Original Research Article

ADOPTION BEHAVIOUR OF FARMERS TOWARDS IMPROVED CULTIVATION PRACTICES OF SOYBEAN IN DIMAPUR DISTRICT OF NAGALAND, INDIA

Abstract

Soybean is known as "golden bean", "miracle crop" etc, because of its several uses, It is an excellent source of protein and oil. Soybean is considered an important crop because of its dual purpose that is oil seed as well as pulses crop. In Nagaland, soybean is cultivated almost in all the districts. The present study was carried out during the session 2021-22. The investigation was conducted in Kuhuboto block of Dimapur district of Nagaland. A total number of 120 respondents from 6 villages were selected using proportionate random sampling procedure.

The study was conducted with the objectives to find out the characteristics of soybean growers, the extent of knowledge and ascertain the extent of adoption behavior of farmers towards improved cultivation practices of soybean and to delineate the constraints faced by the respondents and to obtain their suggestions. An interview schedule based on the study was prepared and data were collected and processed through primary and secondary tables and statistical analysis. The respondents were contacted personally and interviewed. The study revealed that majority of the soybean growers belonged to middle aged group, acquired Upper Primary school education, had medium level of annual income with small size of land holding. Majority of them had medium (10-20) years of farming experience, use of sources of information and medium level of extension contact. It was observed that the majority (70.84%) of the respondents had medium level of knowledge on improved cultivation practices of soybean followed by 13.33% having high and 15.83% having low knowledge level respectively. In respect of correlation analysis between knowledge level and the independent variables, it shows that annual income, land holding and extension contact had positive and found to be significant. Whereas, age, education, marital status, family type, family size, type of house, occupation, farming experience, mass media exposure and source of information was found to be non-significant. As for analysis between adoption level and the independent variables, it was revealed

that variables like annual income, land holding and extension contact are significantly associated with adoption of soybean growers. Further, the variables age, education, marital status, type of family, family size, type of house, occupation, farming experience, mass media exposure and source of information was found to be non significant. The major constraints faced by the respondents were lack of proper resources and capital, high cost of inputs, lack of proper information at time, lack of consultancy, shortage of labors etc.

Key words: adoption, knowledge, soybean, Nagaland

Introduction

Soybean is considered economically the most important bean in the world, providing vegetable protein for millions of people. Soybean is botanically named as Glycine max (L.) Merrill belonging to the family Fabaceae also called leguminosae, in the subfamily Paoilonideae is native to Southeast Asia. The number of chromosomes in soybean is $2n = 2x=40$ and is a self-fertile species with less than 1% out-crossing.**(Wikipedia)**

Soybean is called the 'miracle bean' or 'vegetarian meat' or the 'golden bean' because it contain high quality of protein (40-42%) and edible oil (18-20%) containing major essential amino acid .Soybean is consider an important crop because of its dual purpose that is oil seed as well as pulses crop. It is the world's most important seed legume, which contributes 25% of the global edible oil, about two-third of the world's protein concentrated for livestock feeding (**Agarwal et al., 2013**).

In India, soybean was introduced from china in tenth century AD through the Himalayan routes, and also brought in via Burma (now Myanmar) by traders from Indonesia. As a result, soybean has been traditionally grown on small scale in Himachal Pradesh, the kumaon Hills of Uttar Pradesh (now Uttaranchal), eastern Bengal, the Khasi hills, Manipur, the Naga Hills, and parts of central India covering Madhya Pradesh.(**Agarwal et al.,2013**)

The worldwide production of soybean is estimated to be 365 million tones, which is cultivated globally on 121.53 million hectares. At present, India ranks fifth in the area and production in the world after Brazil, USA, Argentina and China. In India the top 3 largest soybean growing states are Madhya Pradesh, Maharashtra and Rajasthan. (**Wikipedia**)

In north east soybean is mostly utilized as pulses and fermented products. Locally known as Axone (Nagaland, Hawaijar (Manipur), Bekang-um (Mizoram) and many other products made from soybean .

In Nagaland, soybean is cultivated almost in all the districts. The area of soybean cultivation is estimated to be 24860 hectare. In Dimapur district, soybean covers an area of 2040 ha, 2520 MT of production and 1.23 t/ha of productivity (2013-2014). (**Statistical Handbook of Nagaland 2017**)

The study was taken under the following objectives:

i. To find out the Socio-economic characteristics of the soybean growers.
ii. To analyse the knowledge level of the respondents towards soybean cultivation.
iii. To ascertain the extent of adoption of improved practice in soybean cultivation by the farmers.
iv. To identify the major constraints face by the soybean cultivators.

Materials and Methods

Location of the study area:

The study was conducted in Dimapur district of Nagaland. Nagaland state has a total area of 16,579 km^2 .The Dimapur District is located in the southwest of Nagaland. The vast majority of this area is flat with the Dhansiri River, a tributary of the Brahmaputra River flowing east of the city. The Dimapur District lies between 25°48' and 26°00' North latitude and 93°30' and 93°54' East longitude. The district is bounded by Assam on its North and West, Kohima on the East and Peren District in the South. The total area of the Dimapur is 927km sq. The district has a population of 379,769.(**District Industrial Profile Report of Dimapur District ,[Code:06],2015**)

Selection of Respondents

A total of 120 respondents were selected randomly from 6 villages based on the soybean growers for the present study. There are 16 villages in Kuhuboto block out of which 6 villages namely (Lotovi village, Suhoi , Tokugha, Nizhevi, S.Hotovi, Luzheto) were selected through purposive sampling based on highest grown area under soybean production. Data was collected with the help of pre-structured interview schedule. The descriptive research design was used for the present research study at the month of April and May, 2022 where 120 number of farmers were interviewed from each selected (6) villages among soybean growers.

The socio-economic variables selected for the study were age, education, family size, family type, land holding, annual income, farm experience, extension contact, mass media exposure and sources of information utilization resources

Statistical analysis of data

The entire data was transformed into normal score for tabulation. The independent variables as well as dependent variable were categorized as low, medium and high or the term applicable so far on the basis of score obtained. Keeping in view the objectives of the study and to draw logical conclusion the statistical tests i.e. frequency, percentage, mean, standard deviation and correlation coefficient were used for analyzing and interpretation of the data.

Results and Discussion:

1. **Socio-economic and personal characteristics of the respondents.**

   Majority (62.5%) of the respondents were middle aged people, (30.83%) of the respondents had education up to Upper primary school level (**Table 1**). Majority (90.83%) of the respondents were married, (74.17%) had nuclear family, (63.33%) had up to 5 members and (55.83%) of the respondents lived in semi-cemented house. (**Table 1**) It was also found that majority of the respondents had

farming experiences between (10 to 20 years) in cultivation. **(Table 1)** A large number of the respondents had medium level of income. Most of the respondents also had social contacts with NSRLM**. (Table 1)** It was found that (49.17%) of respondents read newspaper sometimes, (61.67%) daily watch television and(79.17%)never listen to radio. **(Table 1).** Majority (64.17%) of the respondents were frequently interacting with progressive farmers, sometimes (54.17%) with neighbours, (64.17%) with relatives sometimes and (55.83%) frequently interact with friends. **(Table 1)**

Table 1. Socio-economic and personal characteristics of farmers among soybean growers.

S.no	Independent Variables	Category	Frequency	Percentage
1.	Age	Young(upto 35)	**26**	**21.67**
		Middle Age(36-55)	**75**	**62.5**
		Old(Above 55)	**19**	**15.83**
2	Education	Illiterate	**11**	**9.17**
		Lower Primary	**35**	**29.17**
		Upper Primary	**37**	**30.83**
		High School	**18**	**15**
		Secondary School	**10**	**8.33**
		Graduate and above	**9**	**7.5**
3	Marital Status	Married	**109**	**90.83**
		Unmarried	**11**	**9.17**
4	Type of family	Nuclear	**89**	**74.17**
		Joint	**31**	**25.83**
5	Size of family	Upto 5 members	**76**	**63.33**
		Above 5 members	**44**	**36.67**
6	Type of	Hut	**30**	**25**

	house	Semi-cemented	67	55.83
		Cemented	23	19.17
7	Annual Income	Low(Less than 60,000)	39	32.5
		Medium(60,000-1,20,000)	68	56.67
		High(Above 1,20,000)	13	10.83
8	Total land holdings	Marginal(<2 acre)	39	32.5
		Small(2-4acre)	63	52.5
		Medium(4-6)	14	11.67
		Large(>6 acre)	4	3.33
9	Farming Experience	Below 10 years	23	19.17
		10-20 years	72	60
		Above 20 years	25	20.83
10	Extension contact	Low	15	12.5
		Medium	59	49.17
		High	46	38.33
11	Mass media exposure	Radio	Daily	00	00
			Sometimes	25	20.83
			Never	95	79.17
		Television	Daily	74	61.67
			Sometimes	14	11.67
			Never	32	26.66
		Newspaper	Daily	20	16.67
			Sometimes	59	49.17

Sn				F	%
			Never	**41**	**34.16**
	Magazines		Daily	**00**	**00**
			Sometimes	**00**	**00**
			Never	**120**	**100.00**
12	Information sources utilization	Neighbor	Frequently	**30**	**25**
			Sometimes	**65**	**54.17**
			Never	**25**	**20.83**
	Friends		Frequently	**67**	**55.83**
			Sometimes	**47**	**39.17**
			Never	**6**	**5.00**
	Relatives		Frequently	**15**	**12.50**
			Sometimes	**77**	**64.17**
			Never	**28**	**23.33**
	Progressive Farmers		Frequently	**77**	**64.17**
			Sometimes	**28**	**23.33**
			Never	**15**	**12.50**

Knowledge Level of the Farmers

Table 2:- Distribution of the knowledge level of the respondents about improved cultivation practices of Soybean cultivation.

Sn	Statements	Knowledge level		
		Fully correct F (%)	**Partially correct**	**Not correct**
1.	Varieties recommended i. Local varieties	61 (50.83%)	33 (27.50%)	26 (21.67%)

	ii. Improved and high yielding varieties			
2.	Sowing time (Mid June – End June)	98 (81.67%)	13 (10.83%)	9 (7.50%)
3	Seed treatment	20 (16.67%)	19 (15.83%)	81 (67.50%)
4	Seed rate (55-65kg/ha with 30-45 cm spacing)	38 (31.67%)	63 (52.50%)	19 (15.83%)
5	Field preparation i. Deep ploughing in early summer to kill harmful insects and flies ii. Followed by spreading cow manure to enrich field iii. Well drained soil with pH 6.0-7.5	15 (12.50%)	95 (79.17%)	10 (8.33%)
6	Method of sowing i. Seed drill method	7 (5.84%)	22 (18.33%)	91 (75.83%)
7	Spacing i. RxR= 45-50cm ii. SxS= 4-7cm	45 (37.50%)	67 (55.83%)	8 (6.67%)
8	Recommended quantity of FYM to be applied - FYM@10t ha-1	13 (10.83%)	38 (31.67%)	69 (57.5%)
9	Methods of irrigation i. Irrigate immediately after sowing ii. Life irrigation on the 3rd day iii. Intervals of 7-10 and 10-15 days during summer and winter season respectively	25 (20.83%)	87 (72.50%)	8 (6.67%)
10	Weed management i. Hand hoeing/traditional	39 (32.50%)	72 (60.00%)	9 (7.50%)
11	Disease control i. Anthracnose, cercospora leaf spot and	11 (9.17%)	34 (28.33%)	75 (62.5%)

	pot and stem blight-foliage applied fungicides			

12	Pest control
	  i. Deep summer ploughing
	  ii. Field sanitation: remove the infested plant parts at least once in 10days and bury them in compost pit to monitor and reduce the populations.
		9
		(7.5%)
			26
			(21.67%)
				85
				(70.83%)

13	Harvesting
	  - Leaves start falling and pods look dry
	  - Moisture should not be more than 14percent
	  - Dry harvesting crop for 8-10days at the threshing floor
		94
		(78.33%)
			26
			(21.67%)
				-

14	Yield
	  - 1600-2000kg/ha under rainfed condition
	  - 2000-2500kg/ha under irrigated condition
		52
		(43.33%)
			48
			(40.00%)
				20
				(16.67%)

The above table 2 shows that 21.67 per cent of the respondents were not known about the improved varieties of soybean whereas 27.50 per cent were partially known and 50.83 per cent of the respondents were fully correct about the improved varieties of soybean.

About 81.67% of the respondents were fully correct about the sowing time of improved cultivation practices of soybean whereas 10.83% were partially correct followed by 7.50% of the respondents were not correct about the sowing time.

About 16.67% of the respondents were fully correct about the seed treatment of improved cultivation practices of soybean whereas 15.83% were partially correct followed by 67.50% of the respondents were not correct about the seed treatment.

About 31.67% of the respondents were fully correct about the seed rate of improved cultivation practices of soybean whereas 52.50 % were partially correct followed by 15.83% of the respondents were not correct about the knowledge of seed rate.

About 12.50 % of the respondents were fully correct about the field preparation of improved cultivation practices of soybean cultivation whereas 79.17 % were partially correct followed by 8.33% of the respondents were not correct about the field preparation.

About 5.84 % of the respondents were fully correct about the method of improved cultivation practices of soybean cultivation whereas 18.33% were partially correct followed by 75.83% of the respondents were not correct about the method of sowing.

About 37.50% of the respondents were fully correct about the spacing of improved cultivation practices of soybean whereas 55.83% were partially correct followed by 6.67% of the respondents were not correct about the spacing.

About 10.83% of the respondents were fully correct about the recommended quantity of FYM to be applied for improved cultivation practices of soybean whereas 31.67% were partially correct followed by 57.5% of the respondents were not correct about it.

About 20.83% of the respondents were fully correct about knowledge of methods of irrigation of improved cultivation practices of soybean cultivation whereas 72.50% were partially correct followed by 6.67% of the respondents were not correct about the methods of irrigation.

About 32.50% of the respondents were fully correct about the weed management of improved cultivation practices of soybean cultivation whereas 60.00% were partially correct followed by 7.50% of the respondents were not correct about the weed management.

About 9.17% of the respondents had full knowledge about disease control of improved cultivation practices of soybean cultivation whereas 28.33 % were partially correct followed by 62.5% of the respondents were not correct about the disease control.

About 7.5% of the respondents were fully correct about the pest control of improved cultivation practices of soybean cultivation whereas 21.67% were partially correct followed by 70.83% of the respondents were not correct about the knowledge of pest control.

About 78.33% of the respondents were fully correct about the harvesting of improved cultivation practices of soybean cultivation while 21.67% of the respondents were partially correct about harvesting.

About 44.33% of the respondents were fully correct about the yield of improved cultivation practices of soybean whereas 40% were partially correct followed by 16.67% of the respondents were not correct about the yield of soybean.

Table 3: Distribution of the respondents based on the level of knowledge towards improved cultivation practices of soybean.

S.N	Category	Frequency	Percentage	Mean	SD
1	Low (<25.15)	19	15.83		
2	Medium (25.15-30.55)	85	70.84	27.8	2.6
3	High (>30.55)	16	13.33		
	Total	120	100.00		

Table 3 reveals that the level of knowledge of respondents of improved cultivation practices of soybean is medium 70.84% followed by low 15.83% and high 13.33% respectively. Similar findings were found in **Sikarwar (2019).**

Table 4. Association between selected independent variables with knowledge of respondents in improved cultivation practices of soybean cultivation

Association between selected independent variables with knowledge

S/no	Variables	Pearson's correlation coefficient
1	Age	0.053 NS
2	Education	0.110 NS
3	Marital Status	-0.101 NS
4	Type of family	-0.018 NS
5	Family size	-0.024 NS
6	Type of house	0.014 NS
7	Occupation	0.133 NS
8	Land holding	0.335 *
9	Annual income	0.205 *
10	Farming experience	0.079 NS

11	Extension contact	0.271 *
12	Mass media exposure	-0.061 NS
13	Source of information	0.158 NS

* = Significant at p = 0.05%, NS= Non Significant

The result of correlation analysis in above table revealed the significance and non-significance of the socio-economic profile of the people and their level of knowledge of soybean growers.

Table 4 revealed that independent variables like annual income, land holding and extension contact are significantly associated with knowledge of soybean growers. Further, the variables age, education, marital status, type of family, family size, type of house, occupation, farm experience, mass media exposure and source of information was found to be non significant.

Extent of adoption of recommended Soybean Cultivation Practices

Table 5. Distribution of the adoption of the respondents about improved cultivation practices of soybean cultivation.

Sn	Statements	Adoption level		
		FA	PA	NA
1	Varieties recommended	80 (66.67%)	27 (22.5%)	13 (10.83%)
2	Planting/ sowing time	107 (89.17%)	-	13 (10.83%)
3	Field preparation	16 (13.33%)	95 (79.17%)	9 (7.5%)
4	Method of sowing	-	21 (17.5%)	99 (82.5%)
5	Manures and fertilizers	16 (13.33%)	27 (22.5%)	77 (64.17%)
6	Spacing	26 (21.67%)	70 (58.33%)	24 (20%)
7	Seed rate	22	87	11

		(18.33%)	(72.5%)	(9.17%)
8	Inter cultivation	20 (16.67%)	24 (20%)	76 (63.33%)
9	Irrigation	12 (10%)	76 (63.33%)	32 (26.67%)
10	Weed management	12 (10%)	52 (43.33%)	56 (46.67%)
11	Pest control	9 (7.5%)	22 (18.33%)	89 (74.17%)
12	Disease control	5 (4.17%)	21 (17.5%)	94 (78.33%)
13	Harvesting	93 (77.5%)	22 (18.33%)	5 (4.17%)
14	Yield per hac	66 (55%)	32 (26.67%)	22 (18.33%)

The above table shows that a majority of 66.67% of the respondents were using the recommended varieties of improved cultivation practices of soybean while 22.5% of the respondents partially adopted and 10.83% of the respondents did not adopt these recommended varieties.

About 89.17% of the respondents had fully   adopted the optimum time of sowing of improved cultivation practices of soybean whereas 10.83% of the respondents did not adopt the sowing time of the improved cultivation practices of soybean.

About 13.33% of the respondents had fully adopted the recommended field preparation of improved cultivation practices of soybean whereas 79.17% of the respondents partially adopted and 7.5% of the respondents did not adopt the field preparation of the improved cultivation practices of soybean.

About 17.5% of the respondents partially adopted the recommended method of sowing of improved cultivation practices of soybean whereas 82.5% of the respondents did not adopt the recommended method of sowing of improved cultivation practices of soybean.

It is observed that about 13.33% of the respondents fully adopted manure and fertilizer dose as per recommendation whereas 22.5% of the respondents had adopted dose below recommendation and majority 64.17% of the respondents has not adopted the recommended manure and fertilizer of improved cultivation practices of soybean.

About 21.67% of the respondents fully adopted recommended spacing whereas majority 58.33% of respondents partially adopted recommended spacing and 20% of respondents did not adopt the recommended spacing of improved cultivation practices of soybean.

Majority of respondents 72.5% had partially adopted recommended seed rate whereas 18.33% of respondents had fully adopted recommended seed rate and about 9.17% respondents has not adopted the seed rate of improved cultivation practices of soybean.

Majority 63.33% of the respondents has not adopted the inter cultivation practices whereas 20% of the respondents has partially adopted and about 16.67% of the respondents has fully adopted the inter cultivation practices of improved cultivation practices of soybean.

 From the table it is seen that majority 63.33% of respondents had partially adopted recommended irrigation while 10% of the respondents had adopted fully and 26.67% has not adopted the recommended irrigation.

About 46.67% of the respondents did not adopt intercultural operation as per recommendation while 43.33% of respondents partially adopted as recommended and 10% of the respondents fully adopted the intercultural operations i.e. weed management of improved cultivation practices of soybean.

From the table it is highlighted that majority 74.17% of the respondents had not adopted recommended pesticide/ insecticides. While 7.5% of the respondents had fully adopted recommended insecticides/ pesticides and about 18.33% respondents had partially adopted it.

About 4.17% respondents had adopted recommended control measure for diseases. Whereas 17.5% of respondents had partially adopted the recommended control measures for diseases and about majority 78.33% of the respondents had not adopted recommended control measures of diseases of improved cultivation practices of soybean.

From the table it is seen that majority 77.5% of the respondents had harvested crops as recommended while 4.17% of respondents had not adopted and 18.33% partially adopted the recommended time for harvesting of soybean.

Majority 55% of respondents had fully adopted the recommended yield while 26.67% had partially adopted and 18.33% of the respondents had not adopted the recommended yield of soybean cultivation.

Table 6: Distribution of the respondents based on the adoption towards improved cultivation practices of soybean cultivation.

Sl no	Category	Frequency	Percentage	Mean	SD
1	Low (<27.45)	19	15.83		
2	Medium (27.45-30.81)	79	65.84	29.1	1.6
3	High (>30.81)	22	18.33		
	Total	120	100.00%		

Table 6 revealed that 65.84% of respondents were having medium level of adoption followed by 18.33% of respondents having high level of adoption whereas 15.83% of respondents were having low level of soybean crop.

Similar findings were also reported by **Kumar(2018)** and **Patodiya (2018).**

Association between selected independent variables with adoption of farmers towards improved cultivation practices of soybean cultivation.

Table 7. Association between selected independent variables with adoption of Soybean cultivation practices by the farmers

S.No	Variables	Pearson's correlation coefficient
1	Age	0.038 NS
2	Education	0.151 NS
3	Marital status	-0.128 NS
4	Type of family	0.009 NS
5	Family size	0.073 NS
6	Type of house	-0.090 NS
7	Occupation	0.0006 NS
8	Land holding	0.386 *
9	Annual income	0.425 *
10	Farming experience	0.116 NS
11	Extension contact	0.395 *
12	Mass media exposure	0.105 NS
13	Source of information	0.073 NS

* = Significant at p = 0.05%, NS= Non Significant

Table 7 revealed that independent variables like annual income, land holding, extension contact are significantly associated with adoption of soybean growers. Further, the variables age, education, marital status, type of family, family size, type of house, occupation, farming experience, mass media exposure and source of information was found to be non significant.

Conclusion

It is concluded from the present study that majority of the respondents were middle aged people, had education up to Upper Primary school level, majority are married, had nuclear family up to 5 members and most of them lived in semi-cemented house. Majority of the respondents had farming experiences between 10 to 20 years. A large number of the respondents had medium level of income. Most of the respondents also had social contacts with NSRLM. It was found that large number of respondents had medium level of knowledge and medium level of adoption.

Variables like annual income, land holding, extension contact are significantly associated with knowledge of improved cultivation practices of soybean. Further, the variables age, education, marital status, type of family, family size, type of house, occupation, farming experience, mass media exposure and source of information was found to be non significant whereas for adoption by the respondents, variables like annual income, land holding, extension contact are significantly associated with adoption of improved soybean cultivation practices. Further, the variables age, education, marital status, type of family, family size, type of house, occupation, farming experience, mass media exposure and source of information was found to be non significant.

The main constraints faced by the respondents were lack of proper resources and capital , high cost of input, lack of proper information at time, lack of consultancy/extension services , shortage of labors. They have suggested that seeds and other inputs should be made available at the village/block level, trainings should be given according to locally available resources and more training programs should be carried out by various extension workers which gives the farmers a wider range of knowledge regarding various types of cultivation practices as well as various schemes they are able to apply so as to assist them in balancing their earning and the subsidiaries provided by the government.

The researcher hopes that this research study would come in use to understand the socio-economic and personal characteristics of soybean growers with their level of knowledge and adoption of improved cultivation practices of Soybean cultivation.

Consent

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

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