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Socio-Economic Profile Of Hybrid Seed Growers And Factors Influencing Hybrid Cotton Seed Production In Kalyana Karnataka Region Of

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Abstract
A survey was conducted during 2022-23 to study the socio-economic characteristics of hybrid cotton seed production in kalyana karnataka. For the study, multistage sampling procedure as well as snow ball technique was adopted for selection of major district and sample farmers of 60. The average age of famers involved in hybrid cotton seed production was 43.01 years. The hcsg had completed primary or high school education (53.30%), followed by college or above (30.00%) education. The majority of farmers i.e., 58.30 per cent were used to live in nuclear family and rest 41.60 per cent farmers used to live in joint family. More than half (68.30%) of the hybrid seed growers had experience spanning 6 to 10 years. The results of a logit model used to analyse the factors influencing the adoption of hybrid cotton seed production by farmers in a specific study area. Training and extension contact were also found to be significant at the 5 per cent level of significance, with coefficients of 0.81 and 0.80, respectively. The results suggest that several factors play a significant role in determining farmers' decisions to adopt hybrid cotton seed production.

Key words: *cotton, logit, extension, hybrid, training.*

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I. Introduction

Cotton (*Gossypium herbaceum*) is as ancient as the human civilization. Exclusive cotton fabrics have become a status symbol and are becoming increasingly costlier. Cotton, the 'White Gold' and 'King of Fibres', is a crop of prosperity and is considered to be an industrial commodity of worldwide importance. Cotton is the world's most important natural fiber crop, accounting for more than half of all fiber used in textile production. It is more valuable than synthetic fibers and it is cultivated in more than 80 nations worldwide. It's the only crop that produces natural fiber, edible oil, and seed by-products for livestock feed. Globally, 27 M tonnes of cotton was produced from 33 million hectare of land in the year 2022. Major cotton-producing countries in the world are India, the USA, China, Pakistan and Brazil in area wise. Global exports stood at 9.96 million metric tonnes. The USA is the top exporting country with 2.96 million metric tonnes, followed by Brazil with 2.10 million metric tonnes.

India is an important producer of cotton in the world. Since time immemorial India has been the producer of cotton and the finest and most beautiful cotton fabrics. India thus enjoys the distinction of being the earliest country in the world to domesticate cotton and utilize its fibre for manufacture of fabrics. Cotton is the basic raw material for textile industry which provides direct and indirect employment to 51 million and 68 million people respectively, signifying the importance of cotton for Indian economy. However, despite being the largest producer of cotton, productivity per hectare in India is quite low with a merely 479 kg per hectares in comparison to 771 kg per hectares at global level (Anon., 2022b). In Karnataka, average per hectare cotton yield was 274 kgs of lint which is 85 per cent of the national average yield of 322 kgs. In the state, cotton is

grown in an area of 8.17 lakh hectares with a total production of 2,330 thousand tonnes desi cotton occupies nearly 30 per cent of the total area under cotton. Cotton is an important commercial crop which can be grown in all parts of Karnataka. Dharwad, Ballari, and Raichur are the major cotton cultivating districts of Karnataka (Anon., 2022b).

Cotton seed

The cotton industry is a cornerstone of the global agricultural sector, contributing significantly to economies, employment, and trade. Hybrid cotton seed production, a key aspect of the cotton industry, has undergone a remarkable transformation over the past few decades. Hybrid cotton seeds are engineered to exhibit superior traits, such as increased yield, pest resistance, and better fibre quality. These traits have led to enhanced productivity and profitability for cotton farmers, making hybrid cotton seed production a crucial driver of modern cotton agriculture.

The global cotton seed market is competitive, with the leading players capturing a whopping share in revenues. Longping High-tech, Monsanto, DowDuPont, Nuziveedu Seeds Ltd, Kaveri Seeds, Mayur Ginning & Pressing Pvt. Ltd, Bayer AG, Corteva Agriscience, Maharashtra Hybrid Seeds Co. (Mahyco), and Namdhari Seeds Pvt. Ltd. are focused on technology advances for new launches at affordable prices. The major players are utilizing strategies including acquisitions & mergers, regional expansion, and partnerships to stand out as strong competitors in the market (Anon.,2023a). Cotton seed production in India is concentrated in five states, namely, Andhra Pradesh, Tamil Nadu and Karnataka in South India and Gujarat and Maharashtra in the central part of India. These five states account for nearly 95 per cent of total cotton seed production in the country. Of the total 98,000 acres of cotton seed production in India in 2021-22, Gujarat has the largest area covering nearly 54,000 acres (55%) followed by Andhra Pradesh with 24,000 acres (24.50%) and Karnataka with 9,000 acres (9.20%) (Anon., 2022c).

In Karnataka, seed production began in the 1970s and Karnataka was the first state in south India to produce hybrid cotton seeds for commercial cultivation. The Cotton seed production was mainly concentrated in the conventional seed production areas like Raichur, Koppal, Gadag, Bagalkot and Haveri and it was very meagre in the Nonconventional areas like Chikkaballapura and Tumkur. Both public and private organizations and companies are involved in the production and distribution of hybrid cotton seeds. In Kalyan Karnataka Raichur and Koppala together contribute nearly 50.47 per cent of the area under hybrid cotton seed production in the state. Seeds are mainly distributed through seed coordinators of the respective private companies. In the year 2021-22, the total area under seed production by different companies was 24,895 acres (Anon., 2023b).

In Kalyana Karnataka many people are involved in hybrid cotton seed production owing to realization of higher profitability (Bellundagi et al. 2016). However literature review suggests that very limited information on socio-economic profile of farmers and factors which are influencing farmers to go for hybrid seed production in Kalyana Karnataka although the area under hybrid seed production is increasing (Mahadev Reddy, 2015). Hence this paper provides insights into socioeconomic profile of farmers and factors that are motivating farmers to undertake hybrid seed production in cotton. This analysis will in turn helps for policy makers ,extension officers and other institutions to develop suitable practices and technologies by understanding farmers background.

II. Materials And Methods

Primary data

In this study purposive sampling method was used for the selection of farmers to define sampling unit through the personal interview of farmers using well-structured questionnaires. The questions were asked according to the selected objectives.

Secondary data

In the study, secondary data was collected from interaction with the company personals, brochures, review and internet were used to emphasize more on this project work.

Sampling Procedure

The paper makes use of data collected from 60 sample respondents who are selected using snow ball sampling technique from two districts namely Raichur and Koppal which were selected using purposive multistage sampling technique.

Data analysis

To study the socio-economic condition of farmers in study area, tabular method, percentage analysis, bar diagrams were used. The parameters included for the study of socio-economic profile of the sample farmers are given below.

Age of Farmers
Educational level of sample farmers
Social class of sample farmers
Family type of sample farmers
Family size of sample farmers
Status of sample farmers according to land holding
Farming experience of sample farmers
Annual income of sample farmers

To identify and analyze the factors that governed the farmer's decision to adopt hybrid seed production technology, the logistic regression was employed. The influence of various socioeconomic factors on the willingness of decision-makers to adopt new seed production has been investigated by several studies (Padma and Flinn, 2008). In most of the studies on adoption behavior, the dependent variable is constrained to lie between 0 and 1 and the models used are exponential functions. The univariate logit model and its forms have been used extensively to study the adoption behavior of farmers. It is generally recommended to use a probit model for functional forms with limited dependent variables that are continuous between 0 and 1 and a logit model for discrete dependent variables. Thus, the univariate logit model, as specified below, was estimated using the maximum likelihood method.

ln [{P (Bt/X)}/{P(NBt/X}] = XB + E…….(1)
ln [{P (Bt/X)}/{1-P(Bt/X)}] = XB + E……(2)
where,
P (Bt/X) = Probability of an individual farmer going for hybrid seed production, given the level of X,
P (NBt/X) = Probability of an individual farmer not going for hybrid seed production technology, given the level of X,
[{P (Bt/X)}/ {P (NBt/X)}] = {P (Bt/X)}/ {1-P (Bt/X)}] = 1-P (Bt/x)
X = Vector of explanatory variables,
B = Vector of response coefficients, and
E = Vector of random disturbances.
The specific logit model estimated to predict the logarithm of "relative odds of a farmer's adoption versus non-adoption of the Bt technology" was specified as per Equation(3):

In [Pi /(1-Pi)] = b0 + b1 EXHRi + b2 EDNi + b3 AGEi + b4 LHOLDi +
b5 FAMSIZEi + b6 IRRLANDi + b7 TRAINi
+ b8 EXTENi +Ui…….(3)

where,
Pi = Probability that the farmer is an adopter of the hybrid seed production,
1-Pi = Probability that the i^{th} farmer is not an adopter of the hybrid seed technology,
EXHR= Expectation of higher returns (₹)
EDN = Education of the household head (completed years of schooling),
AGE = Age of the household head (in completed years),
LHOLD = Landholding (acre),
FAMSIZE = Family size (No.),
IRRLAND= Irrigated land(acre),
TRAIN= Training(No.),
EXTEN= Extension contacts(No),
bj = Logit coefficients (j = 0,1...,9), and
Ui = Random disturbances (i=1,2…,60).

Several independent variables are used in the analyses which includes the educational status of the farmer, size of land holding, size of irrigated land, size of the family, age of the farm household head, number of extension contacts of the farmer and training received by farmers The choice of the above factors is based on the assumption of the influential capability of these factors in acting as determinants of hybrid seed production adoption decisions by the farmer. Most of the factors used for analysis base their possibility in such a way that the more favorable or intensive the factor might be the more it is likely to contribute towards adopting hybrid seed production. The above logit model and the marginal effect of selected variables on the probability of adoption of seed production technology have been analyzed using the statistical software SPSS 16.

III. Results And Discussion

Age composition of the HCSG

The socio-economic characteristics were studied to know the social and economic profile of HCSG (Hybrid Cotton Seed Growers) in the study area. The profile of the sample respondents presented in Table.1 and Fig 1. The farmers were divided in three age groups i.e., below 25, between 25 to 50 and above 50 years. The

average age of famers involved in hybrid cotton seed production was 43.01 years. The percentage analysis revealed that 80 per cent of HCSG were belonged to age group between 25-50 years. Which was followed by 18.30 per cent of the population in the category of above 50 years age. Age composition suggesting that younger generations are mostly involved in seed production activity. They further stated that younger farmers have the tendency to operate more efficiently on the farm than the older ones because the younger farmers are more agile and energetic to work on farm.

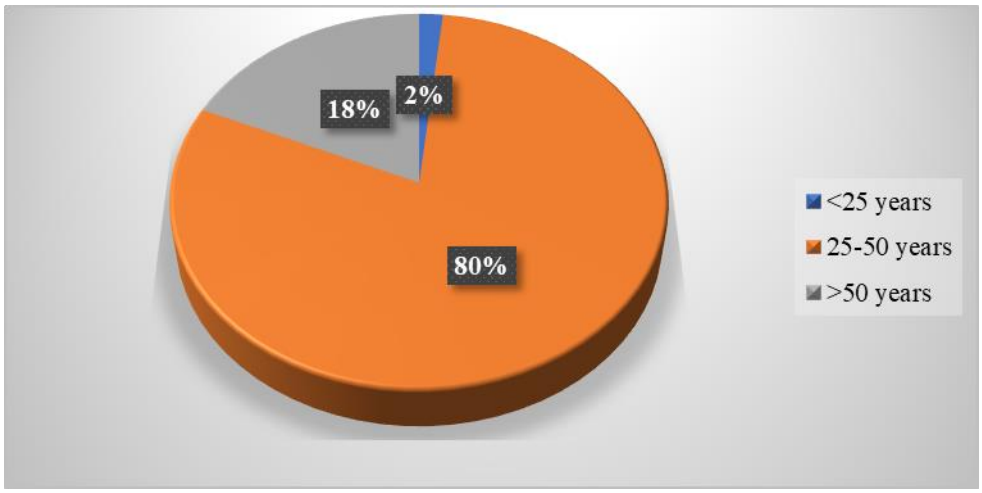

Fig 1. Percentage distribution of sample farmers across different age group

Educational level of sample farmers

The education level of sample farmers was categorised as illiterate, primary or high school and college or above education. It is important to note that the majority of the HCSG had completed primary or high school education (53.30%), followed by college or above (30.00%) education. This concluded that majority of the farmers were educated up to primary or high school level hence the literacy rate of farmers was good in the study area.

Social class of sample farmers

The social class of the sample farmers is presented in Table 1. The groups were classified into general, Other Backward Class (OBC), Schedule Caste (SC), Schedule Tribe (ST). Results from the analysis revealed that the majority of farmers i.e., 36.70 per cent farmers were from OBC and general category, followed by 15 per cent farmers were belonged to ST categories and the lowest of 11.66 per cent farmers belonged to SC categories. The suggested that slightly higher percentage of farmers were belonged to OBC and general category.

Family type of sample farmers

The family type of sample farmers were divided into two categories i.e., joint family and nuclear family. Results revealed that majority of farmers i.e., 58.30 per cent were used to live in nuclear family and rest 41.60 per cent farmers used to live in joint family. It was observed during study that percentage of involvement in hybrid seed production is slightly high among joint family when compared to nuclear family.

Family size of sample farmers

The family size of sample famers in study area were divided into small (<4 members), medium (4-6 members) and large (>6 members). The findings from analysis revealed that The average family size of HCSG was 6.48 members. Slightly more than half (55.00%) of the respondents to HCSG had a family size between 4 and 6 members, followed by large families (45.00%) with more than 6 members. The findings of the study revealed that the majority of the respondents had a medium working force in their respective families. Alam et al., 2013 who reported that family size is relevant to cotton production because it constitutes the highest supply of labour in cotton production. It is believed that where family labour supply is high, then cost of total production will be reduced.

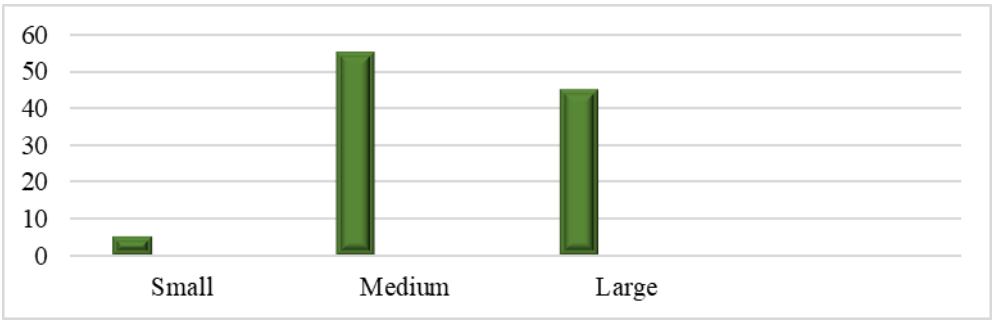

Fig 2. Percentage of family size

Status of sample farmers according to land holding

Status of sample farmers according to land holding is presented in table 1. The distribution of farmers were small, medium, semi-medium and large i.e., the farmers had landholdings less than 3 acre as small, between 3 to 6 acre as medium, between 6 to 9 acre as semi-medium and above 9 acre as large farmers. With respect to land holding, the average land holding of HCSG was 8.65 acres per household. Figure 3 depicted that nearly 37 per cent of the farmers in HCSG belonged to the semi-medium category with land holdings of 6 to 9 acres, followed by the medium category (33.33%) with land holdings of 3 to 6 acres. This indicated that HCSG were more likely to divert their land to seed production and other agricultural activities.

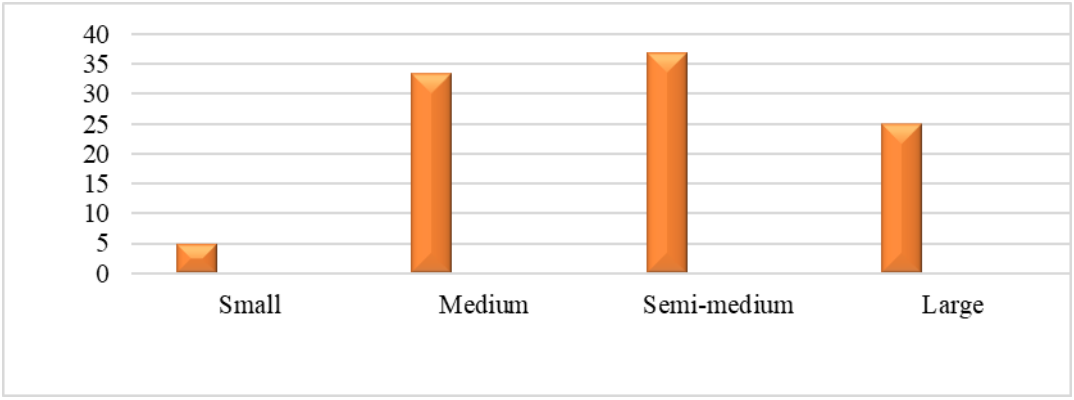

Fig 3. Status of land holding of hybrid cotton seed growers

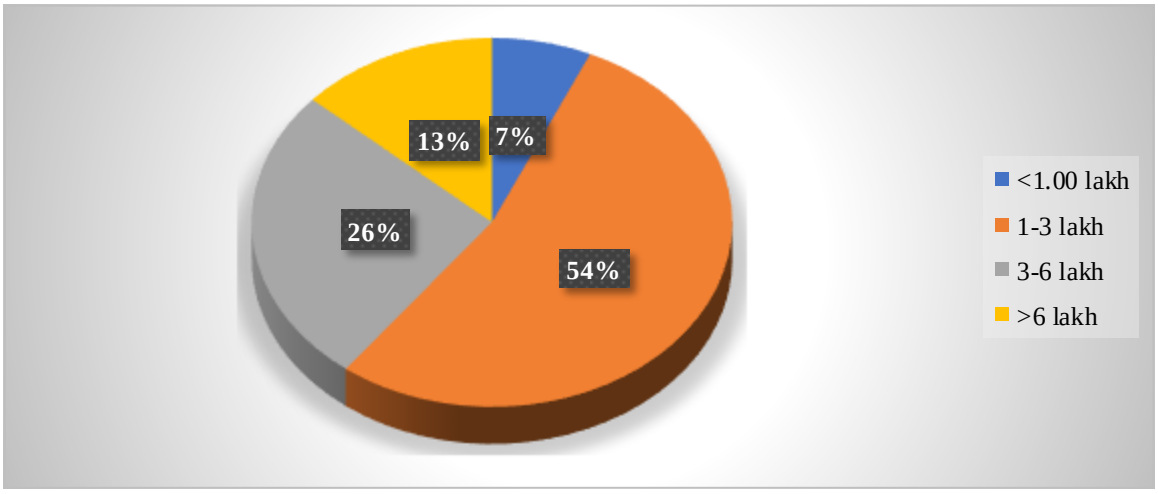

Fig 4. Per annum income level of sample farmers

Table 1. Socio-economic profile of the sample respondents in the study area

Sl. No	Particulars	HCSG(n=60)	
		Number	Per cent
I	Age group (No.)		

1	<25 years	1	1.70
2	25-50 years	48	80.00
3	Above 50 years	11	18.30
Average age (Years)		**43.01**	
II	**Educational level**		
1	Illiterate	10	16.66
2	Primary or high school	32	53.30
3	College or above	18	30.00
III	**Caste**		
1	General	22	36.70
2	OBC	22	36.70
3	Schedule Caste (SC)	7	11.66
4	Schedule Tribe (ST)	9	15.00
IV	**Type of family**		
1	Joint	25	41.60
2	Nuclear	35	58.30
V	**Family size**		
1	Small (<4 members)	3	5.00
2	Medium (4-6 members)	33	55.00
3	Large (>6 members)	27	45.00
Average family size		**6.48**	
VI	**Landholding**		
1	Small (< 3 acre)	3	5.00
2	Medium (3-6 acre)	20	33.33
3	Semi-medium (6-9 acre)	22	36.66
4	Large (>9 acre)	15	25.00
Average landholding (acre)		**8.65**	
VII	**Farming experience(years)**		
1	Low(<6 years)	2	3.30
2	Medium (6-10 years)	41	68.30
3	High (> 10 years)	17	28.30
Average farming experience		**9.34**	
VIII	**Income/annum**		
1	< 1.00 lakh	4	6.66
2	1.00-3.00 lakh	32	53.33
3	3.00-6.00 lakh	16	26.00
4	>6.00 lakh	8	13.33
Average income/annum		**243333**	

Farming experience of sample farmers

In the study, the experience of the household in hybrid cotton seed was assessed. It was noted that the average farming experience of HCSG was 9.34 years. More than half (68.30%) of the hybrid seed growers had experience spanning 6 to 10 years, followed by 28.30 per cent having more than 10 years of experience in seed production. Results indicated that hybrid seed production was highly remunerative and profitable, which encouraged them to continue with this as a primary source of revenue.

Annual income of sample farmers

The annual income of the sample farmers were divided into four categories i.e., less than 1.00 lakh, between 1.00 to 3.00 lakh, between 3.00 to 6.00 lakh and above 6.00 lakh. The findings from the figure 4 revealed that slightly more than half (53.33%) of the farmers had yearly incomes between 1 and 3 lakhs, followed by 3 to 6 lakhs (26.00%) and more than 6 lakhs (13.33%).

In a nutshell, the socioeconomic profile of the respondent suggests that better-off people, people with good education levels, families with large land holdings and families with high incomes go for seed production because they can sustain deferred payments. Small, medium and semi-medium farmers also go for seed production, but in lesser numbers because these categories of farmers need early payment and can't withstand deferred payment as they solely depend on a single source of income. Therefore, efforts should be made to encourage small and medium landholding farmers to adopt seed production by providing scale of finance, covering their seed production activity under insurance, providing financial support through loans by different financial institutions and providing early procurement prices for their produce by the companies. This will help farmers reduce their risk and uncertainties in hybrid cotton seed production.

Factors influencing farmers to adopt hybrid cotton seed production

Table 2 provides the results of a logit model used to analyse the factors influencing the adoption of hybrid cotton seed production by farmers in a specific study area. The coefficients (bj) of the variables such as expectation of high returns, education, age of household head, landholding, family size, irrigated land, training and extension contract in the model indicates how changes in those variables affect the probability of farmers adopting hybrid cotton seed production. The table also provides the mean values and standard deviations of each variable.

Among eight variables considered, the coefficient for the expectation of high returns was 0.08 with a standard deviation of 0.01. It was statistically significant at the 5 per cent level. This suggested that farmers' expectations of high returns had a positive impact on the probability of adopting hybrid cotton seed production. For every one-unit increase in the expectation of high returns, the probability of adoption increased by 0.08 units. With respect to the coefficient for education, it was 0.15 and significant at the 5 per cent level of significance. This meant that farmers with more years of education were more likely to adopt hybrid cotton seed production. An increase of one year of education led to a 0.15-unit increase in the probability of adoption.

Table 2 Factors determining farmers' decision on adoption of hybrid cotton seed production in the study area

Sl. No	Variables	*bj* (coefficients)	Marginal effect on probability of adoption	
			Mean value	Standard deviation
1	Expectation of high returns (₹)	0.08**	0.01	0.00
2	Education (years)	0.15**	0.01	0.00
3	Age of household head (years)	0.01	0.00	0.00
4	Landholding (acre)	0.13*	0.01	0.01
5	Family size (in No)	-0.06	-0.00	0.00
6	Irrigated land (acre)	0.46*	0.05	0.03
7	Training	0.81**	0.10	0.06
8	Extension contact (in No)	0.80**	0.10	0.06
Number of observations		60		

Training and extension contact were also found to be significant at the 5 per cent level of significance, with coefficients of 0.81 and 0.80, respectively. This indicated that farmers who had received training were more likely to adopt hybrid cotton seed production, and having more extension contacts positively affected the probability of adoption. The coefficients for landholding and irrigated land were 0.13 and 0.46, respectively. And significant at the 10 per cent level of significance. This suggested that larger landholdings positively affected the probability of adoption. An increase of one acre in landholding led to a 0.13-unit increase in the probability of adoption. It was observed during the survey that small landholding farmers were also involved in hybrid seed production, but they were not ready to withstand the deferred payment process by the company, as they expected early payment for their produce. With respect to the coefficient of the age of the household, it was positive (0.01). This suggests that the age of the household head did not have a significant impact on the probability of adopting hybrid cotton seed production. The results are in line with Padaria *et al*. (2016) who conducted study on factors that had affected Bt cotton adoption among 120 farmers in Punjab and Karnataka.

The results suggest that several factors play a significant role in determining farmers' decisions to adopt hybrid cotton seed production. Expectation of high returns, education, landholding, irrigated land, training, and extension contacts are positively associated with adoption, while age and family size do not appear to have significant effects. These findings can be useful for policymakers and agricultural extension services to target interventions and support to encourage the adoption of hybrid cotton seed production in the study area by providing financial support through banking institutions and technical guidance, which in turn encourages farmers to adopt seed production.

Based on the results of the findings, the following conclusions were made: farmers in the study area have divers socio-economic characteristics with majority of family are nuclear. Suggesting that as seed production is labour required process having nuclear family may have impact on production cost. From the factor analysis it is clear that expectation of high returns, education, landholding, irrigated land, training, and extension contacts are positively associated with adoption, therefore extension offices, private companies and seed producing organizations should concentrate on providing training and services to the farmers involved in hybrid cotton seed production.

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