and by addition of the scores for each respondent. The reliability of the knowledge test calculated was 0.78.

2.4 Data analysis procedure

The data collected on the developed instrument were analyzed by using SPSS (Statistical Package for Social Sciences). The data were tabulated, categorized and summarized by calculating mean, %age and standard deviation. Overall knowledge level of farmers was calculated using categorization of their score on knowledge test as low (0-18), medium (19-36) and high (37-55). The knowledge index was calculated by using the following formula:

$$\text{Knowledge index} = \frac{\text{Number of correct responses}}{\text{Total number of knowledge items}} \times 100$$

The data collected in the pre test and post test sampling for male as well as female farmers were compared by using various statistical analysis methods like tabulation, graphical representation, mean, percentage, f-test and t-test. Inferences were thus drawn to sum up the impact of technical training on improving knowledge regarding sustainable agricultural practices of paddy cultivation.

3 Results and discussion

3.1 Knowledge level of paddy growing farmers

For sustainable cultivation of any crop, first and foremost requirement is enough knowledge of technical agricultural practices required to grow, harvest and trade that crop efficiently. Therefore, one aspect to test the knowledge level of farmers was taken as knowledge regarding improved technical agricultural practices and management in paddy cultivation. The scale encompasses of 13 statements as depicted in Table 1a. Comparatively, low number of farmers showed knowledge of area required to raise the nursery for one hectare (12%), spacing between rows in nursery (32%), number of plants / square meter in bushening (4%). But, the farmers showed a marked improvement in knowledge regarding all the aspects of improved technical agricultural practices and management.

The data showed that before scientific intervention only 64.30% male farmers and 40.50% female farmers had knowledge of improved technical agricultural practices and management in paddy cultivation, whereas, after scientific intervention their knowledge level raised to a level of 84.30% and 56.90% for male and female farmers respectively. There is a difference in knowledge level of male and female in pre test as well as post test.

Table 1a Knowledge level of paddy growing farmers regarding improved technical agricultural practices and management in paddy cultivation

S. No.	Item	Before intervention (Pre test)			After intervention (Post test)		
		Male	Female	Total	Male	Female	total
1	Improved variety	40 (80.0)	40 (80.0)	80	49 (98.0)	43 (86.0)	92
2	Seed rate	48 (96.0)	35 (70.0)	83	48 (96.0)	41 (82.0)	89
3	Time of sowing/ nursery raising	49 (98.0)	29 (58.0)	78	49 (98.0)	43 (86.0)	92
4	Area required to raise the nursery for one hectare	10 (20.0)	2 (4.0)	12	39 (78.0)	5 (10.0)	44
5	Spacing between rows in nursery	17 (34.0)	15 (30.0)	32	31 (62.0)	29 (58.0)	60
6	Age of seedlings at the time of transplanting	40 (80.0)	30 (60.0)	70	50 (100)	46 (92.0)	96
7	Plant to plant distance in the main field	48 (96.0)	29 (58.0)	77	50 (100)	42 (42.0)	92
8	Number of plants/square meter in bushening	2 (4.0)	2 (4.0)	4	18 (36.0)	11 (22.0)	29
9	Water level to be maintains in the field	25 (50.0)	3 (6.0)	28	39 (78.0)	12 (24.0)	51
10	Application of zinc sulphate or single super sulphate in three years	20 (40.0)	9 (18.0)	29	35 (70.0)	13 (26.0)	48
11	Weeding interval	33 (66.0)	8 (16.0)	41	41 (82.0)	15 (30.0)	56
12	Proper irrigation during tillering stage	41 (82.0)	25 (50.0)	66	49 (98.0)	28 (56.0)	77
13	Draining water from the fields 10-15 days before harvesting	45 (90.0)	36 (72.0)	81	50 (100)	42 (84.0)	92
	Mean	32.15 (64.3)	20.23 (40.5)	52.38	42.15 (84.3)	28.46 (56.9)	70.62
	Standard deviation (S.D.) ±	15.76 (31.5)	14.13 (28.3)	28.77	9.75 (19.5)	15.28 (30.6)	23.30

It is evident from the Table 1b that the test on knowledge of fertiliser use and efficiency in paddy cultivation was comprised of ten statements. In the pre test male farmers were having 58.4% of knowledge, whereas, female farmers were having 16.8% knowledge which was raised to a level of 82.80% and 53.8% for male and female farmers, respectively. Before scientific intervention the farmers showed a satisfactory knowledge regarding application of nitrogenous fertilizer in split doses (68%), application of potash fertiliser as a basal dose in single application (63%) and ill effects of regular use of granular fertiliser (51%). The enhancement in knowledge was shown for all the other aspects except zinc sulphate for nursery (37%) and leaf colour chart for fertiliser deficiency (42%).

Table 1b Knowledge level of paddy growing farmers regarding fertiliser use and efficiency in paddy cultivation

S. No.	Particulars	Before intervention (Pre test)			After intervention (Post test)		
		Male	Female	Total	Male	Female	total
1	Soil testing to know about nutritional status of soil	20 (40.0)	3 (6.0)	23	50 (100)	45 (90.0)	95
2	FYM application in nursery	35 (70.0)	5 (10.0)	40	41 (82.0)	22 (44.0)	63
3	Zinc sulphate for nursery	15 (30.0)	2 (4.0)	17	23 (46.0)	14 (28.0)	37
4	Application of ammonium sulphate/urea in one acre of nursery when plant turns yellow	25 (50.0)	2 (4.0)	27	37 (74.0)	26 (52.0)	63
5	Application of nitrogenous fertilizer in split doses	46 (92.0)	22 (44.0)	68	49 (98.0)	38 (76.0)	87
6	Application of potash fertilizer as a basal dose in single application	45 (90.0)	18 (36.0)	63	49 (98.0)	34 (68.0)	83
7	Increasing urea efficiency by adding neem	28 (56.0)	9 (18.0)	37	48 (96.0)	15 (30.0)	63
8	Benefits of potash application	35 (70.0)	12 (24.0)	47	49 (98.0)	16 (32.0)	65
9	Ill effects of regular use of granular fertilizer	40 (80.0)	11 (22.0)	51	45 (90.0)	40 (40.0)	85
10	Leaf colour chart for fertilizer deficiency	3 (6.0)	0 (0.0)	3	23 (46.0)	19 (38.0)	42
	Mean	29.20 (58.4)	8.40 (16.8)	37.60	41.40 (82.8)	26.90 (53.8)	68.30
	S.D. ±	13.77 (27.6)	7.38 (14.8)	20.52	10.54 (21.1)	11.48 (22.97)	19.22

In the Table 1c eleven different aspects of plan protection practices in paddy cultivation were included so that an overview of farmer's knowledge about protection of their paddy crop against pests, insects and disease could be analyzed. The data delineated that about half of the farmers showed about 50%-55% of knowledge for time of application of herbicides, knowledge about friendly insects and application of pesticides or insecticides in the evening instead of morning. But an insufficient level of knowledge was shown in most of the farmers for seed treatment (41%), application of nitrogenous fertilizer after pest control (36%), application of herbicide with urea or sand (29%), control of rat infestation in fields (44%), use of light trap (20%), after flowering application of pesticides / insecticides in the evening instead of morning (36%), pest control (26%) and disease control (27%) in concurrence to the results of Salameh et. al. 2004. It is evident from the data in the Table 1c that the female farmers showed a poorer level of knowledge than the male farmers. But, this level was raised to an acceptable number of farmers after scientific intervention for all the mentioned aspects for proper plant protection of paddy crop. The level depicted a satisfactory increase of 63.27% after extension education.

Table 1c Knowledge level of paddy growing farmers regarding plant protection practices in paddy cultivation

S. No.	Particulars	Before intervention (Pre test)			After intervention (Post test)		
		Male	Female	Total	Male	Female	total
1	Seed treatment	35 (70.0)	6 (12.0)	41	40 (80.0)	38 (76.0)	78
2	Application of nitrogenous fertilizer after pest control	25 (50.0)	11 (22.0)	36	45 (90.0)	12 (24.0)	57
3	Time of application of herbicides	40 (80.0)	11 (22.0)	51	40 (40.0)	13 (26.0)	53
4	Application of herbicide with urea or sand	26 (52.0)	3 (6.0)	29	47 (94.0)	22 (44.0)	69
5	Control of rat infestation in fields	33 (66.0)	11 (22.0)	44	49 (98.0)	17 (34.0)	66
6	Knowledge about friendly insects	37 (74.0)	13 (26.0)	50	46 (92.0)	25 (50.0)	71
7	Use of light trap	11 (22.0)	9 (18.0)	20	35 (70,0)	24 (48.0)	59
8	After flowering application of pesticides / insecticides in the evening instead of morning	25 (50.0)	11 (22.0)	36	39 (78.0)	13 (26.0)	52
9	Application of pesticides/ insecticides in case of rain within three hours of spraying	40 (80.0)	15 (30.0)	55	50 (100)	38 (76.0)	88
10	Pest control	23 (46.0)	3 (6.0)	26	38 (76.0)	13 (26.0)	51
11	Disease control	25 (50.0)	2 (4.0)	27	40 (80.0)	12 (24.0)	52
	Mean	29.09 (58.2)	8.64 (17.3)	37.73	42.64 (85.3)	20.64 (41.27)	63.27
	S.D. ±	8.80 (17.6)	4.43 (8.9)	11.51	4.95 (9.9)	9.86 (19.7)	12.23

Post harvest management is a very important area of any crop production because every year the post harvest losses in India are 40%-45% on aggregate of the crops which result in huge economic losses. The Table 1d delineated that the farmers had only knowledge about storage and losses (46%) and it was only limited analysing a single cause the rodents which they tried to overcome by control of rat infestation in their stores (56%). However, they showed a very poor knowledge regarding other eminent causes responsible for post harvest losses like moisture content (0%), weight loss during storage (3%), drying rate (3%), % increase in broken grain (1%), milling techniques and losses (10%) and proper pest control (17%). There was not a noticeable difference between the knowledge level of male farmers probably because post harvest management rests as the responsibility of female farmers predominantly. Besides, the scientific intervention resulted in enhancement of the knowledge of male farmers (26%) along with the female farmers (23.44%) satisfactorily.

The low productivity of small holder farming systems and enterprises is attributed mainly to the limited resources of farming households and to the application of inappropriate skills and Practices that can lead to land, human and other natural resources (Steve et al., 2002). The data in Table 1e depict a scanty knowledge regarding latest technologies / drudgery reduction practices in paddy cultivation by the selected paddy growers viz., use of flat fan nozzle (3%), disc harrow or rotavators for tillage (2%), precision levellers for efficient water use (2%), paddy transplanters (6%), combines for mechanical harvesting (12%), seed drills for direct seeded rice (2%), SRI (System of Rice Intensification) technique (2%), zero tillage technique (11%), paddy threshers (20%), drum seeders (1%), occupational health hazards (3%) and postural stress of paddy cultivation (0%). Moreover, a drastic shift in their knowledge was found after scientific intervention in case of use of flat fan nozzle (35%), disc harrow or rotavators for tillage (53%), precision levellers for efficient water use (32%), paddy transplanters (82%), combines for mechanical harvesting (84%), seed drills for direct seeded rice (42%), SRI (System of Rice Intensification) technique (50%), zero tillage technique (45%), paddy threshers (68%), drum seeders (62%), occupational health hazards (0%) and postural stress of paddy cultivation (59%), respectively. It delineates that latest technologies and drudgery reduction technologies are a matter of concern for the farmers as well as the researchers.

Table 1d Knowledge level of paddy growing farmers regarding post harvest management of paddy cultivation

S. No.	Particulars	Before intervention (Pre test)			After intervention (Post test)		
		Male	Female	Total	Male	Female	total
1	Average and standard deviation of moisture content before and after drying	0 (0.0)	0 (0.0)	0	13 (26.0)	13 (26.0)	26
2	Total weight loss of paddy	3 (6.0)	0 (0.0)	3	12 (24.0)	10 (20.0)	22
3	Drying rate	3 (6.0)	0 (0.0)	3	13 (26.0)	13 (26.0)	26
4	% increase in broken grain	1 (2.0)	0 (0.0)	1	22 (44.0)	19 (38.0)	41
5	% increase in cracked grain	1 (2.0)	0 (0.0)	1	17 (34.0)	17 (34.0)	34
6	Milling techniques and losses	8 (16.0)	2 (4.0)	10	25 (50.0)	24 (48.0)	49
7	Storage and losses	41 (82.0)	5 (10.0)	46	48 (96.0)	45 (90.0)	93
8	Control of rat infestation in storage	37 (74.0)	19 (38.0)	56	46 (92.0)	45 (90.0)	91
9	Pest control	13 (26.0)	4 (8.0)	17	38 (76.0)	25 (50.0)	63
	Mean	11.89 (23.8)	3.33 (6.7)	15.22	26.00 (52.0)	23.44 (46.9)	49.44
	S.D. ±	15.93 (31.9)	6.18 (12.4)	21.14	14.40 (28.8)	13.19 (26.4)	27.32

Table 1e Knowledge level of paddy growing farmers regarding technology / drudgery reduction practices in paddy cultivation

S. No.	Particulars	Before intervention (Pre test)			After intervention (Post test)		
		Male	Female	Total	Male	Female	total
1	Use of flat fan nozzle	3 (6.0)	0 (0.0)	3	24 (48.0)	11 (22.0)	35
2	Disc harrow or rotavators for tillage	2 (4.0)	0 (0.0)	2	30 (60.0)	23 (46.0)	53
3	Precision levellers for efficient water use	2 (4.0)	0 (0.0)	2	17 (34.0)	15 (30.0)	32
4	Paddy transplanters	5 (10.0)	1 (2.0)	6	40 (80.0)	42 (84.0)	82
5	Combines for mechanical harvesting	9 (18.0)	3 (6.0)	12	48 (96.0)	36 (72.0)	84
6	Seed drills for direct seeded rice	2 (4.0)	0 (0.0)	2	22 (44.0)	20 (40.0)	42
7	SRI (System of Rice Intensification) technique	2 (4.0)	0 (0.0)	2	25 (50.0)	25 (50.0)	50
8	Zero tillage technique	11 (22.0)	0 (0.0)	11	20 (40.0)	25 (100)	45
9	Paddy threshers	15 (30.0)	5 (10.0)	20	33 (66.0)	35 (70.0)	68
10	Drum seeders	1 (2.0)	0 (0.0)	1	32 (64.0)	30 (60.0)	62
11	Occupational health hazards of paddy cultivation	3 (6.0)	0 (0.0)	3	35 (70.0)	35 (70.0)	70
12	Postural stress of paddy cultivation	0 (0.0)	0 (0.0)	0	29 (58.0)	30 (60.0)	59
	Mean	4.58 (9.2)	0.75 (1.5)	5.33	29.58 (59.2)	27.25 (54.5)	56.83
	S.D. ±	4.62 (9.2)	1.60 (3.2)	5.99	8.82 (17.6)	9.17 (18.3)	17.10

3.2 Overall Knowledge level of paddy growing farmers regarding improved practices of cultivation

Based on the score of ‘one’ to a correct response and ‘zero’ for incorrect response then by summing up the scores on all knowledge items the total score for each respondent was computed. The maximum and minimum score obtainable for each respondent was 55 and 0 respectively. The total score for each respondent paved a way to categorize them into three categories of low (0-18), medium (19-36) and high (37-55) level as clearly mentioned in the Table 2. Before scientific intervention most of the male farmers pursued a medium category of knowledge (80%) followed by low level (14%) and then high level (6%) of knowledge index. On the other hand, female farmers mostly fell under the category of low level (96%) and very few under the medium level (4%) index. The trend was found different for the knowledge index after the scientific intervention. Most of the male farmers (70%) showed a shift towards high level of knowledge index whereas most of the female farmers (54%) shifted to medium level of knowledge index.

Table 2 Overall knowledge level of paddy growing farmers regarding improved practices of paddy cultivation

Respondents	Category of knowledge		
	Low (0-18)	Medium (19-36)	High (37-55)
Before Intervention			
Male farmers	7 (14.00)	40 (80.00)	3 (6.00)
Female farmers	48 (96.00)	2 (4.00)	0 (0.00)
Total	55 (55.00)	42 (42.00)	3 (3.00)
After Intervention			
Male farmers	0 (0.00)	15 (30.00)	35 (70.00)
Female farmers	13 (26.00)	27 (54.00)	10 (20.00)
Total	13 (13.00)	42 (42.00)	45 (45.00)

3.3 Comparison in knowledge level of paddy growing male and female farmers

An effort was made to find out that whether the knowledge level of farmers before and after the scientific intervention has its significant impact or not. The t values [12.59 (male farmers) and 6.61(female farmers)] in the Table 3 clearly permeates the aforesaid mentioned statement that there is a significant difference in the knowledge level of males farmers as well as female farmers involved in paddy cultivation, when they are imparted with awareness and skill development programmes for enhancement in their knowledge. A significant difference was found for knowledge level index in pre test [male farmers (mean; 42.12, S.D. ± 84.76) as well as for female farmers (mean; 17.51, S.D. ± 97.07)] and post test [male farmers (mean; 73.40, S.D. ± 222.27) as well as for female farmers (mean; 51.47, S.D. ±428.27)] at $p \leq 0.05$. The Figure 1 depicts a linear trend in all five categories of knowledge for male as well as female farmers. A positive correlation was found in male (r = 1) and female (r = 0.78) farmers before as well as after scientific intervention.

Table 3 Comparison in knowledge index level of farmers (Male Vs Female) regarding improved technical agricultural practices of paddy cultivation before and after scientific intervention ($p \leq 0.05$)

Particulars	Knowledge Index Level Test			
	n, df	Pre-test (Mean, S.D.)	Post-test (Mean, S.D.)	t-test value
Male farmers	50, 48	42.12 (±84.76)	73.40 (±222.27)	12.59*
Female farmers	50, 48	17.51 (±97.07)	51.47 (±428.27)	6.61*

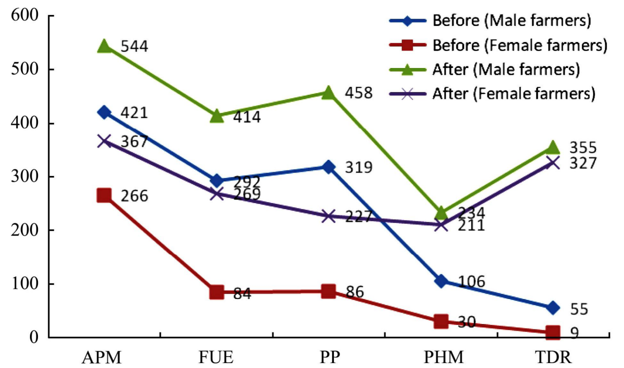

Figure 1 Knowledge level of paddy growing farmers (male and female) regarding improved technical agricultural practices of paddy cultivation

3.4 Difference in knowledge level of paddy growing farmers before and after scientific intervention

Table 4 provides an evidence of impact of extension education imparted to the farmers on various aspects of improved agricultural practices required for paddy cultivation leading towards optimum utilization of resources and better production. The f values clears that a significant difference was found in knowledge index level of male farmers was there for technical agricultural practices and management (f = 0.56, p<0.05), fertiliser use and efficiency (f = 1.00, p<0.05), plant protection practices (f = 1.41, p<0.05) and post harvest management (f = 0.13, p<0.05).

The Figure 2 also supported the data calculated for the significance of difference in knowledge level of male famers before and after scientific intervention regarding improved technical agricultural practices in paddy cultivation.

Table 4 Difference in knowledge index level of male farmers regarding improved technical agricultural practices of paddy cultivation before and after scientific intervention ($p≤0.05$)

S. No.	Aspects	Knowledge Index Level Test			
		n, df	Pre-test (Mean, S.D.)	Post-test (Mean, S.D.)	f value
1	echnical agriculture ractices & management	50, 48	8.48 (±1.44)	10.82 (±2.56)	0.56*
2	Fertiliser use and efficiency	50, 48	5.88 (±2.31)	8.24 (±2.30)	1.00*
3	Plant protection practices	50, 48	6.38 (±6.85)	9.16 (±4.83)	1.41*
4	Post harvest management	50, 48	1.92 (±0.85)	4.88 (±6.23)	0.13*
5	Technology/drudgery reduction	50, 48	4.88 (±6.23)	0.82 (±1.25)	4.97**

Note: * Significant at one tail ** Significant at two tail.

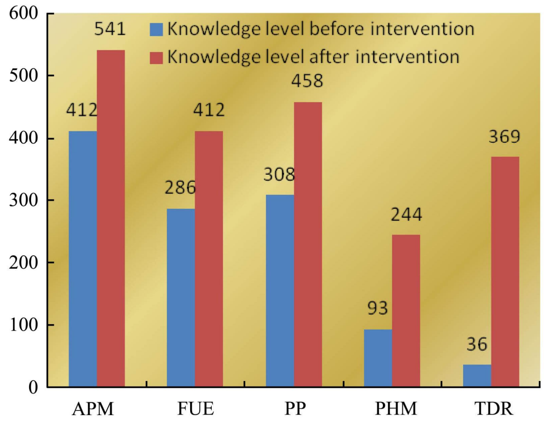

Figure 2 Knowledge level of paddy growing farmers (Male) regarding improved technical agricultural practices of paddy cultivation before and after scientific intervention

The f values in Table 5 compares knowledge level of female farmers before and after scientific intervention regarding improved technical agricultural practices in paddy cultivation. A significant difference was found in knowledge index level of female farmers was there for technical agricultural practices and management (f = 1.05, p<0.05), fertiliser use and efficiency (f = 0.35, p<0.05), plant protection practices (f = 0.82, p<0.05), post harvest management (f = 0.12, p<0.05) and technologies / drudgery reduction (f = 0.01, p<0.05). The Figure 3 also provides evidences in the data calculated for the significance difference for knowledge level of female famers before and after scientific intervention regarding improved technical agricultural practices in paddy cultivation.

Table 5 Difference in knowledge index level of female farmers regarding improved technical agricultural practices of paddy cultivation before and after scientific intervention ($p≤0.05$)

S. No.	Aspects	Knowledge Index Level Test			
		n, df	Pre-test (Mean, S.D.)	Post-test (Mean, S.D.)	f value
1	echnical agriculture practic : management	50, 48	5.39 (±6.49)	7.37 (±6.15)	1.05*
2	Fertiliser use and efficiency	50, 48	1.71 (±2.04)	5.45 (±5.79)	0.35*
3	Plant protection practices	50, 48	1.76 (±7.31)	4.10 (±8.82)	0.82**
4	Post harvest management	50, 48	0.59 (±0.54)	4.26 (±4.24)	0.12*
5	Technology/drudgery reduction	50, 48	0.18 (±0.15)	6.63 (±10.07)	0.01*

Note: * Significant at one tail ** Significant at two tail.

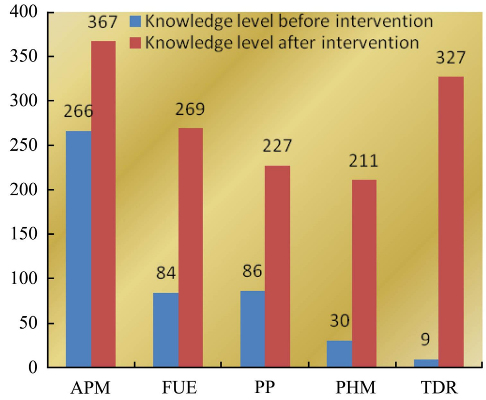

Figure 3 Knowledge level of female paddy growers regarding improved technical agricultural practices of paddy cultivation before and after scientific intervention

4 Conclusion

The farmers reported a higher level of knowledge gain after the extension education than the knowledge index level before the extension education imparted for technical agricultural practices and management regarding sustainable technical agricultural practices of paddy cultivation.

The level of knowledge shows a drastic knowledge gap between male paddy growers and female paddy growers before the extension education in the areas related to plant protection practices, post harvest management as well as technology / drudgery reduction practices in paddy cultivation which was significantly reduced after the extension education.

The extension education proved to be having its positive impact on knowledge level of farmers. Therefore, farmers should be provided ample opportunities to participate in such kind of scientific intervention programmes, which can enhance their knowledge and skills thereby increasing sustainable food security and agricultural production.

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