

Crop Diversification of Small and Marginal Farmers for Their Household Food Availability in Flood Affected Areas of Assam, India

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ABSTRACT

The present study was carried out in two flood affected districts viz. Jorhat and Dhemaji districts of Assam in order to assess the extent of crop diversification, food availability and problems faced by small and marginal farmers in crop diversification. A total of 96 farmers were selected randomly from eight villages of two districts and data were collected through personal interview by pre tested structured schedule. Simpsons' index of diversification was used to assess the crop diversification. The findings reveal that majority sample small and marginal farmers belonged to medium level of crop diversification with SID (Simpson Index of Diversity) ranges from 0.18 to 0.66. This indicates farmers of flood affected area of two districts followed crop diversification. The mean SID values of 2010 and 2014 are 0.42 and 0.48 respectively. The shifting of mean SID value in 2010 and 2014 was found statistically non significant ($t=0.101$) indicates no significant change of crop diversification from 2010 to 2014. The findings also reveal that per capita availability of cereals and vegetables were found surplus as against the Recommended Dietary Allowance (RDA) with 15.36 per cent and 82.00 per cent respectively. But it was found deficit in oilseed and pulse with 50.00 per cent and 56.25 per cent per capita per day respectively. Problems reported by small and marginal farmers for crop diversification in order of rank were frequent price flocculation, perishable nature of horticulture crops, higher labour wage, and existence of middle man in marketing. Proper extension policy and intervention for popularizing suitable crops in flood affected area will be benefited the small and marginal farmers through crop diversification. Enhancing marketing support, farm mechanization and popularizing post harvest technologies may motivate farmers for crop diversification

Key words: *Crop diversification; Simpson index of diversity; Small and marginal farms;*

Agriculture is considered as a strong option and fundamental instrument for spurring growth and sustainable development, poverty reduction, and enhancing food security in developing countries. Presently 795 million of total world population of the world is in food insecurity and 10.9 per cent population of the world is suffering malnutrition (Annon, 2015). In India the percentage of population is suffering in malnutrition is 14.5 per cent. Again, there is a gradual decrease in operational land holding of farmers. According to the agriculture census, 2010-11, the average land holding of farmers at national level is 1.15 ha while in Assam it is 1.10 ha. Again, flood is the most frequently occurred natural disasters in Assam causes

for crop loss during *kharif* seasons and loss of about 7.40 per cent crop land since 1954 with average annual loss of land area 8000 ha. The flood prone area of Assam is four times higher than the national mark of the flood prone area of the country. On the other hand, 85.57 per cent farmers of the state belong to small and marginal farmer category concentrated in 48.75 per cent cultivated area. In this context, Crop diversification may be one option for farmers of Assam for sustaining food security and farm income. *De and Chattopadhyay (2010)* reported that attention on high value crops with available farm inputs may provide a stable economic base of the poor peasants. Diversification of activities is defined as the process by which rural households build

a growing portfolio of activities and various assets to survive and improve their standard of living (Ellis, 2000). It is an important strategy which makes it possible to reduce vulnerability (Niehof, 2004). Crop diversification is intended to give a wider choice in the production of a variety of crops in a given area so as to expand production related activities on various crops and also to lessen risk. Crop diversification is generally viewed as a shift from traditionally grown less remunerative crops to more remunerative crops. In view of socio-economic and environmental problems arising from monoculture, there is now a growing emphasis on crop diversification in developing countries.

In Assam paddy cultivation occupies 92.96 per cent of the net cropped area and 62.6 per cent of the Gross Cropped area in the State during the year 2015-16 and about 54 per cent percentage of net area sown is under mono cropping. (Annon, 2016-17). From the above status, it is seen that more than half of the net area sown is under mono cropping. So, it is very difficult to raise the economic status of the farmers and also to escape from the risk of crop failure due to natural calamities by growing a single crop throughout the year. In this context, this study was planned to assess the extent of crop diversification by small and marginal farmers and problems faced by them for crop diversification.

METHODOLOGY

The study was carried out in two district of Assam namely Dhemaji and Jorhat districts which are experienced on an average 3-4 times floods in a year. All total 96 small and marginal farmers were selected as respondents for the study from the flood affected areas of the two districts which were inundated with flood water by 3-4 times in a year. A structure schedule was prepared for collection of primary data. Two reference years 2010 and 2014 was taken into account for assessing the extent of crop diversification. For

estimation of crop diversification, Simpson's index of Diversification was used. Simpson Index of Diversity is calculated as

$$SID=1-P_i^2$$

Where SID= Simpson Index of Diversity,

P_i = Proportionate area of the i^{th} crop in the total cropped area. The index ranges between 0 and 1. If there is specialization, the index moves towards Zero. In other words for $P_i^2=1$, there will be complete specialization. If only one crop is grown by the respondent. $P_i=1$ and $SID=0$. As the number of crop increases, the shares (P_i) decline, as the sum of squared shares, so that SID approaches to 1.

The nature and patterns of diversification were examined by looking into temporal changes in area, production and value of different crops. The collected data were coded, tabulated and analyzed in accordance with the objectives of the study by utilizing various appropriate statistical procedures like calculating frequency, percentage, mean, standard deviation and t-test.

RESULTS AND DISCUSSION

In the present study, Simpson Index of Diversity was used to measure the extent of crop diversification in terms of crop of the respondents, as it is widely used index to measure diversity and simple to calculate. The crop diversification among the respondent is given in Table -1 on the basis of SID value.

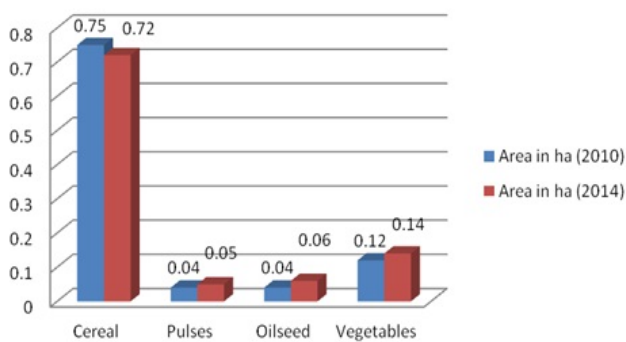
It was observed from the Table 1 that majority of the farmers in 2014 (77.08%) and in 2010 (71.87%) belonged to medium level of crop diversification. On the other hand, 7.29 per cent in 2014 and 10.41 per cent of respondents in 2010 were having high level of crop diversification. Again, 15.62 per cent of respondents in 2014 and 17.70 per cent of respondents in 2010 belonged to low level of diversification. The average extent of crop diversification was found to be 0.48 in 2014 and 0.42 in 2010. It indicates that in comparison to 2010, more number of crops were grown by the respondents in their farms in 2014 for higher return as well as food

Table 1. Distribution of respondents according to their SID value

SID Range	Category	Crop Diversification in 2014 (n=96)			Crop Diversification in 2010 (n=96)			t- value
		No.	Mean	S.D	No.	Mean	S.D	
Below 0.18	Low	15(15.62)	0.48	0.26	17(17.70)	0.42	0.24	0.101
0.18-0.66	Medium	74(77.08)			69(71.87)			
Above 0.66	High	7(7.29)			10(10.41)			
	Total	96(100.00)			96(100.00)			

security (mean 0.42 is skewed towards 0 in 2010). Though the mean value of SID in 2014 was also low but it is found to be greater than 0.42, that indicates crop diversification is increasing but at a lower rate. Similar finding reported by *De UK, and Bodosa, K (2014)*. The reasons might be lack of adequate information, lower extension contact, price fluctuations and small land holdings.

Fig-1: Average Gross cropped Area (Ha) in Study area



From the Figure 1, it was evident that cereal was grown in major area in both reference year 2014 and 2010. But when compared with the year 2010, the area under cereals is seen to declining while the area under pulses, oilseeds, vegetables crops was found to be increased. The diversification towards vegetables is observed to be increasing as the average area under vegetables had increased from 0.12 ha to 0.14 ha. Similarly, average area under oilseed is increased from 0.04 in 2010 to 0.06 ha in 2014. On the other hand, area under pulses, have shown a very minimal increase from 2010 onwards.

Food availability at house hold level: From the existing cropping pattern followed by the respondents, extent of household food security is analyzed by comparing the total production with the Recommended Dietary Allowances (RDA), 2010.

Table 2. Average food availability status (gram/day/ head) in sample area

Crops	Availability	RDA	% of surplus/deficit
Cereals	461.43	400	(+)15.36
Pulses	35	80	(-)56.25
Oilseeds	15	30	(-)50.00
Vegetables	546	300	(+)82.00

(+) indicates surplus and (-) indicates deficit

From the Table 2 it can be observed that average per capita availability of pulse and oilseeds in sample area is lower than the Recommended Dietary

Allowances (RDA). The average per capita availability of cereals is 461.43 gram and vegetables 546.00 gram which are surplus with 15.36 and 82.00 per cent over the RDA. On the other hand that of pulse is 35 gram which are important sources of protein is less than one-half of the recommended intake of pulse. The average per capita oilseed availability is around one-half of the RDA that is 15 gram. This indicates that though availability of cereals and vegetables are in surplus but pulse and oilseed production is still in deficit as far as requirement is concerned. Hence it can be said that existing cropping pattern does not provide a total food security. The reason might be small land holdings, lack of information, poor extension contact, natural calamities etc Intervention either for increasing productivity or area is to be taken by department of agriculture for providing nutrition security in the sample area.

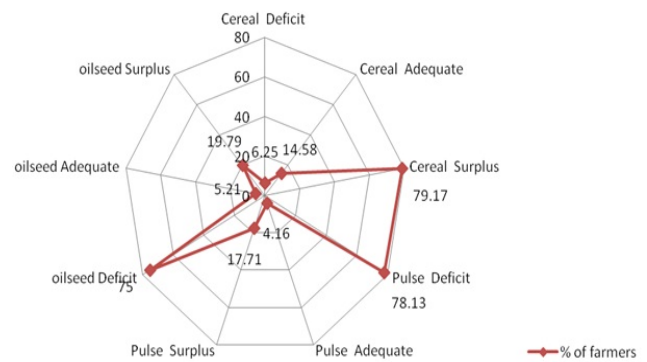


Fig-2: Farmers distribution as per food availability status

Table 3. Distribution of respondents according to their availability of cereals for consumption

Food availability	No. (%)			
	Cereals	Pulse	Oilseed	vegetables
Deficit	6(6.25)	75(78.13)	72(75.00)	32(33.33)
Adequate)	14(14.58)	4(4.16)	5(5.21)	7(7.29)
Surplus	76(79.17)	17(17.71)	19(19.79)	57(59.38)

NB= deficit (< RDA), Adequate (=RDA), Surplus(> RDA)

Again, From the Table 3 it can be observed that majority of the respondents (79.17%) were having surplus in cereals followed by 14.58 per cent were having adequate in cereals and only 6.25 per cent were having deficit in cereals. The reason behind majority of respondents having surplus in cereals might be due to cereal based cropping pattern and majority of the area is under cereals.

Again, it can be seen that majority of the respondents in pulses (78.13%) and in oilseeds (75.00%) were having deficit and it might be due to very low area

allocation to pulses and oilseeds. So, crop diversification towards pulses and oilseeds can be a strategy to satisfy the pulse and oilseeds requirements.

While in case of vegetables, majority of the respondents (59.38%) were having surplus followed by 33.33 per cent were having deficit followed by 7.29 per cent were having adequate level of vegetables. Though there is surplus for majority of respondents, yet one-third of the respondents were having deficit in vegetables. It might be due to the fact that cultivated areas of respondents were low lying areas and not suitable for growing vegetables. Also, growing horticultural crops require managing different operations at the same time and it becomes difficult for the respondents to manage the farm.

Table 4. Distribution of respondents on the basis of problem faced in adopting crop diversification

Category	No.	%	Rank
<i>Input related problem</i>			
Not timely available	34	35.4	XVI
Poor quality seed	39	40.63	XIV
High cost of fertilizers/pesticides	56	58.33	VI
<i>Land utilization problem</i>			
Inadequate availability of land	44	45.83	XI
Poor nutrient availability in soil	28	29.17	XX
<i>Labour mobilization problem</i>			
High cost of hired labour	74	77.08	III
Unavailability of labour	28	29.17	XX
<i>Personal problem</i>			
Difficulty in managing farm operations	62	64.58	V
Lack of courage in taking risk	43	44.79	XII
Lack of formal knowledge	28	29.17	XIX
Difficulty in fencing for large area of field	42	43.75	XIII
<i>Market related problem</i>			
Perishability of horticultural crops	78	81.25	II
Existence of middlemen	67	69.79	IV
High market tax	48	50.00	X
Lack of knowledge of marketing channels	45	46.88	IX
Price fluctuation	81	84.38	I
<i>Fund mobilization problem</i>			
Lack of information about sources of fund	27	28.13	XXI
Complex procedure in getting credit	53	55.21	VIII
Irregularity in repayment of loan	23	23.96	XXII
<i>Infrastructure related problem</i>			
Lack of improved storage facility	32	33.33	XVII
Distant market	56	58.33	VII
Inadequate irrigation facility	38	39.58	XV
No irrigation facility	29	30.21	XVIII

Problems faced by the respondents for crop diversification : It was observed from Table 4 that major problems faced by the farmers in adopting crop diversification were price fluctuation (84.38%), perishability of horticultural crops (81.25%), high cost of hired labour (77.08%), existence of middlemen (69.79%), difficulty in managing different farm operations at the same time (64.58%), high cost of fertilizers/pesticides (58.33%), distant market (58.33%), complex procedure in getting credit (55.21%), and high market tax (50.00%).

The price fluctuation of produce was found to be the major problem in the adoption of crop diversification as it may leads to lower return if price drops. Moreover, perishability of horticultural crops makes it difficult for the farmers to store and as a result the produce are subjected to sale at a lower price while in case of cereals, the farmers can store it and sell at a later date. The crop diversification demands maintaining different farming operations at the same time and it becomes difficult for the farmers to manage the farm only through family labour but the cost of hired labor is high leading to increase in cost of cultivation. The farmers receive low price for their produce due to existence of middlemen. The farmers were reluctant to apply for loan due to complex procedure of application and also lack proper information regarding sources of fund as well as proper marketing channels. High market tax was a reason for less direct selling. For crop diversification, land is inadequate and also they lack courage to take risk of growing another crop. Moreover, most of the fields of the respondents were located at a distant place from their resident and erecting fencing for larger area is became cost intensive. As a result, crop fields were destroyed by the stray animals.

CONCLUSION

The major finding regarding adoption of crop diversification was found to be medium and shows an increasing trend. Motivational programme on crop diversification may be a good intervention. Price fluctuation was found to be the major problem which results in poor return, so intervention should be taken from the concerned authorities to regulate the price. It was found that there were inadequate irrigation facilities such as water pump, proper irrigation infrastructures,

irrigation pipes etc. Therefore, interventions should be taken to provide proper irrigation facilities for drought period. Government should provide proper infrastructural facility like storage facility, market facility, etc. to attract

more farmers in growing horticultural crops which are perishable in nature. Concepts like contract farming should be introduced in the farming sector with a view to mitigate price risk.

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