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ADAPTATION STRATEGIES OF JHUM CULTIVATORS TOWARDS CLIMATE CHANGE IN MOKOKCHUNG DISTRICT, NAGALAND

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ABSTRACT: In the recent years, the impact of climate change for Jhum cultivators has been very apparent as jhum cultivation is purely a rain-fed agricultural system and crop production can be extremely sensitive to year-to-year weather fluctuations. The present investigation was conducted in Ongpangkong block of Mokokchung district of Nagaland. A total number of 120 respondents from 4 villages were selected using proportionate random sampling procedure. Data was collected through pre structured interview schedule and processed through primary and secondary tables and statistical analysis.
The study revealed that the overall adaptation practices towards climate change were medium. Age, farming experience, extension contacts, mass media exposure and social contact were positively significant with the adaptation level towards climate change.

Keywords: Climate change; adaptation strategies; jhum cultivators.

INTRODUCTION:

Jhum (shifting cultivation) has been a part of parcel of the ethnic people living in the North-Eastern states of India. Jhum has been practised by these indigenous people since ages to ensure food security. It is purely a rain-fed agricultural system and is dependent on the rains for irrigation purpose. In Nagaland, major land use pattern continues to be shifting cultivation known as Jhum, which covers 72% of the total arable area of the state. Land under Mokokchung district is mostly cultivated under Jhum paddy of which Ongpangkong range is the highest cultivator of all the six ranges. Out of the state total Jhum paddy cultivated area of 91490 hectares,

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Mokokchung district total cultivated area of Jhum paddy is 9350 hectares *(Statistical handbook of Nagaland 2016-17)* (**Jamir and Khan, 2019).**
Agriculture is strongly dependent on water resources and climatic conditions. Crop production is consequently extremely sensitive as per year-to-year weather fluctuations. Crop diseases or pest infestations are also weather-dependent, and tend to cause more damages in countries with lower technological levels.

Rainfall pattern in recent years in Mokokchung district exhibits uncertainties. The onset of monsoon also appears to be erratic in recent years. Frequent failure of break in monsoon across the state affects the hydro power generator. Most of the places receive heavy rainfall. Crop losses are considerably high during these extremes weather. The heavy monsoon rainfall followed by unusual summer showers affects the paddy production of the state. In short, the climate change scenario in Mokokchung district may be summarized as: excessive rainfall, landslide, decline in forest area, rice likely to be under threat.

RESEARCH METHODOLOGY

The descriptive research design was used for the present study. Multi stage sampling was followed for the present study for the selection of samples. Ongpangkong block was selected by purposive sampling method as it is one of the highest area and production under Jhum Cultivation. The primary data was collected personally from the selected respondents with the help of pre-structured interviews and schedules designed for this study. The secondary data was collected from articles, text books, handbooks, journals, reports, concerned departments, etc.

OBJECTIVES OF THE STUDY:

1. To assess the socio-economic profile of the respondents.
2. To determine the adaptation strategies towards climate change by the jhum cultivators.

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RESULTS AND DISCUSSION

Table 1. Socio-economic profile of the respondents

SL.No.	*Independent Variables*	*Category*	*Frequency*	*Percentage*
1.	**AGE**	Young (upto 35)	9	7.50
		Middle aged (36-55)	67	55.83
		Old (above 55)	44	36.67
2.	**EDUCATION**	Illiterate	16	13.33
		Primary School	6	5.00
		Middle School	23	19.17
		High School	45	37.50
		Secondary School	28	23.33
		Graduate & Above	2	1.67
3.	**FAMILY TYPE**	Nuclear	85	70.83
		Joint	35	29.17
4.	**FAMILY SIZE**	Upto 5	68	56.67
		More than 5	52	43.33
5.	**TYPE OF HOUSE**	Hut	16	13.33
		Semi- cemented	69	57.50
		Cemented	35	29.17

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6.	**ANNUAL INCOME**	Below 1,00,000		43	35.84
		1,00,001 – 2,00,000		70	58.33
		Above 2,00,000		7	5.83
7.	**LAND HOLDING**	Marginal Farmers (<2.5 acre)		13	10.83
		Small Farmers (2.51 to 5.00 acre)		73	60.84
		Medium Farmers (5.0 to 10 acre)		34	28.33
8.	**FARMING EXPERIENCE**	Below 10 years		23	19.16
		10-20 years		50	41.67
		Above 20 years		47	39.17
9.	**EXTENSION CONTACT**	Agri Officer	*Frequently*	7	5.83
			Sometimes	11	9.17
			Never	102	85.00
		AFA	*Frequently*	7	5.83
			Sometimes	24	20.00
			Never	89	74.17
		ATMA	*Frequently*	27	22.50
			Sometimes	64	53.33
			Never	29	24.17
		KVK	*Frequently*	6	5.82
			Sometimes	28	23.34
			Never	85	70.84
		Area	*Frequently*	23	19.17

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		Coordinator	*Sometimes*	91	75.83
			Never	6	5.00
10.	**SOCIAL CONTACTS**	*Low (>5.89)*		19	15.83
		Medium (5.89 – 7.77)		78	65.00
		High (<7.77)		23	19.17
11.	**INFORMATION SOURCES UTILIZATION**	Mass Media Sources	*Low (>15.98)*	12	10.00
			Medium (15.98-18.0)	104	86.67
			High (<18.0)	4	3.33
		Formal Inf. Sources	*Low (>9.5)*	17	14.16
			Medium (9.5-11.4)	81	67.50
			High (<11.4)	18	18.34
		Informal Inf. Sources	*Low (>3.5)*	4	3.33
			Medium (3.5-6.57)	95	79.16
			High (<6.57)	25	17.51

From table 1, it was found that 55.83 per cent of the respondents belonged to the middle age group (36-55 years), 37.50 per cent of the respondents were educated up to the level of High School, 70.83 per cent of the respondents had nuclear family, 56.57 per cent of the respondents had family size of having upto 5 members, 57.50 per cent of the respondents had semi-cemented type of house, 58.33 per cent of the respondents had annual income of ₹ 1,00,101-₹ 2,00,000 through jhum cultivation, 60.84 per cent of the respondents were small farmers having 2.51-5.00 acres of land holdings, 41.67 per cent of the respondents had more than 20 years of experience in

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jhum cultivation and 71.66 per cent had medium overall extension contact, 65.00 per cent of the respondents had medium overall social contact, 86.67 per cent of the respondents had medium mass media sources utilization towards climate change, 67.50 per cent of the respondents had medium formal information sources utilization towards climate change, 79.16 per cent of the respondents had medium informal information sources utilization towards climate change. Similar findings is also reported by **Vishwanath (2013), Ambavane (2014) and Verma *et al.*, (2013)**

Table 2: Adaptation measures or practices towards climate change

SL. NO.	***PRACTICES***	***Fully Adapted***	***Partially Adapted***	***Not Adapted***
a.	**Rice Varieties** - Pursuing field trials of drought tolerant and disease resistant varieties	62 (51.67)	46 (38.33)	12 (10.00)
b.	**Soil** -Construction of low cost bunds using bamboo splits, felled trees, available rocks and boulders -Contour bunding -Bench Terracing	98 (81.66)	11 (9.17)	11 (9.17)
c.	**Water Harvesting** -Construction of Low Cost Water Harvesting Structures -Setting up of Jalkunds -Setting up of Fishery Ponds -Community Forest Conservation for ground water recharge & construction of siltation tanks	49 (40.83)	62 (51.56)	9 (7.61)
d.	**Planting Material** -Treatment of seeds/planting material with hot water -Treatment of seeds/planting material with bio-control agents for disease and	32 (26.66)	77 (64.17)	11 (9.17)

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	pest management -Treatment of seeds and planting material with bio-fertilizers for enhanced germination and improved crop vigour			
e.	**Use of Fertilizers** -Non usage of inorganic fertilizers -Foliar spray of organic plant nutrients -Legume crops cultivation in mixed/relay/sequential/double cropping systems for nitrogen availability -Green manuring followed -Azolla cultivation in TRC/WRC fields for nutrient management -Vermicompost/plant based or animal based organic compost utilized for organic nutrient management	28 (23.34)	79 (65.83)	13 (10.83)
f.	**Change in Sowing Time** -Staggered planting is followed -Crop cultivation under protected structures	14 (11.67)	90 (75.00)	16 (13.33)
g.	**ITK** -ITKs have been used since time immemorial for pests and disease management, determination of cropping or sowing time, post-harvest management etc.	70 (58.33)	40 (33.33)	10 (8.34)
h.	**Disease & Pest** -Conservation of natural enemies, cultural and mechanical management measures are adopted -Bio-control measures are followed	61 (50.83)	50 (41.67)	9 (7.50)

From table 2, it was found that 51.66% of the respondents have fully adapted various strategies for rice, 81.66% of the respondents have fully adapted various strategies for soil, there is poor strategies being adapted for water harvesting as 51.56% of the respondents have partially adapted various strategies for water

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harvesting, 64.16% of the respondents have partially adapted strategies for planting material, 65.83% of the respondents have partially adapted various strategies for use of fertilizers, 75.00% of the respondents have partially adapted strategies for change in sowing time, 58.33% of the respondents use ITK's as an adaptation strategy, 50.83% of the respondents have fully adapted various adaptation strategies to manage disease & pest.

Table 3 : Distribution of respondents according to their overall adaptation towards climate change

Sl. No.	***Category***	***Frequency***	***Percentage***
1.	Low (>11.52)	10	8.33
2.	Medium (11.52 - 12.74)	89	74.17
3.	High (<12.74)	21	17.50
	TOTAL	120	100.00

From table 3, it was found that the overall adaptation level of the respondents towards climate change is medium. Similar findings is also reported by **Reddy *et al.*, (2018)** and **Venkataramulu *et al.*, (2010)**

Table 4 : ASSOCIATION BETWEEN SELECTED INDEPENDENT VARIABLES WITH ADAPTATION OF THE RESPONDENTS

Sl. No.	**Variables**	**"r" value**
1.	Age	-0.196*
2.	Education	0.008 NS
3.	Family type	0.050 NS
4.	Family size	-0.027 NS

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5.	Type of house	0.077NS
6.	Annual income	0.014 NS
7.	Land holding	0.064 NS
8.	Farming experience	0.198*
9.	Extension contact	0.440 *
10.	Mass media exposure	0.206*
11.	Social contact	0.260 *

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

The finding indicates that age, farming experience, extension contact, mass media exposure, and social contact are positively significant with the adaptation level of the respondents towards climate change. Whereas education, family type, family size, type of house, annual income and land holding had non-significant correlation with the adaptation level of the respondents towards climate change. Similar findings were reported by **Mane *et al* (2012) and Gurjar (2016)**

CONCLUSION

It is concluded that majority of the respondents were middle aged, majority belonged to nuclear type of family with family size upto 5 members, majority of the respondents had an annual income of 1,00,001 – 2,00,000. Majority of the respondents had medium level of social contacts, medium level of extension contacts, medium level of overall information sources utilization in access to weather information. There is almost no advanced technological adaptation for the Jhum cultivators to adapt to climate change through advanced technologies. On the other hand, the farmers have been mostly using their conventional agricultural practices to react to climate-change impacts. Majority of the respondents still use the traditional weather forecasting techniques to predict weather. It is therefore concluded from the study that majority of

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the respondents fall under medium adaptation level towards climate change. The study indicates that farmers having access to climate information and agricultural extension services and participation in trainings have a higher ability to adopt strategies to adapt to climate warming. It was also found that age, farming experience, extension contact, mass media exposure and social contact were positively associated with the adaptation level of the respondents.

Further, the study also revealed that among the many constraints faced by the respondents in the study area were lack of proper marketing channel, difficulties to get planting material or new varieties to help adapt with climate change, crop losses due to climate change.

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