Extent of adoption of recommended cultivation practices of maize (*Zea mays*) in the state of Nagaland

ABSTRACT

Agriculture is considered as the backbone of Nagaland's economy where about one-third of the population depends on agriculture. Major variants of cereals produced in Nagaland are rice, maize and millet. The two most common methods of cultivation among the Naga tribes are jhum and terrace cultivation which makes about 86 per cent of the total cultivable area in Nagaland. With the increasing trend in population, there arises a need to stress more on improving the production and productivity of agriculture so as to overpass the gap between the demand and supply of food grains. A study was carried out in six districts of Nagaland with a sample size of 300 maize farmers to measure the extent of adoption in regard to recommended cultivation practices of maize. The respondents were interviewed personally with the help of structured interview schedule. The data was collected during the year 2019 and were coded, tabulated and analysed using frequency, percentage, mean, standard deviation, co-efficient of variance and Karl Pearson's co-efficient of correlation. Findings revealed that the recommended cultivation which were fully adopted by majority of the respondents was seed bed preparation viz., ploughing (95%), ridges/earthing (95%) and drainage (83.33%). Findings also showed that the computed correlation coefficient r values of operational land holding (r=0.197*), information sources utilization (r=0.931*), extension contact (r=0.905*), innovativeness (r=0.958*), economic motivation (r=0.941*) and achievement motivation (r=0.945*) were positively and significantly correlated with the extent of adoption of recommended cultivation practices of maize.

Keywords: Extent of Adoption, Extension, Maize farmer, Recommended cultivation practices.

1. INTRODUCTION

In India, maize is the third most important cereal crop cultivated after rice and wheat covering an area of about 9.47 m ha with a production of 28.72 mt (Directorate of Economics & Statistics, DAC&FW, 2018-19). India stands fifth in global maize production. Maize is grown in India throughout the year with *kharif* season being the main season for its

cultivation covering nearly 80 per cent area of maize. Productivity of maize in India at 2.5 mt per hectare is less than half the global average of 5.5 mt per hectare. Presently, production of maize is 28.72 million tonnes and projected demand of maize to be 45 million tonnes by 2030. This demand can only be made by increasing the area under maize cultivation and technological interventions such as adopting high yielding varieties and improved package of practices.

Rogers (1962) explained adoption as the decision to make full use of an idea or innovation as the best course of action available. Rogers and Shoemaker (1971) also stated adoption as making full use of an innovation as the best course of action available.

Maize is an important crop which ranks next to rice in the state of Nagaland. It is grown for consumption purpose as well as feed and fodder for farm animals. Maize is usually grown as a pure crop in some instances and mostly grown as an inter-crop with different crop combinations such as jhum paddy, vegetables, legume crops etc. Maize is locally known as Seko, Metata, Tsungro, Kholakithi, Ongchuk etc. by different tribes of the state. The maize cultivars grown varies from popcorn, sticky and sweet corn types. Total area under maize cultivation is 68960 ha with a production of about 136540 mt (Nagaland Statistical Handbook, 2018). Maize can be grown in all over the state in the *kharif* season, some of the varieties can be also grown successfully in the location such as river valley and plain areas in the Rabi season.

With the ever-increasing trend in population, there is a high rise in global demand of food grains among consumers which can only be met by increasing the global agricultural production by a larger percentage. But to meet these challenges of global shortage of food grains, it is very crucial that the farmers and the farming community adopt and put into practice improved and evolving farming technologies for improved crop yield and higher sustainable crop production. In research and agricultural technology, adoption of improved farming technologies by the farmers is the supreme test and should be the supreme goal as well. Keeping this in view, the present study was carried out to assess the extent of adoption of recommended cultivation practices of maize by the farmers.

2. METHODOLOGY

The state of Nagaland was selected as the study area from which six districts *viz.*, Dimapur, Kohima, Wokha, Mokokchung, Tuensang and Zunheboto were selected

purposively for the study keeping in view the area and production of maize in these districts. For selection of the respondents, a multistage purposive cum random sampling design was followed. From each district, two rural development blocks were selected randomly and two villages from each rural development blocks were selected randomly thus making a total of 24 villages. Finally, a total of 300 maize farmers were selected as respondents using random sampling technique. The data were collected personally by the researcher through the means of personal interview technique by administering a structured schedule.

Extent of Adoption

Extent of adoption was operationalised as the degree to which a farmer accepts and adopts recommended cultivation practices of maize. For measuring the extent of adoption of recommended cultivation practices of maize, the recommended package of practices of maize developed by the Department of Agriculture Nagaland was followed. In order to check the relevancy of the recommended package of practices of maize, judges rating was conducted where the developed package of practices was mailed to various scientists, agricultural professors and KVK officials where the experts ranked each practice on the basis of its relevancy *viz*., highly relevant, moderately relevant and not relevant. Based on the responses received, the package of practices of maize recommended by the Department of Agriculture Nagaland was found to be highly relevant therefore this package of practices was followed to measure the extent of adoption of recommended cultivation practices of maize.

Three adoption categories namely 'full', 'partial' and 'low' were given for each of the practices respectively. Frequency and percentage were calculated for each category of responses by the respondents based on the respondent's compliance with recommended practices as 'full adoption' when the respondent fully complied with the recommendations for that practice, 'partial adoption' when the respondent partially complied with the recommendations for that practice and 'no adoption' when the respondent did not comply with the recommendations at all, respectively.

3. RESULTS AND DISCUSSIONS

3.1 Extent of Adoption of Recommended Cultivation Practices of Maize by the Farmers

Table 1. Extent of adoption of recommended cultivation practices of maize N=300

CULTIVATION PRACTICES		EXTENT OF ADOPTION		
		FULL	PARTIAL	LOW
Seed bed preparation	Ploughing	285(95%)	15(5%)	0(0%)
	Ridges/Earthing	285(95%)	15(5%)	0(0%)
	Drainage	250(83.33%)	15(5%)	35(11.67%)
Sowing of seeds	Sowing time	105(35%)	141(47%)	54(18%)
	Seed rate (20kg/ha)	63(21%)	183(61%)	54(18%)
	Spacing	90(30%)	146(48.67%)	64(21.33%)
	Sowing methods	102(34%)	198(66%)	0(0%)
Manures and fertilizers	FYM @25-30 cart loads	0(0%)	51(17%)	249(83%)
	NPK	0(0%)	57(19%)	243(81%)
Irrigation	Flowering and grain filling stage (1-2 irrigation)	20(6.67%)	66(22%)	214(71.33%)
	Winter seasons (5-8 irrigations at different growth stages)	20(6.67%)	36(12%)	244(81.33%)
Weed management	Hand weeding at 30 DAS	102(34%)	198(66%)	0(0%)
	Hand weeding at 60 DAS	102(34%)	198(66%)	0(0%)
	Earthing up	35(11.67%)	69(23%)	196(65.33%)
	Chemical weeding (Atrazine @1.5 kg/ha)	0(0%)	57(19%)	243(81%)

CULTIVATION PRACTICES	EXTENT OF ADOPTION

			FULL	PARTIAL	LOW
Insect-pest and disease control	**Pest**	**Control**			
	Stem borer	4% Endosulfan or carbaryl granulesr	0(0%)	57(19%)	243(81%)
		release*trichogramma*	55(18.33%)	24(8%)	221(73.67%)
	Army	Spray crop with endosulfan 0.05%	0(0%)	23(7.67%)	277(92.33%)
	Grey weevil	Spray crop with 0.05% Metasystox 25 EC or	0(0%)	57(19%)	243(81%)
		0.06% Rogor 30 EC	0(0%)	57(19%)	243(81%)
	Disease	**Control**			
	Leaf spot	Use resistant varieties and practice crop rotation	87(29%)	171(57%)	42(14%)
	Seedling blight	Seed treatment with captan or Thiram @ 3gm/kg of seed	0(0%)	23(7.67%)	277(92.33%)
	Downy mildew	Spray the crop with Dithane M-45 @ 0.2%	0(0%)	57(19%)	243(81%)
	Crop rotation		87(29%)	171(57%)	42(14%)
	Chemical control		0(0%)	17(5.67%)	283(94.33%)
Harvesting	Estimation of moisture content (25-30%)		102(34%)	198(66%)	0(0%)
	Drying before shelling		131(43.67%)	143(47.67%)	26(8.66%)

Table 1 reveals that under seed bed preparation practices, 95 per cent of the respondents fully adopted ploughing and ridges/earthing practices respectively. While 83.33 per cent fully adopted drainage practices.

Under sowing of seeds practices, majority (47%) partially adopted sowing time, 61 per cent of the respondents partially adopted seed rate (20 kg/ha) and 48.67 per cent partially adopted spacing and 66 per cent partially adopted sowing methods.

For manures and fertilizers, 83 per cent of the respondents did not adopt FYM and 81 per cent did not adopt NPK.

Majority of the respondents did not adopt flowering and grain filling stage 1-2 irrigations (71.33%) and winter seasons 5-8 irrigation at different growth stages (81.33%) respectively under irrigation practices.

Under weed management, 66 per cent of the respondents partially adopted hand weeding at 30 DAS and hand weeding at 60 DAS respectively, 65.33 per cent did not adopt earthing up and 81 per cent did not adopt chemical weeding (Atrazine @1.5 kg/ha).

Under insect-pest and disease control, majority of the respondents did not adopt recommended chemical control for pest such as stem borer i.e., 4% carbaryl granules (81%) and release trichogramma (73.67%), army worm i.e., Spray crop with endosulfan 0.05% (92.33%) and grey weevil i.e., Spray crop with 0.05% Metasystox 25 EC (81%) and 0.06% Rogor 30 EC (81%).

For disease control, 57 per cent of the respondents partially adopted use of resistant varieties for leaf spot, 92.33 per cent did not adopt seed treatment with captan or Thiram @ 3gm/kg of seed for seedling blight, 81 per cent did not adopt spray the crop with Dithane M-45 @ 0.2% for downy mildew, 60 per cent partially adopted crop rotation and 94.33 per cent did not adopt chemical control.

Lastly, 66 per cent of the respondents partially adopted estimation of moisture content (25-30%) and 47.67 per cent partially adopted drying before shelling respectively under harvesting practices.

Table 2. Distribution of respondents based on their extent of adoption in regard to recommended cultivation practices of maize N=300

Adoption	Range	Frequency	Percentage	Mean	SD	CV

Level						
Low	<43.18	35	11.67			
Moderate	43.18-52.58	207	69	47.88	4.70	9.81
High	>52.8	58	19.33			

Table 2 shows that more than half (69%) of the respondents had moderate level of adoption, followed by 19.33 per cent having high adoption level and 11.67 per cent having low adoption level.

Table 2 indicated a moderate level of adoption of recommended cultivation practices of maize by the farmers. This may be due to farmers still practicing traditional and conventional farming methods. And, also most importantly due to the fact that farmers practice natural and organic way of farming so most of the recommended chemical control for pest and disease management practices are not being followed by the farmers. This finding is similar to that of Dhruw (2008), Kothari *et al*. (2010) and Netam *et al.* (2018).

3.2 Relationship between Selected Profile Characteristics with Extent of Adoption of Recommended Cultivation Practices of Maize

An attempt was made to find out if there exists any relationship of the profile characteristics of farmers *viz*., age, gender, education, family type, family size, occupation, operational land holding, annual income, farming experience, social participation, information sources utilization, extension contact, cosmopoliteness, innovativeness, economic motivation, scientific orientation, achievement motivation and attitude towards shifting cultivation with extent of adoption of recommended cultivation practices of maize.

Table 3. Correlation coefficients of extent of adoption of maize with selected profile characteristics of the respondents (N=300)

Sl. No.	Independent variables	'r' value

1.	Age	0.076
2.	Gender	0.039
3.	Education	-0.032
4.	Family type	0.060
5.	Family size	0.014
6.	Occupation	0.057
7.	Operational land holding	0.197*
8.	Annual income	-0.263*
9.	Farming experience	0.079
10.	Social participation	0.049
11.	Information sources utilization	0.931*
12.	Extension contact	0.905*
13.	Cosmopoliteness	-0.024
14.	Innovativeness	0.958*
15.	Economic motivation	0.941*
16.	Scientific orientation	0.014
17.	Achievement motivation	0.945*
18.	Attitude towards shifting cultivation	-0.081

* Significant at 0.05 level probability

** Significant at 0.01 level probability

Table 3 shows that the computed correlation coefficient r values of operational land holding (r=0.197*), information sources utilization (r=0.931*), extension contact (r=0.905*), innovativeness (r=0.958*), economic motivation (r=0.941*) and achievement motivation (r=0.945*) were positively and significantly correlated with the extent of adoption of recommended cultivation practices of maize and annual income (r=-0.263*) was found to be negatively significant. Whereas, computed 'r' value of age, gender, education, family type, family size, occupation, farming experience, social participation, cosmopoliteness, scientific

orientation and attitude towards shifting cultivation were not significant with the extent of adoption of recommended cultivation practices of maize.

Table 3 showed a significant relationship between operational land holding and extent of adoption of recommended cultivation practices of maize. It can be inferred that as operational land holding increased there was more adoption of recommended cultivation practices of maize. This might be due to the reason that a farmer with more operational land holding will be able to cultivate more and experiment on latest modern technology to see the impact. A positive result and improved crop yield will motivate the farmer to adopt more sophisticated and modern farming technologies. The finding is similar to that of Akumbole *et al.* (2018).

Table 3 also showed a positive significant result with information sources utilization and extent of adoption of recommended cultivation practices of maize. It might be due to the reason that farmers utilizing various information sources were able to access required farm information and knowledge on maize farming practices. Exposure to various mass media enables a farmer to gain knowledge and information related to modern farming technologies leading them to adopt it.

Table 3 also revealed that extension contact was found to be positively significant with extent of adoption of recommended cultivation practices of maize as farmers with more extension contact are more likely to adopt new practices. Farmers having high extension contact with ATMA, extension officers, agriculture officers, KVKs etc are supplemented with latest knowledge and farm information enabling them to gain a better insight and decision-making ability to adopt new technologies. This finding is similar to that of Akumbole *et al.* (2018).

Table 3 showed a significant relationship between innovativeness and extent of adoption of recommended cultivation practices of maize. It can be inferred that farmers with high innovativeness will adopt the recommended practices as an innovative farmer are the first to introduce and adopt new ideas and methods into a farming community for better result and outcome. An innovative farmer has more positive orientation towards latest technologies and tries to acquire new knowledge and information on recent farming technology and adopts the new farming technology for positive results. The finding is similar to that of Thiyagarajan (2011) and Singha and Baruah (2011).

Table 3 revealed a positive significant relationship between economic motivation and extent of adoption of recommended cultivation practices of maize. This might be due to the reason that farmers with more economic motivation will be oriented towards maximum profit-making by adoption of modern farming technology. The finding is similar to that Singha and Baruah (2011) and Thiyagarajan (2011).

Table 3 also revealed that achievement motivation was positively significant with extent of adoption of recommended cultivation practices of maize as farmer with high achievement motivation will want to achieve more, try to compete and perform better than the other farmers by means of adopting the new improved farming practices. They tend to strive and work harder and better than their peers to achieve more.

4. CONCLUSION

The overall extent of adoption of recommended cultivation practices of maize was found to be of medium level. This may be due to farmer's favourable attitude towards traditional and conventional farming practices and lack of awareness or sceptical nature towards recommended cultivation practices. Also, most of the farmers practice organic way of farming and do not practice application of chemical fertilizers and chemical control of disease and pest management. Appropriate research and extension strategies should be undertaken by concerned departments to impart knowledge and awareness towards improved cultivation practices through extensive training, demonstrations and exhibition programmes etc., to increase the extent of adoption of the farmers. Also, suitable modifications in the package and practices of recommended cultivation practices should be made by giving priority on Integrated Nutrient Management i.e., use of organic manures and bio-fertilizers, Integrated Pest and Disease Management strategies i.e., use of natural and biological controls.

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