

Sustainability of *Jhum* Cultivation as perceived by the Tribal People of Tripura

Jayasree Datta¹, N R Gangadharappa² and Amit Debnath³

¹ ICAR Research Complex for NEH Region, Tripura Center, Lembucherra, Agartala-799 210, India

² Department of Agricultural Extension, University of Agricultural Sciences, GKVK, Bangalore, India.

³ School of Social Science, College of Post Graduate Studies, Central Agricultural University, Ri-Bhoi, Barapani, Meghalaya, India.

Corresponding author: dattajayasree3@gmail.com

ABSTRACT

Jhum/shifting cultivation is traditional land-use practice of North East region of India, is an ecologically and economically viable system of agriculture as long as population densities are low and *Jhum* cycles are long enough to maintain soil fertility. Population explosion resulted in reduction of *Jhum* cycle due to which, the resilience of ecosystem is interrupted and the quality of the land is worsening day by day which is important to maintain the sustainability of *Jhum*. Hence an attempt has been made to know the perception of tribal people about the sustainability of *Jhum* cultivation. The study was conducted in Tripura and data was collected using pretested interview schedule. The result indicates that majority of the farmers perceived sustainability level of *Jhum* as medium followed by low and high. It is also revealed that number of family member involved in *Jhum*, area under *Jhum*, *Jhum* cycle and cosmopolitaness have direct correlation with sustainability level and contributed most for variation in sustainability level of *Jhum*. So these variables must be manipulated and farmers need to be supported by enterprises such as dairy, poultry, piggery, goatery etc. to improve their socio-economic condition. This diversification can naturally promote sustainable *Jhum* by way recycling farm wastes.

Keywords: *Jhum*, shifting cultivation, sustainability, *Jhum* cycle, Tripura

Jhum or shifting cultivation is a widely distributed and main form of agriculture in the upland areas of North East India. The hills constituted about 70% of the total land of North East region, where shifting agriculture, locally called “*Jhum*” is the traditional chief land use system (Ramakrishnan *et al.*, 1996). Traditional *Jhum* or shifting cultivation is the form of agriculture in which indigenous communities clear and cultivate secondary forests, and leave parcels to regenerate naturally via fallows of medium to long duration (Fujisaka *et al.*, 1996). *Jhum* contributes 85% of the total cultivation in North East India. The practice of *Jhum* involves site selection, slash and burn followed by mixed cropping for a year or two

and fallowing for certain years for recuperation of the land. It has evolved as a traditional practice and is an institutionalized resource management mechanism ensuring ecological security and food security thus providing a social safety net for local communities (Andersen *et al.*, 2008).

Shifting cultivation (which includes perennial cash crops) is sustainable in two senses: it is resilient to exogenous disturbances and it exhibits a non-negative trend in output. Shifting cultivation makes an important contribution to the overall stability and sustainability of the farming system (Cramb, 1993). At present about 15, 000 hectares of area is under *Jhum* cultivation in Tripura. Major crops in *Jhum* includes Paddy, maize, pulses (pegon pea, local beans), vegetables (ash gourd, pumpkin, cucumber, sweet gourd, leafy vegetables), fruit crops (orange, banana, guava, mango, papaya, watermelon) etc. *Jhum* used to be a sustainable land use practice in diverse socio-economic set ups where the dependent human population was within the carrying capacity of a 10-15 year *Jhum* cycle which helps the land to return to its natural condition after the anthropogenic disturbances. Population explosion and emergence of new generation of youth cultivators resulted in reduction of the cycle of cultivation from 10-15 years to 2-3 years due to the abandoning and re-occupying of fallow land frequently.

The most critical factor that governs the sustainability of *Jhum* is the length of the fallow period (Abizaid and Coomes, 2004). The shortening of *Jhum* cycle (the intervening period between fallowing and returning to the same spot for cultivation) is indeed a matter of concern. This is seriously impacting on environmental security in many pockets of the region. Keeping the above aspect in view, this study has been conducted with the objective to know the perception of tribal people about the sustainability of *Jhum* cultivation.

METHODOLOGY

Tripura is the third smallest state of India with 10, 492 Sq.Km. area. *Jhum* cultivation is deeply integrated into the social, cultural, and economic life style of many tribal groups that constitute about 31% of the total population of Tripura, India. In 2007, the Forest Department completed the first-ever census of hardcore shifting cultivators (*Jhumias*) and found 27, 278 families, comprising about 136, 000 people, dependent on *Jhum* (Anonymous, 2007).

The research study was conducted in Gomati district of Tripura, India. Gomati district consists of three sub-divisions. They are Udaipur, Amarapur and Karbuk. Udaipur Sub-division consists of three blocks, Amarapur and Karbuk sub-division consists of two blocks each. From each of these seven blocks of Gomati district two villages were selected purposively considering the maximum number of people practicing *Jhum* cultivation i.e. total fourteen villages was considered for the study. From each of selected fourteen villages 10 farmers were selected randomly. Thus total sample for the study was 140 respondents. Data was collected through pretested interview schedule.

Measurement of the variables

Sustainability level of Jhum

Sustainability level of *Jhum* is operationalised as the extent to which the tribal people practice *Jhum* that are less specialized farming, requiring mixed crop-livestock farming with minimum/no dependency on outside inputs that provide basic need of the farm family.

Sustainability level of *Jhum* is measured by calculating the perception of people about sustainable *Jhum* cultivation practices. Based on review of literature, sustainable *Jhum* practices have been selected. Responses were taken under three category viz. agree, somewhat agree, disagree and were given a score of 3, 2, 1 respectively.

Based on total score of the respondent in the overall perception of sustainable *Jhum* practice, the respondent were classified in three categories viz. low ($< \text{Mean} - \frac{1}{2} \text{SD}$), medium ($= \text{Mean} \pm \frac{1}{2} \text{SD}$), high ($> \text{mean} + \frac{1}{2} \text{SD}$). Personnel interview method was employed for collection of data. Correlation was used to find out relationship between sustainability level of *Jhum* and their personal, socio-economic, psychological, communication characteristics of the farmers. Regression was used to know the contribution of personal, socio-economic, psychological, communication characteristics of the farmers on sustainability level of *Jhum*.

RESULTS AND DISCUSSION

The practices which were perceived and agreed by the tribal people as sustainable were selection of site for *Jhum* based on the cultivation practiced since last few years, slashing and burning the vegetation (Fig. 1), cleaning the site and providing fence, practicing minimum tillage to remove only the roots of the weeds, selection of those crops which are well suited to farm soil and climate, use of local varieties suitable for *Jhum*, mixed cropping (Fig. 2), preferring to farm generated resources over purchasing material. These practices were sustainable because these can maintain the ecological balance and also farmers can obtain maximum output with minimum input. Tribal people perceived the *Jhum* cultivation practices as they tend to perceive because of their previous experience as Jhumia. Majority of tribal people practicing *Jhum* are illiterate, have less cosmopolitaness, medium to low mass media participation etc. These enable them to set these practices as sustainable, others are not. This is the set attitude of tribal people practicing *Jhum*. These findings can be consistent with the Gestalt theory of perception (Wertheimer, M., 1938). The perception of tribal farmers about sustainability of *Jhum* cultivation practices are given below in details.

CROP MANAGEMENT PRACTICES

Cultivation Planning and Preparation

It is evident from the Table 1 that 80.71% of the tribal people said that they have developed an annual cultivation plan through experience for the entire farm

because most of them in the starting of the year will plan for number of crop to be grown based on the area selected for *Jhum*. All of them agreed about selection of site for *Jhum* based on the cultivation practiced since last few years because if the land is allowed to more number of years of fallow period, soil fertility will also be more. They also agreed about practices like slashing and burning the vegetation, cleaning the site and providing fence to protect the crops from wild animal threats as these are mandatory operations for *Jhuming*. Majority of them (81.43%) didn't use hand tools for tillage because use of tillage tools may destroy the soil structure which is very important for *Jhuming*.

Fertilizer and Pesticide Use

Most of the tribal people (68.57%) disagreed that they used livestock manure and legume to cover nutrient deficiency as they used to follow traditional shifting cultivation system. Some of the farmers (22.86%) somewhat agreed that they applied inorganic fertilizers and pesticides based on productive potential of soil because they used some fertilizers in case of cash crops like vegetable crops wherever required. In case of usage of pesticide/fungicide they dint have knowledge about what and how to use them. Further incidence of pest and disease might not be there.

Storage and Application of Manure

Maximum tribal people (79.29%) disagreed that they stored manure appropriately because they not used to apply manures in the *Jhum* field. Ash generated from burning of vegetation was used as fertilizer of soil. Only 26.43% of farmers somewhat agreed about application of manure into the soil because of less soil fertility of the selected area. Hence, wherever needed they apply manures to the soil.

Diversification of Crop Species

All of them agreed that they selected those crops which are well suited to the soil and climate. They practiced mixed cropping like rice with vegetable crops (Fig. 3) as they have less area. Further they also used local varieties suitable for *Jhum* because these tested varieties can sustain the aberration weather condition.

Resource Management

The tribal people agreed that they prefer to use first farm generated resources and most of them (81.4%) agreed that secondly they prefer to use locally available off-farm inputs when required as on-farm inputs will reduce the cost of cultivation.

Weed, insect, pest and disease control

The tribal people disagreed about the use of weeding hoes and 79.29% of the farmers agreed that they enhanced condition for controlling or suppressing weeds, insect pest and diseases. The reason is that as *Jhum* is mixed cropping system

weed competition is less. Another reason is that before sowing they mix the seeds with cow urine and dry it in shade to reduce incidence of diseases and pests.

Table 1. Perception of tribal people about the sustainability of *Jhum* cultivation (n = 140)

Statements	A		SWA		DA	
	F	%	F	%	F	%
A. Crop Management Practices						
I. Cultivation planning and preparation						
1. Develop an annual cultivation plan for the whole farm	113	80.71	27	19.29	0	0
2. Selection of site for <i>Jhum</i> based on the cultivation practiced since last few years	140	100	0	0	0	0
3. Slashing and Burning the vegetation	140	100	0	0	0	0
4. Cleaning the site and providing fence	140	100	0	0	0	0
5. Terracing of steep slopes and higher areas	0	0	46	32.86	94	67.14
6. Soil preparation using hand tools	26	18.57	114	81.43	0	0
II. Fertilizer and pesticide use						
7. Use of livestock manure and legume to cover nutrient deficiency	0	0	44	31.43	96	68.57
8. Application of inorganic fertilizers and pesticides	0	0	32	22.86	108	77.14
III. Storage and application of manure						
9. Storage of manures appropriately	0	0	29	20.71	111	79.29
10. Application of manure into the soil	0	0	37	26.43	103	73.57
IV. Diversification of crop species						
11. Selection of crops which are well suited to farm soil and climate	140	100	0	0	0	0
12. Mixed cropping for reducing the area under crop species	140	100	0	0	0	0
13. Use of local varieties suitable for <i>Jhum</i>	140	100	0	0	0	0
14. Higher crop diversity to ensure greater food security	101	72.14	39	27.86	0	0
V. Resource Management Practices						
15. First preference for farm generated resources over purchasing material	140	100	0	0	0	0
16. Secondly locally available off-farm inputs (when required) over those from remote areas	114	81.43	26	18.57	0	0
VI. Weed, insect, pest and disease control practices						
17. Use of weeding hoes	0	0	0	0	140	100
18. Enhancement of condition for controlling or suppressing weeds, insect pest and diseases	111	79.29	29	20.71	0	0

B. Livestock Management Practices						
19.Livestock housed and grazed at low density	140	100	0	0	0	0
20.Construction of well established structure for livestock unit	0	0	94	67.15	46	32.85
21.Proper vaccination and medication whenever needed	0	0	22	15.71	118	84.28
C. Natural Resource management practices						
I. Soil Management practices						
22. Minimum tillage to remove only the roots of the weeds	140	100	0	0	0	0
23.Practicing contour tillage operation	0	0	37	26.43	103	73.57
24. Strip cropping to control the soil erosion	0	0	19	13.57	121	86.43
II. Water management practices						
25. Use of weeds as mulching material to conserve soil moisture	26	18.57	114	81.43	0	0
26. Bun cultivation practice to use rain water judiciously	0	0	97	69.29	43	30.71
III. Forest wealth Management practices						
27. Preserving trees from previous <i>Jhum</i> for the use of household	132	94.28	8	5.71	0	0
28. Agro-forestry with anti-erosion plants for income generation and control of soil erosion	0	0	0	0	140	100
D. Fallow Management practices						
29. Farmers prepares sapling to establish the tree crops during resting period	0	0	0	0	140	100
30. Leave the poles to decompose	85	60.71	55	39.29	0	0

A-Agree, SWA-Some What agree, DA-Disagree

Livestock Management Practices

The tribal people agreed that they housed and grazed livestock at low density because of less land availability. 67.15% of the farmers somewhat agreed about construction of well established structure for livestock unit. They generally keep the livestock in their house yard (Fig. 4) as they have less number of livestock. More than 84% of the farmers disagreed about proper vaccination and medication because in remote hilly areas these facilities are not available.

Natural Resource Management Practices

Soil Management

All tribal people were practicing minimum tillage because it remove only the roots of weeds and break the clods. More than 26% somewhat agreed about contour

tillage operation and 13.57% of farmers somewhat agreed about strip cropping to control soil erosion. The reason might be that they didn't follow scientific technologies for *Jhum*/shifting cultivation.

Water management

Majority of them (81.43%) somewhat agreed that they used weeds as mulching material and 69.29% of farmers somewhat agreed that they practiced bun cultivation to use rain water judiciously because they are fully depended on rain for *Jhum* as a source of water.

Forest wealth Management

Majority of tribal people (94.28%) agreed that they Preserved trees from previous *Jhum* because they use dry trees/plants as fuel in their household. They also preserve the seeds from previous year *Jhum* for the use of next *Jhum*. None of them they practiced agro-forestry because agro-forestry is difficult for them to manage.

Fallow Management

Most of the farmers (60.71%) agreed that they leave the poles to decompose as it improves the soil fertility. Also the leaves and other biomass falls during fallow period which increases the soil fertility.



Fig. 1: Slashing and burning of vegetation in *Jhum*



Fig. 2: A Jhumia harvesting rice in mixed cropping.



Fig. 3: Mixed cropping with vegetable like pumpkin.



Fig. 4: Jhumia rearing livestock in house yard

The findings of the study are consistent with the Otis Dudley Duncan and Leo Schnore's "Ecological complex" (1959). According to them, ecology deals with society as a functional organization of a population in the process of achieving and maintaining an adaptation to its environment. The central concern of the ecological perspective is the analysis of the problem of cultural diversity and social change in terms of interaction between social organization and environment. Duncan identifies four categories of variables that constitute ecological complex or ecosystem; they are population, organization, environment and technology. Duncan and Schnore regard population as an aggregate of individuals who establish viable relationship with environment, not independently but collectively through the mechanism of a system of relationship.

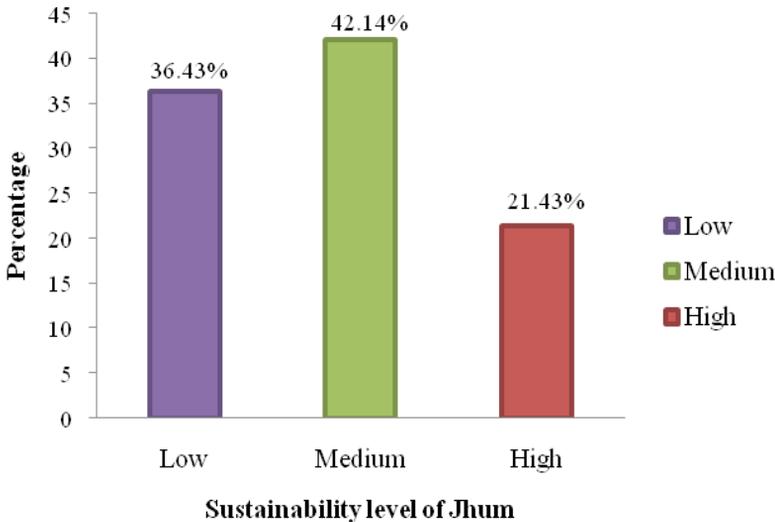


Fig. 5: Overall perceptions of tribal people about the sustainability level of *Jhum*

It is revealed from the Fig. 5 that majority of the farmers (42.14%) perceived sustainability level of *Jhum* as medium followed by 36.43% as low and 21.43% as high. As population is increasing availability of land also decreasing, so farmers cannot leave a land under long fallow period. As a result soil fertility of land was not maintained and they started using inorganic fertilizers for growing of crops. Hence sustainability level of *Jhum* is medium at the present situation.

It is observed from Table 2 that education level of tribal people was found to be positively significant with the sustainability level of *Jhum* because education plays a vital role in acquisition of the information about different *Jhum* cultivation technologies which is suitable for sustainable agriculture in hilly areas. Family size and number of family member involved in *Jhum* was found to be positively significant with sustainability level of *Jhum* as sustainable *Jhum* is labour intensive. If family size is large, more number of people will be able to engage in *Jhuming*.

Table 2. Correlation between sustainability level of *Jhum* as perceived by the tribal people with personal, socioeconomic, psychological and communication variables

(n = 140)

Sl. No.	Independent variables	Correlation co-efficient (r)
1	Age	-0.088 ^{NS}
2	Education	0.243 ^{**}
3	Family size	0.462 ^{**}
4	No. of family member involved in <i>Jhum</i>	0.187 [*]
5	Area under <i>Jhum</i>	0.834 ^{**}
6	Annual income	0.852 ^{**}
7	<i>Jhum</i> cycle	0.187 [*]
8	Cosmopoliteness	0.325 ^{**}
9	Livestock possession	0.100 ^{NS}
10	Material Possession	0.326 ^{**}
11	Credit orientation	0.147 ^{NS}
12	Extension participation	0.347 ^{**}
13	Mass media participation	0.049 ^{NS}

** Significant at 0.01 level, * Significant at 0.05 level, NS Non-Significant

Hence it will be easy to do cultivation practices and maintain the conditions for growing crops sustainably. Area under *Jhum* and annual income were also found to be positively significant with sustainability level of *Jhum*. If area under *Jhum* is more farmers can grow more number of crops. So failure of one crop can be replaced by another crop which will provide income, hence sustainability of *Jhum* will also be more. *Jhum* cycle also was found to be positively significant with sustainability level of *Jhum*. If a land is under more number of fallow periods, the soil fertility status also will be more which is most important for sustainable *Jhum*. The result also revealed that there was a positive significant relationship of cosmopoliteness with sustainability of *Jhum* because the farmer with greater cosmopoliteness will have greater contact with the other society, which broadened the mental horizon of farmers and thus inducing them to acquire the new ideas and try these new technologies in *Jhum* sustainably. Material possession was found to be positively significant with sustainability level of *Jhum*. If farmers possess more materials like slashing knives, spade, weeding hoes, threshing equipments etc. different tools and implements, it will be easy for them to cultivate more number of crops in a large area. A positive and significant relationship was found between extension participation and sustainability level of *Jhum*. The reason may be extension participation will directly expose the farmers to sustainable technologies and farmers will be able to overcome the barriers in adopting new technologies for *Jhum* sustainably.

Table 3 revealed that there is 75.4% variation in perception of tribal farmers about sustainability level of *Jhum*. Number of family member involved in *Jhum*, area

Table 3. Contribution of independent variables on sustainability level of *Jhum*

(n=140)

Sl. No.	Independent variables	Regression co-efficient (β)	Std. Error	't' value
1	Age	0.058	0.016	1.217 ^{NS}
2	Family size	0.072	0.321	1.286 ^{NS}
3	Number of family member involved in <i>Jhum</i>	-0.130	0.349	2.572*
4	Area under <i>Jhum</i>	0.774	0.263	14.298**
5	<i>Jhum</i> cycle	0.090	0.207	1.989*
6	Cosmopolitaness	0.127	0.241	2.341*
7	Livestock possession	0.009	0.026	0.172 ^{NS}
8	Material possession	0.017	0.155	0.350 ^{NS}
9	Credit orientation	0.003	0.180	0.069 ^{NS}
10	Extension participation	0.163	0.184	3.084 ^{NS}
11	Mass media participation	-0.002	0.243	0.038 ^{NS}

** Significant at 0.01 level, * Significant at 0.05 level, NS Non-Significant

under *Jhum*, *Jhum* cycle and cosmopolitaness had positive significant relationship but other characteristics had non-significant relationship. According to 't' test criterion, these four variables had contributed most for variation in sustainability level of *Jhum* perceived by the tribal farmers because all these variables expose the tribal farmers to different parameters of sustainable *Jhum* and also these variables helps them to select most appropriate ways of doing *Jhum* cultivation to increase its sustainability level.

IMPLICATIONS

All the farmers need to be supported by other enterprises such as dairy, poultry, piggery, sheep and goat rearing so as to enable farmers to improve their socio-economic condition and this diversification naturally promotes sustainable *Jhum* by way of providing organic manure through recycling of farm wastes. Farmers should give education to their children so that they will be able to get some jobs rather than doing only *Jhuming*. Extension participation has direct relationship with sustainability level of *Jhum*. Hence the field extension officers should give more emphasis on training, demonstration, field visit to make them aware of different sustainable technologies of hill agriculture.

CONCLUSION

From the results of the research study it can be concluded that most of the farmers perceived sustainability level of *Jhum* as medium followed by low and high.

Characteristics like education, family size, area under *Jhum*, family member involved in *Jhum*, annual income, cosmopolitanness, material possession and extension participation had positive significant relationship with sustainability level of *Jhum*. Among these variables number of family member involved in *Jhum*, area under *Jhum*, fallow period and cosmopolitanness had contributed most for variation in sustainability level of *Jhum* perceived by the tribal farmers. So this variables must be manipulated and farmers need to be supported by enterprises such as dairy, poultry, piggery, goatery to improve their socio-economic condition and this diversification can naturally promotes sustainable *Jhum* by way of recycling farm wastes.

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