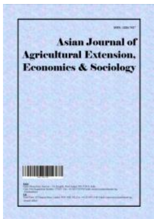

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Adoption Outcomes of Krishi Vigyan Kendra, Central Research Institute for Dryland Agriculture Technologies by Farmers in South India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors contributed the intellectual input, assistance to this study and manuscript preparation. Author KRS is the PI of the research project. Authors KRS, GN, KN and BMKR selected variables and developed the questionnaire based on study objectives. Authors KRS and KS collected the review of literature. Authors KRS and SVK collected the data. Authors PKP and JS performed data analysis and tabulation. Author KRS wrote the paper with editing done by author GRC. All authors read and approved the final manuscript.

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ABSTRACT

Rainfed areas are subjected to climate change through extreme weather events, decrease of water availability and decrease in agricultural productivity. The problem to be addressed is the limited access to and exchange of, information and knowledge related to agriculture and food security at local, national, and regional levels. Krishi Vigyan Kendras (KVKs) act as a crucial player in technology assessment, refinement and demonstration. Technology adoption to be successful depends on successful technology assessment, refinement and demonstration. Hence, the role of KVKs is of paramount importance in the above processes. KVK Rangareddy district of Telangana state (South India) is attached to the Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad. The study was conducted in three KVK adopting villages' of Pudur mandal, Rangareddy

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district, Telangana state. The objectives of the study are to assess the extent of adoption of KVK technologies, factors affecting and constraints in adoption; to assess the impact of KVK technologies in terms of improved productivity in crops, livestock, income levels of farm women; and to assess the gain in knowledge levels. A sample of 40 farmers each from adopting and non-adopting categories in the same villages was selected for data collection, thus, making a total sample of 240 farmers. The data was collected using a pre-tested interview schedule from the farmers. Focus group discussion and interviews were conducted to elicit data. Data was analysed using descriptive statistics (frequencies and percentages) and inferential statistics (correlation, multiple linear regression and adoption indices). Final data was averaged from the three villages both for adopting and non-adopting category of farmers and presented. More than 60% adoption was recorded for production technology and stem borer management in maize; spacing and fertilizer management in cotton; and demonstration of perennial fodder hybrid Bajra Napier CO-4 etc. T-test scores showed significant higher mean values for adopters over non-adopters except in the case of the variable age. Adopters had better knowledge and adoption rates over non-adopters. Productivity of farmers increased between 33-57% with KVK technologies. Income levels of farm women increased three to four times based on the enterprise after adoption. Farmers' adoption of technologies requires more concerted efforts in establishing mechanisms and traits including readiness of availability, ease of use, low cost, low labor requirement and time requirements of different technologies and their components. The adoption results of KVK technologies/interventions in case of non adopting category of farmers were found to be meager.

Keywords: KVK; CRIDA; technologies; adoption; adopters; non-adopters.

1. INTRODUCTION

Rainfed areas are generally endowed with fragile resource base and low productivity. Majority of the inhabitants are resource-poor and are obliged to eke out an existence in harsh biophysical and socio-economic environments. They are subjected to climate change through extreme weather events, decrease of water availability and decrease in agricultural productivity. The problem to be addressed is the limited access to and exchange of, information and knowledge related to agriculture and food security at local, national, and regional levels. The productivity improvements in rainfed areas shall be achieved through adoption of established technologies by farmers. This can be done by supporting efforts of researchers, extensionists and farmers working in rainfed areas through increased knowledge exchange and sharing [1,2]. The objectives of the study are to assess the extent of adoption of KVK technologies, factors affecting and constraints in adoption; to assess the impact of KVK technologies in terms of improved productivity in crops, livestock, income levels of farm women; and to assess the gain in knowledge levels.

1.1 Adoption of Technologies

Adoption is, "the mental process an individual passes from first hearing about an innovation to final adoption" [3]. It is always an individual decision process. Feder, et al. [4] describe technology adoption as a multistage process the decision maker undergoes from the time they get exposed to the technology (become aware of its existence) through to the time that they decide to start using the technology. Central to the adoption decisions is the role of information about the technology. Information and learning are argued to be central to the adoption process. Among other factors, whether to adopt a technology or not depends on the profitability of the technology, farmer education/learning, and other observed and unobserved differences among farmers and across farming systems [5]. Risk aversion discourages adoption, as uncertainty will always be greater for the new technology than for the old [6]. Risk is a major factor limiting the adoption of new innovations [7,8,9]. For a new technology to be successful, extension efforts and training /trailing of the technology need to be in place, and the needed inputs must be procured. Designing technologies that can be implemented by households with labor and land constraints, notably correlated with poorer households, is a continuous need of extension programs [10]. Extension, promotion and marketing programs by government workers and/or the private sector can be positively related to adoption [11,12]. Reasons for non-adoption of dryland agricultural technologies were discussed at length and are: irregular and inadequate rains, inadequate finance, non-availability of inputs, lack of improved implements, high cost and complexity of certain practices and lack of guidance [13,14]. The adoption of improved technology seems to be influenced by many factors, ranging from environmental factors, farmer type and the methods used by extension agents, to socioeconomics [15]. Age, farming experience were found to be non significant; while education, annual income were positively and significantly related to the adoption of improved agricultural practices of dryland farmers in the Bellary district of Karnataka [16]. Farm size was positively and significantly related to the adoption of recommended dryland agricultural technologies of dryland farmers in Aurangabad district of Maharashtra [17].

1.2 Prologue of CRIDA and KVK

Central Research Institute for Dryland Agriculture (CRIDA) is a National Research Institute was established in 1985 under Indian Council of Agricultural Research (ICAR), Department of Agriculture Research & Education (DARE), Ministry of Agriculture & Farmers Welfare, New Delhi, India.

The mandate of the Institute is to conduct:

1. Basic and applied research for sustainable and climate resilient agriculture in rainfed areas.
2. Co-ordinate network research for generating location-specific technologies in rainfed areas.
3. Capacity building programmes for different stakeholders on natural resource management in drylands.

ICAR-CRIDA and Department of Agriculture and Cooperation, Ministry of Agriculture & Farmers' Welfare, along with State Agricultural Universities (SAUs), ICAR Institutes and KVKs prepared District Agricultural Contingency plans (DACs) for 650 districts in the country. All India Coordinated Research Programmes (AICRPs) of ICAR on Dryland Agriculture and Agrometeorology are in CRIDA generating location specific technologies as well as acting as Nodal point for the National Innovations in Climate Resilient Agriculture (NICRA). NICRA is being implemented at large number of Research Institutes of ICAR, State Agricultural Universities and 121 Krishi Vigyan Kendras (KVKs). Under Technology Demonstration component of NICRA, 151 Climate resilient villages were developed to enhance productivity, income and adaptive capacity of farmers.

Krishi Vigyan Kendra (KVK) Rangareddy district was established in 1977. It is attached to the Central Research Institute for Dryland Agriculture (CRIDA) Hyderabad. The main objectives of KVK are:

1. To transfer the latest agricultural technology to the practicing farmers, farmwomen, rural youth and field level extension functionaries through need based, skill-oriented training on the basis of work experience, following the principles of 'learning by doing' and 'teaching by doing'.
2. To demonstrate the worth of improved farm technologies on farmer's fields through conducting Frontline Demonstrations (FLDs) on various mandatory crops of the district.
3. To test and verify the technologies in the socio-economic conditions of the farmers through on-farm trials with a view to finding out the technologies that are suited to the micro-farming situation.
4. To create awareness and popularizing improved farm technologies through Field Days, film shows, exhibitions, Farmers Days, study tours etc.
5. To develop close functional linkages between various district / state level development departments and institutions, NGOs, credit organizations and rural people for quicker transfer of technology through operating collaborative programs.

2. MATERIALS AND METHODS

The study was conducted in three villages' viz., Mirzapur, Kandlapally and Yenkepally (KVK adopting villages during 2011-2014) of Pudur mandal of Rangareddy district of Telangana characterized by both red and black soils. In each of the above three villages around 400 total households are present. Each household represents one farmer for our study purpose. Out of this, 10% i.e., 40 farmers were treated as adopter farmers and were exposed to KVK technologies/interventions. For ease of comparison, another 10% farmers unexposed to KVK technologies/interventions were taken as non-adopter category. A sample of 40 farmers each from adopting and non-adopting categories in the same villages was selected for data collection. Thus, a sample of 240 farmers i.e., 80 from each village (by 3 villages) was selected for data collection. Data were collected from the adopting and non-adopting category of farmers' in the above villages after time lapse of 4 years from adoption period to have a true picture of adoption status of different technologies. Primary quantitative data was collected using a pre-tested structured household survey questionnaire from the adopting and non-adopting category of farmers. Focus group discussions and structured interviews were conducted with the adopting and non-adopting category of farmers to generate qualitative data. Descriptive statistics (frequencies and percentages) and inferential statistics (correlation, multiple regression and adoption indices) were used for data analysis. T-test was used to determine if there is a significant difference between the means of two groups (here adopters and non-adopters). Adoption index was derived by the formula,

$$\text{Adoption index} = \frac{\sum_{i=1}^{k} X_i}{K},$$

where Xi is score on i^{th} technology,
K is the number of technologies

Final data was averaged from the three villages both for adopting and non-adopting category of farmers and presented ($p<0.05$). Adoption and Knowledge were the dependent variables while, Age, Education, Family size, Farming experience, Annual Income, Land holding, Farm power, Livestock possession, Mass media exposure and Extension contact were the independent variables. These socio-economic variables for the present study had been selected after extensive review of literature and after examining their relevance, and in consultation with experts and various sources of information.

3. RESULTS AND DISCUSSION

3.1 Socio-demographic Characteristics of Study Respondents

From the selected adopting farmers' (n=40), 70 % were above the age of 40 with 65% having land holdings below three acres. 55% had no formal education; 62% had less than 30 years of farming experience; 42% had an annual income below Rs.25,000/- and 35% had an annual income ranging between Rs.25,000-40,000/-.The main crops in the village were paddy, cotton, maize, sorghum, pigeon pea and vegetables. With regard to age, similar results were reported by Dhayal and Mehta [18,19,20] in their studies that majority of the farmers who adopting different crop technologies were found in middle age group.

From the selected non-adopting farmers' (n=40), 48 was the average age of farmers. 69% had no formal education; the average farm size was 3 acres; while the average farming experience was 32 years. The average annual income was Rs. 15,000/-. Similar results regarding education were reported by Siddayya and Kammar [21] in their study of adoption of improved technologies of pigeon peas, whereby only 30% were found to be illiterate among the adopting farmers compared to 50% for non-adopting farmers.

3.1.1 Sources of farm power

Major source of farm power was bullocks both for adopting (28%) and non-adopting (26%) categories of farmers because they were resource poor and cannot afford to have tractors individually.

3.1.2 Livestock possession

The major livestock kept by adopting farmers was cattle (25%), while for the non-adopting farmers it was buffaloes (38%). The study found the population of goats and poultry to be significantly high among non-adopting farmers because they were poor economically and most of them were agricultural labor.

3.1.3 Mass media exposure

Television was the major mass media exposed to for both adopting (73%) and non-adopting farmers (69%). Adopters were more exposed to agricultural information than non-adopters because they were more enterprising and eager to know latest know-how in farming.

3.1.4 Extension contact

KVK scientists were the major source of extension contact for both adopting (83%) and non-adopting farmers (87%). Agricultural officers (74% and 70% for adopting and non-adopting farmers respectively) followed by Agricultural extension officers (70% and 54% for adopting and non-adopting farmers respectively) were the second and third source of extension contact for both categories of farmers.

3.2 Adoption of Technologies/Livelihood Interventions

The proposed technologies/interventions for various crops by KVK and the farmers' reasons and constraints for adoption are presented in Tables 1 and 2. Stem borer management in Maize (97.5%) and Spacing and fertilizer management in Cotton (97.5%) were found to have maximum adoption by farmers followed by Demonstration of perennial fodder hybrid Bajra Napier CO-4 (95%); Drip Irrigation system (92.5%); Pigeon pea wilt tolerant variety PRG-158 (90%); Production technology in Maize (90%); Tomato nursery raising in pro-trays & shade net (90%); Management of sucking pests in Cotton (87.5%); Shoot fly management in Sorghum (75%); IPM in Pigeon pea (65%); Perennial fodder hybrid Bajra Napier APBN-1 (32.5%) and Zero till Maize after rice with 25% adoption.

Technologies/Interventions of KVK are as such very good and proven. During the period of KVK operation (2011-14) in the village, more than 80% adoption was recorded for almost all technologies: including farm machinery, varietal evaluation, IPM, home science, fodder and feed management, micro irrigation using drip and sprinklers and Natural Resource Management (NRM). In the case of pigeon pea wilt tolerant PRG-158, adopters were more optimistic because of the proven merit of the variety like wilt tolerance trait. So they have adopting with a curiosity of obtaining higher yields. In case of spacing and fertilizer management in maize and cotton, farmers' were following the recommended practices without much deviation along with advantage of cost savings. However, with withdrawal of KVK from the adopting villages, some of the technologies/interventions became out of reach (impractical), particularly those that requires capital on the part of the farmer. e.g. machinery, mulch material and NRM. The relevance of new or improved technologies to farmers and the need of the farmers to improve their situation are therefore important driving factors of adoption [15].

3.3 T-test Results for Adopters and Non-Adopters

From Table 3, it can be inferred that the mean values for the adopters were significantly higher than the non-adopters in all of the variables under study except age. Educated people are better adopters (mean value 8.15). Farmers possessing higher farm power (mean 1.43) and livestock population (mean 5.57) are better adopters. Adoption of KVK interventions was found to be a powerful tool for improving annual income which was Rs. 78,275/- for adopters as compared to non-adopters which was Rs. 14,975/-. Moreover, the adopters had better knowledge (mean 25.1) and adoption rates (mean 23.43) than the non-adopters.

3.4 Correlation Coefficients ('r' values) between Socioeconomic Variables and Farmers' Adoption of KVK Interventions

From Table 4, it is clear that education (0.81), farming experience (-0.79), annual income (0.73), land holding (0.69) and extension contact (0.77) had significant relationship with farmers' (adopting category) adoption of KVK interventions. Only livestock possession (0.35) had significant relationship with farmers' (non-adopting category) adoption of KVK interventions. Study by Pramod and Manoj [22] on Adoption level of oilseed production technologies in Konkan region of Maharashtra also revealed that adoption of oilseed technology by respondents was significantly associated with their education, annual income, and experience in oilseed growing, extension contact.

3.5 Regression Coefficients of Socioeconomic Variables with Farmers' Adoption of KVK Interventions

Socio-economic variables are the major contributors for adoption of a technology at rural household level. Age, education, family size, farming experience etc. are the known factors contributing to the successful adoption of technology. Thus, in the present study it becomes essential to calculate regression coefficients so as to exhibit their real contribution towards adoption of a technology in rainfed areas.

From Table 5, it is clear that education had positive significant relationship (R^2 =69) and farming experience had negative significant relationship with farmers' adoption to KVK Interventions (adopters). Farmers with higher levels of education are more inclined to adopt newly-introduced technology than those with lower education [23]. A panel study by Endale [24] in Ethiopia reported that the level of education of farmers does influence the adoption decisions in regards to newly-introduced technologies. In their study on cereal production and technology adoption in Ethiopia [25] also found that the level of education of farmers is likely to have a positive effect on adoption of a newly- introduced technology. The negative

Table 1. Adoption of KVK technologies/livelihood interventions in sorghum, pigeon pea and maize by farmers

Crops/ Technology	S. no.	Proposed KVK Technologies/ Interventions	Adoption		Reasons for Adoption	Constraints in Adoption
			n	%		
Sorghum	1.	Shoot fly management in Sorghum	30	75	Following early sowings and increased seed rate along with soil application of Carbofuron during sowing time. Ease of operation.	--
Pigeon pea	2.	Pigeon pea wilt tolerant variety PRG-158	36	90	Wilt tolerant. Good yields, fetching good market price.	--
	3.	IPM in Pigeon pea	26	65	Using neem oil, bird perches and chemicals.	Pheromone traps and NPV not readily available.
Maize	4.	Production technology in Maize	36	90	Following spacing, fertilizer & pesticide recommendations correctly now. Previously used excess fertilizer doses.	--
	5.	Stem borer management in Maize	39	97.5	Scrupulously following Monocrotophos spray @1.6ml/lt. at 10-12 DAS.	--
	6.	Zero till Maize after rice	10	25	--	Weed problem and less yields override cost and time savings.

Table 2. Adoption of KVK technologies/Livelihood Interventions in Cotton, Tomato and Fodder by farmers

Crops/ Technology	S. no.	Proposed KVK Technologies/ Interventions	Adoption		Reasons for Adoption	Constraints in Adoption
			n	%		
Cotton	1.	Spacing and fertilizer management in Cotton	39	97.5	Following recommended spacing's and fertilizer doses.	--
	2.	Management of sucking pests in Cotton (Stem application with Monocrotophos and Verticillium spray).	35	87.5	Convinced of the reduced use of Monocrotophos along with less labor requirement.	--
Tomato	3.	Tomato nursery raising in pro-trays & shade net (income from it)	36	90	Cost saving by reducing the seed rate for production of seedlings per acre. No weed problem. Shade nets protect from direct heat and germination will be good.	--
	4.	Drip Irrigation system	37	92.5	Savings in water. Less problem of weeds.	--
Fodder	5.	Demonstration of perennial fodder hybrid Bajra Napier CO-4	38	95	Lustrous green growth of fodder. Higher milk yields.	--
	6.	Perennial fodder hybrid Bajra Napier APBN-1	13	32.5	_	Leaves are spiny and coarse in texture.

Table 3. T- test results (Mean ± SD values) for adopters and non-adopters

S. no.	Variables	Mean ± SD Values	
		Adopters	Non-adopters
1.	Age	46.10 ± 1.64	48.20 ± 1.94
2.	Education	8.15 ± 0.61**	1.78 ± 0.38**
3.	Family size	4.26 ± 0.17*	3.50 ± 0.20*
4.	Farming experience	12.65 ± 0.97**	28.70 ± 2.53 **
5.	Annual income	78275 ± 6384.85**	14975 ± 1400.77 **
6.	Land holding	4.88 ± 0.45**	1.93 ± 0.19**
7.	Farm power	1.43 ± 0.46 **	0.65 ± 0.19**
8.	Livestock possession	5.57 ± 1.71 **	2.63 ± 1.15 **
9.	Mass media exposure	5.18 ± 0.24*	4.2 ± 0.44*
10.	Extension contact	7.90 ± 0.51**	3.93 ± 0.29**
11.	Adoption	23.43 ± 0.75 **	1.28 ± 0.41**
12.	Knowledge	25.1 ± 0.99 **	14.50 ± 0.91 **
13.	Adoption index	86.69 ± 2.77**	4.70 ± 1.51

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

Table 4. Correlation coefficients between socioeconomic variables and farmers' adoption of KVK Interventions

Socioeconomic variables	Adopters	Non-adopters
Age	-0.31	-0.03
Education	0.81**	0.10
Family size	-0.08	-0.22
Farming experience	-0.79**	-0.10
Annual income	0.73*	0.07
Land holding	0.69*	-0.23
Farm power	-0.05	-0.04
Livestock possession	0.13	0.35*
Mass media exposure	-0.23	0.00
Extension contact	0.77*	-0.15

**Significant at 0.05 probability level*
***Significant at 0.01 probability level*

Table 5. Regression coefficients of socioeconomic variables with farmers' adoption of KVK interventions

Socioeconomic variables	Adopters	Non-adopters	P value
Age	-0.22	-0.02	0.22
Education	1.86*	0.47	0.03
Family size	-0.48	-2.63*	-0.02
Farming experience	-1.24*	-0.06	0.05
Annual income	-0.02	0.04	0.79
Land holding	-0.93	-1.88	0.43
Farm power	-0.23	2.15	0.68
Livestock possession	0.19	0.51*	-0.02
Mass media exposure	-0.02	1.26	0.98
Extension contact	1.20	-1.60	0.29
R^2	0.69	0.11	-

**Significant at 0.05 probability level;*
***Significant at 0.01 probability level*

significant relationship of farming experience with adoption may be due to the fact that as farmers' age, they become more risk averse which negates technology adoption. In the case of non adopters, family size (-2.63) had a negative and significant relationship with farmers' adoption, and livestock possession (0.51) had a positive significant relationship with farmers' adoption of KVK interventions.

3.6 Correlation Coefficients ('r' values) between Socio-economic Variables and Farmers' Knowledge of KVK Interventions

40 items/statements were framed carefully regarding KVK technologies/interventions in true/false mode. These were framed after extensive review of literature and after examining their relevance, and in consultation with experts and various sources of information. Each item in the knowledge test was read out to the respondents by the researcher and the response in the form of correct or incorrect answers were recorded. The correct answers were assigned a weight age of 'two' and 'one' to incorrect answers. Total of all the scores on complete test items was computed for each respondent. The possible maximum and minimum scores ranges for the test was 80 and 40 respectively.

Table 6 presents results of correlations between socio-economic variables and farmers' knowledge of KVK interventions. It can be noted that there was no significant relationship between any of the socio-economic variables and farmers' knowledge of KVK interventions for both adopters and non-adopters category.

3.7 Regression Coefficients of Socioeconomic Variables with Farmers' Knowledge of KVK Interventions

Table 7 presents a summary of the regression analysis of the relationship between socio-economic variables and farmers' knowledge of KVK interventions. From Table 7, it is clear that among the adopters, only farming experience had significant positive relationship with farmers' knowledge of KVK Interventions at 5% level of significance (0.92).

3.8 Impact of KVK Interventions on the Productivity of Major Irrigated Crops

Table 8 presents results of impact of KVK interventions on productivity of major irrigated crops in Kharif and Rabi. The yield data was taken directly from the adopting farmers of the study. From Table 8, significant productivity increase was observed especially in case of maize, cotton, red gram and tomato in major irrigated crops in kharif (57%, 56%, 55% and 55% respectively). A study on factors influencing precision agriculture technologies in cotton production showed that propensity of precision agriculture technology adoption was higher for producers who use irrigation in their operation [26].

3.9 Impact of KVK Interventions on the Productivity of Major Rainfed Crops

Table 9 presents findings of the impact of KVK interventions on the productivity of major rainfed crops in Kharif and Rabi. The yield data was taken directly from the adopting farmers of the study. From Table 9, significant productivity increase was observed especially in case of maize, cotton and paddy in major rainfed crops in kharif (57%, 40% and 39% respectively). The reason may be due to the fact that in maize, farmers' followed stem borer management practices scrupulously as advised by KVK subject matter specialists. In cotton, spacing and fertilizer management recommendations were meticulously followed by the farmers' along with sucking pests' management.

Table 6. Correlation coefficients ('r' values) between socioeconomic variables and farmers' knowledge of KVK interventions

Socioeconomic variables	Adopters	Non-adopters
Age	-0.64	-0.08
Education	0.28	0.10
Family size	-0.13	0.06
Farming experience	-0.01	-0.02
Annual income	0.23	-0.10
Land holding	0.10	-0.16
Farm power	-0.04	-0.05
Livestock possession	-0.10	0.01
Mass media exposure	-0.13	-0.21
Extension contact	0.15	-0.09

Table 7. Regression coefficients of socio-economic variables with farmers' knowledge of KVK interventions

Socioeconomic variables	Adopters	Non-adopters
Age	0.09	0.03
Education	0.70	0.14
Family size	0.45	0.59
Farming experience	0.92*	-0.01
Annual income	0.09	-0.02
Land holding	0.29	-0.57
Farm power	-0.38	-1.19
Livestock possession	-0.08	-0.02
Mass media exposure	-0.25	-0.90
Extension contact	0.04	0.55
R^2	0.03	-0.18

**Significant at 0.05 probability level*

3.10 Knowledge Gap Analysis of Adopting and Non-adopting farmers as a Result of KVK Interventions

Table 10 presents findings of knowledge gap analysis of adopting and non-adopting farmers as a result of KVK interventions. From Table 10, there is a significant difference in knowledge score of 7 between adopters and non-adopters. This implies that there is a significant difference in the knowledge gained by adopting farmers over non-adopting farmers. This is because of the training, demonstrations and advice given by KVK subject matter specialists. Similarly, in a study by Uma and Sridhar [27] there is better knowledge gain among the demonstration farmers over non-demonstration farmers of KVK, Visakhapatnam on technologies related to Paddy, Sugar cane, Groundnut, Sesame, Blackgram crops. The better knowledge gain is due to hands on experience in the demonstration and due to series method demonstrations conducted for demonstration farmers of KVK compared to non demonstration farmers.

3.11 Knowledge Levels of Adopting and Non-adopting Farmers as a result of KVK Interventions

Table 11 presents findings of knowledge levels of adopting and non-adopting farmers as a result of KVK interventions. From Table 11, high level of knowledge (72.5) exists among majority of adopting farmers, while, medium level of knowledge (37.5) is high among non-adopting farmers. This is due to the fact that Adoption is the outcome from the five-stage process viz., awareness, interest, evaluation, trial and adoption. From farmers' point of view, awareness about technologies is one thing, which has to be supported with resources like finance, material and labor for final adoption. Hence, the above results.

3.12 Income Levels of Farm Women

Table 12 presents findings of income levels of farm women. It is worth noting that most of the activities were done by the women for

Table 8. Impact of KVK interventions on productivity of major irrigated crops

S. no.	Crops	Yield Before (q/acre)	Yield After (q/acre)	% change
Kharif				
1.	Maize	6.5	10.2	57
2.	Cotton	4.3	6.7	56
3.	Sorghum	5	7	40
4.	Paddy	16	22	38
5.	Red gram	2	3.1	55
6.	Tomato	4	6.2	55
Rabi				
1.	Maize	3	4	33
2.	Paddy	19.7	22.3	13
3.	Tomato	6	8	33

Table 9. Impact of KVK interventions on the productivity of major rainfed crops

S. no.	Crops	Yield Before (q/acre)	Yield After (q/acre)	% change
Kharif				
1.	Maize	7	11	57
2.	Cotton	5	7	40
3.	Paddy	18.3	25.5	39
Rabi				
1.	Tomato	8	10	25

Table 10. Knowledge gap analysis of adopting and non-adopting farmers

Statistic/ Parameter	Knowledge score of adopters	Knowledge score of non adopters	Difference in knowledge scores
Mean	25.1[B]	18.1[A]	7
Range	13 to 33	2 to 33	

[AB] vary significantly at 1% level of significance (p value=0.000151)

Table 11. Knowledge levels of Adopting and non-adopting farmers

S. no.	Level of knowledge	Adopting farmers		Non-adopting farmers		Knowledge gap (%)
1.	High (23-33)	29	72.5	14	35	37.5
2.	Medium (12-22)	11	27.5	15	37.5	-10
3.	Low (0-11)	0	0	11	27.5	-27.5
	Total	**40**	**100**	**40**	**100**	

Table 12. Income levels of farm women

S. no.	Major Activity	Income (Rs.) Approximation Basis	
		Before	**After**
1.	Tailoring and Zardosi work	100	400
2.	Preparation of Phenyle	100	400
3.	Baking products	100	300
4.	Preparation of iron rich recipes	50	200

themselves and their family, but not as a marketing venture. As shown in Table 12, on an average, women could save three to four times the money which they normally would have expended in the absence of the activity. This implies that the non-farm activities which farm women are carrying out is supplementing their income as if they are not being carried out. Tailoring work apart from generating income is also used for sewing their household clothes. Similarly products like phenyle, bakery items etc. are used for domestic consumption apart from generating revenue by their sale. Study by Deepa and Balai [28] also revealed similar results where nearly 60% of farm women whose average annual income ranged between Rs. 1,00,000 and 3,00,000 before the training had their average annual family income increasing by Rs. 20,000-50,000 after the training. The farm women whose average family annual income was about Rs. 3,00,000 or more than this earned extra Rs. 50,000 annually.

4. CONCLUSION

Farmers' Knowledge about dryland technologies is very good, but needs to be translated to adoption. This requires more concerted efforts in establishing mechanisms and traits including readiness of availability, ease of use, low cost, low labor requirement and time requirements of different technologies and their components. Spacing, fertilizer and chemical recommendations are by far, easily and readily adopting by farmers in this study. Adopters had better knowledge, adoption rates, productivity and income levels over non-adopters. Interplay of different socio-economic factors and decision making processes leads to adoption behavior of farmers. Therefore, for continuous adoption, additional working mechanisms need to be put in place such as extending hand holding for few more years, forming groups for ease of operation and improving farmers confidence to enable them continue with the practices even when projects from outside transition. Farmers should be advised to realize that returns are more than investments in the long run especially in NRM activities in drylands.

DISCLAMIER

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CONSENT

As per international standard farmers' written consent has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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