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Shifting cultivation: A tribal way of life in north east India and alternative approaches for increasing productivity

Sanjay Swami

Abstract
The shifting cultivation in North East India is dynamic in nature and is known as 'Jhum'. The region is prone to a number of biophysical, institutional and socio-economical problems, resulting into subsistence agriculture with low input-low yield-low risk technology. Upland rice is the main crop grown in mixture with maize, foxtail, finger millet, beans, cassava, yam, banana, sweet potato, ginger, chillies, vegetables, etc. in such system. The single crop of rice is preferred in the second year and this continues for 2-3 years and then it is left for fertility build up through regeneration of vegetation. The period is known as 'fallow period'. But this leads to considerable soil erosion due to heavy intense rainfall instead of increasing its fertility. The fallow period has been reduced from 10-20 years to 5-7 years. Contour bunded areas at 35 per cent slope took the shape of bench terrace in four years. The use of bench terraces, half moon terraces and grassed waterways on steep slopes (35-23 per cent) was found to be effective in checking soil erosion and retaining 80-100 per cent of annual rainfall (2300 mm/annum) in situ with various land uses. The existing form of shifting cultivation may be improved by introducing inputs of seed, fertilizer implements and other in phased manner The main objectives of developing alternatives are to harness the resource potential of the watershed (fuel, food, fodder, fruit, fibre, etc. required for local population on sustainable basis**).** Off farm activities such as sericulture, weaving, handicrafts out of the local materials and value addition to the farm product are needed to enhance income of tribal farmers.

Keywords: Jhum cultivation, North East India, natural resource management, developing alternatives, increasing productivity

Introduction
Shifting cultivation is a part and parcel of socio-cultural life of the tribal people in North-East India and as such all its operations are inseparably linked with their religious rites and festivals (Singh and Sharma, 1999) [6]. Tribal people of the North-East India have been maintaining a special fascination towards shifting cultivation due to their nomadic nature and also due to their traditional habit and belief on such age-old practice. Despite of its adverse effects on the eco-system and low productivity, it still continues with as a necessary evil; and it may be continuing for the following inherent characteristics:

- Bulk of the labor force management and capital comes from the households;
- Production is either consumed on the farm/and or traded in the local markets.
- The decision making process is hampered by limited access to marketing and political institutions.
- Most of the farmers live much above the culturally determined subsistence level.

Shifting cultivation is an age old system of production which involves in cutting, drying and burning of natural vegetation on steep slopes followed by dibbling of crop seeds. As the name indicates, the site of cultivation is shifted from one place to another after every 2-3 years (Borthakur, 1992) [1]. The system involves cultivation of crops and steep slopes where the land is cleared by cutting of forests, bushes, etc. up to the stump level in December-January. The cut materials are left as such for drying and final burning to make the land ready for dibbling of seeds of crops before the onset of rains. The cultivation is confined to a village boundary and after 2-3 years, the cultivated area is abandoned and a new site is selected to repeat the process (Upadhaya and Jha, 1995) [8]. The area of cultivation is decided on the basis of family size. The ill effect of shifting cultivation is loss of flora and fauna, excessive soil erosion and ecological imbalance. In early days, the system worked well and was not so detrimental considering the virginity of land and less population pressure.

The rationale to continue with this system lies in its compatibility with the physico.-social environment of sparse population, community land tenure system, undulating and steep topography, acute moisture stress during post monsoon period. This sort of socio-cultural environment, is of course, gradually getting slackened under the impact of higher population, low yield, shortening of jhum cycle, new economic and social goals as well as introduction and popularization of modern scientific technology and with the dying out of tribal isolation from the main stream. It is also observed that the lower rate of adoption of agricultural innovations and at least favourable attitude towards them by the tribal farmers were due to their lower educational levels, lower socio-economic status, small size holdings and lower annual income. The headman also plays an important role in all round agro-economic development of the tribal farmers and hence training to the village elders/headman regarding modern agricultural practices may help in adoption and diffusion of technological innovations.

Land Use

The hills and hill slopes are mostly covered with forest. The foot hill slopes and uplands are mostly used for tea and horticultural crops. The valleys and plain lands are cultivated for paddy.

Major problems

The NE region is prone to a number of biophysical, institutional and socio-economical problems, resulting into subsistence agriculture with low input-low yield-low risk technology. The major problems confronting the agricultural growth of the region are enumerated below:

Acidic Soil: The acid soils of the region have low availability of phosphorus, which gets fixed on application, thus leading to low response to fertilizers. The soils have high concentration of iron and aluminum toxicity to plants.

High rainfall and humidity: The high rainfall and relative humidity not only creates favourable environment for wide range of pests, diseases and weeds but also create problems in their chemical control through spraying. Such a climate also creates problems in storage of grains and hay-making. The high rainfall and cloudy sky reduces the total sunshine hours so essential for food production.

Low Temperature: Low temperature favours incidence of crop and animal diseases, resulting in low productivity. The low temperature prevailing for considerable period during winter limits the total growing period for crop production.

Undulating topography, hill slopes and altitude: The undulating topography, hill slopes and varying altitudes create problems of agricultural production. In many cases, varieties suited to low altitude areas do not perform well or are not suitable for medium and high altitudes. Consequently, separate sets of varieties of the same crop are needed for different altitudes.

Shifting Cultivation: Shifting cultivation known as *"Jhuming"* is the dominant farming system in the NE region. Although the system was good at one point of time when it emerged, it has lost much of its relevance with growing population pressure and shrinking of land resource. Continuance of shifting cultivation leads to large-scale deforestation and denudation of hill tops and slopes, resulting in large-scale soil erosion, causing siltation of reservoirs and streams and leading to flood in the plain areas. Removal of top soil leads to loss of soil fertility, which is not easily built up. Continuance of this system of farming offers very little scope for introduction of modern/improved technology.

Land tenure system/operational holding: The ownership of land by community or the village chief and the prevailing land-tenure system often acts as a disincentive for proper development and maintenance of land for cultivation. Similarly, the average operational holdings are also very small for sustainable growth of agriculture in the region.

Soil erosion and land degradation: A major problem in the NE region is that the available land is subjected to heavy soil erosion and degradation resulting from deforestation and incessant rains. This is largely attributable to slash-and-burn technique of production associated with 'jhum' as also to indiscriminate felling and sale of timber trees to private contractors. In Sikkim soil erosion is caused by un-terraced farming on the slopes and by canal irrigation system without protective cover to the channel.

Constraints

There are various technical and implementation constraints to agricultural development within the region, which vary according to agro-ecological situations.

Technical Constraints

- High level of diversity in the upland farming systems, in agro-climatic conditions (physiography, soils, altitude, rainfall, etc.) and in the socio-economic and socio-cultural conditions of the different tribal communities, precluding uniform prescriptions and requiring the development of location-specific solutions.
- Limited opportunities for expanding or increasing the productivity of settled arable farming due to the limited availability of low lands suitable for wetland rice cultivation and the high cost of developing the remaining areas having potential for irrigation, declining fertility in permanent fields, limited availability of fertilizers and pesticides in the hilly areas, difficulty in promoting mechanized agriculture on sloping land, and low incidence of sunshine during the rainy season, resulting in low productivity of crops.
- Depletion of soil, water and forest resources in watersheds where short fallow cycles are practiced in shifting cultivation system.
- Relatively high mortality rate of domestic animals due to high incidence of diseases and insufficient animal health coverage.
- Limited availability or access to improved varieties of seeds/planting materials and animals.
- High dependency of hill farmers on rice production as staple food causing difficulty in diversification of the cropping systems.

High population growth in the NR region results in increasing population density in the upland areas and more pressure on natural resources necessitating shorter fallow cycles, rapid encroachment on forest land and extending agriculture on steep sloping lands.

Implementation constraints

- Lack of integration and co-ordination between different line departments of different states in the promotion of integrated development strategies and lack of experience of extension staff in participatory development.
- Inadequate research, extension and training support services with little client oriented or participatory extension activities, resulting in communication gaps between extension agencies and the farmer.
- Lack of integration of research, extension and education in agricultural development programmes.
- Lack of adequate service facilities such as credit, input supply and marketing to support agricultural development activities.
- Dependency attitude of farmers who have continuosuly benefited from government sponsored subsidized schemes.
- Relative isolation and poor accessibility of most of the village settlements.
- Low level of understanding on the key aspects of indigenous farming systems including shifting cultivation without any scientific analysis of these farming systems.
- The transport and communication bottleneck and the resultant high transport costs in the region, limited scope for exploitation of development potential in areas like plantation and horticultural crops.

Environmental Constraints

Ruggedness of terrain: The rugged terrain of the mountain ecosystem of NE India is not very congenial for development of settled cultivation because the technology and implements used in it are not ideally suitable to rugged terrain, slope and soil conditions.

Dry Terraces: The dry slope terraces are generally rainfed and of smaller size in comparison to lower slope terraces which are usually irrigated and larger in size. Crop production is relatively lower in the former.

Micro-agro-climatic conditions of the flat valley lands: Soil moisture tends to be higher on the flat valley lands than in the hill slopes. It allows abundant growth of weeds and insect pests which are detrimental to the domesticated crops. Hence there is problem of adaptation of high-yielding varieties (HYV), causing poor production.

Socio-economic and cultural constraints

Poor economic condition: Due to poor economic condition, the shifting cultivators except a few, are unable to afford additional inputs like improved plough, fertilizer, pesticides, irrigation**,** etc. required for settled cultivation.

Lack of skill and work force: The practice of settled cultivation demands a greater skill, work load, attention and management from the cultivators, particularly from the male week force. But most of agricultural operations in hills are executed by women, causing shortage of skilled male work force.

Approaches to overcome the problems

Integrated approach: Alternative to shifting cultivation

The concept of land capability, watershed management and land use planning do not fit well with the socio-economic and traditional systems culminating into non-participation of peoples in the programme. An area comprising of village or cluster of villages within a watershed of 500-1000 ha could be the base for holistic land use planning.

Soil and Water Conservation

For steep hill slopes, the following considerations may form basis for efficient land use planning:

- Ensuring adequate protection of land against soil erosion with the use of local materials and simple know-how.
- Maximum retention of rainfall within the area without affecting crops.
- Storage of run-off water for pisciculture/irrigation at suitable sites.

Various soil conservation measures such as contour bunds, graded trenches, bench terraces, half moon terraces, grassed waterways need to be adopted according to site conditions. Plantation of vegetative barriers such as pineapple, grass and fodder legumes help in the stabilization of terrace rise and also provide useful biomass (Patiram, 2002) [3].

The main objectives of developing alternatives are to harness the resource potential of the watershed (fuel, food, fodder, fruit, fibre, etc. required for local population on sustainable basis). Off farm activities such as sericulture, weaving, handicraft and out of the local materials and value addition to the farm product are needed to enhance income (Deka and Sarmah, 2010) [2].

Contour bunded areas at 35 per cent slope took the shape of bench terrace in four years. The use of bench terraces, half moon terraces and grassed waterways on steep slopes (35-23 per cent) was found to be effective in checking soil erosion and retaining 80-100 per cent of annual rainfall (2300 mm/annum) in situ with various land uses (Ramakrishnan and Toky, 1981) [5]. Water yield potential of hill slopes was evaluated and found to vary from 021 to 073 ha. m. per ha of catchments. The contribution of water storage in seasonal/perennial ponds was 22.4 percent from direct rain, 2.3 percent from run-off and 75.3 per cent from sub-surface flow. The water yield of well managed watershed was practically silted free.

Construction measures for non-arable lands

Land capability classes VI, VII and VIII are normally unsuited for agricultural production. Establishment of vegetative cover is one of the best soil and water conservation measures for such lands. Natural grass cover alone could reduce the run-off and soil losses to negligible values compared with cultivated fallow. Tree cover also intercepts rainfall and reduces the energy of raindrops striking the soil surface, thus reducing soil detachment.

Alternatives to shifting cultivation

Suggested Approach

For introducing a drastic change or alternative, there is opposition from traditional farming communities, ecologists and social scientists. It is thus suggested that to overcome the problems described above the existing form of shifting cultivation may be improved by introducing inputs of seed, fertilizer implements and other in phased manner. Abrupt changes **or** alternatives should be solution in those categories of farmers who could afford this both financially and also socio-ecologically (Tripathi and Barik, 2003) [7]. Thus, the solution of overcoming the problems of shifting cultivation should be either replacement of the existing system or improvement of the existing system for the above two

categories of farmers/situations.

Alternatives should be introduced in those areas which are having better communication, marketing and other infrastructure. Agriculture, horticulture, livestock, forestry and combination of these systems are some of the options. These systems strengthened with subsidiary sources of income through animal husbandry or fishery provide opportunities for optimum realization of potentials through recycling of wastes of the system for converting them into economic products. While considering any alternative for adoption, it may be kept in view that a jhum farmer has about 3.11 farm workers (1.61 males + 1.50 females) per family particularly for deciding the size of land that can be covered under system. Watershed based land use concept was found appropriate for adoption of land use alternatives. The cost/benefit ratio of experimental watersheds viz. dairy based farming system (2.08), agro-pastoral system (with a unit of livestock-2.05, without a livestock unit-1.83), agri-horti-silvi-pastoral (with livestock 2.14, without livestock-1.42) was quite satisfactory (Prasad *et al.* 1986) [4].

People's Participation

People motivation, education and active participation in such programme are considered very important. The excellent bench terraces in Kohima district or Nagaland, Sikkim, water management in Apatani Plateau of Arunachal Pradesh are examples of people's innovative efforts in resource conservation. The tribal farmers are tied up in a community for undertaking important operations in shifting cultivation, house construction, etc. This community feeling amongst the tribal community is very significant which needs mobilization of undertaking afforestation, soil and water conservation programme.

Gram Panchayats/ Village Councils/Village Authority/Village Development Boards belonging to the prioritized watershed villages may apply for selection of watershed project under their jurisdiction to the District Nodal Officer along with a resolution on the following aspects:

a. Willingness to manage watershed programme through a separate WA/WC after its registration under the Society Registration Act.
b. A declaration indicating that each one of the jhumia families will have a minimum of 1.5 ha. Ownership land/provided for in the watershed.
c. Willingness to take up 1/3rd jhum area under plantation.
d. Willingness to implement the project by villagers themselves.
e. Willingness to maintain all records properly and own the audit responsibility for the developmental funds to be released under the project from time to time.
f. Willingness to pay contribution for individual as well as community works.
g. Willingness to operate revolving fund for improving farm production system and livelihood support system through organized UG/SHG.
h. Willingness to maintain community structures to be created under the project.
i. Willingness to operationalise social fencing (ban on free grazing and un-authorized cutting of trees) for development of common land/forest land wherever exists; and also allocation of unufruct over the perennial vegetation from these land in favour of resource poor families and women SHG to promote equity.
j. Willingness to contribute as *shram dan* for implementation of entry point activities as well as development of common land resources.
k. Willingness to cooperate with PIA/WDT for organizing the community into SHG, UG, WA, WC and for carrying out PRA exercises for preparation of watershed plan and implementation.
l. Identification of appropriate office bearers of WA/WC who are local residents, capable, respected and non-political.

Capacity Building

To overcome the constraints of inadequate capacity particularly at Project Implementing Agency and Watershed Committee level, a major orientation in the tools and techniques of participatory approaches and capacity building programme is suggested as mandatory. Orientation programme is required at WA/WC/ IA/WDT/DWDC/ and State level. For this purpose the following specific steps are being proposed:

1. Orientation of members of various management committees and institutional heads.
2. Training of state level trainers drawn from various organizations.
3. Training of faculty members of autonomous support organizations.
4. Training of Project Implementation Agency Watershed Development Team identified for each ch.3ter of 2-10 mini-micro-watersheds.
5. Training of office bearers of Watershed Association, Watershed Committee, User Groups, Self Help Groups, etc.

Awareness Building

Before commencing the developmental activities of the programme, sufficient attention should be paid towards generating awareness among the community members regarding the new strategy and approach as well as main features of the common guidelines under the watershed programme. For this purpose repeated meetings in large and small groups may be arranged. It may be useful if the conventional methods and traditional forms are adopted to communicate the above apsects during large group meetings. Such an approach may help in building awareness among the resource poor families particularly the women. If needed, summary version of the common guidelines in local languages/dialects may also be distributed.

Entry point activities

The primary purpose of Entry Point Activities is to meet a part of the felt needs of the community, develop rapport with people and to build the capacity of WA, WC, SHG and UG to plan and implement a programme through participatory approach.

Integration of social resource management with natural resource management

Normally low emphasis is given on organization of community particularly the SHG and UG. Even if these groups are organized, they are hardly involved in the mainstream activities like planning and implementation of land and water resource development component. Integration of Social Resource Management (SRM) with Natural Resource Management (NRM) is crucial for achieving sustainable results. Such integration would become easier if

action plants of all components are developed separately within each group; implementation of above plants are carried out by respective groups; adequate emphasis is given to production enhancement and livelihood support activities, combining short term, medium term and long term gains to watershed community.

Application of information technology

At present some of the organizations are successfully applying the Information Technology (IT) under the watershed programme. A number of GIS based software/ application programmes are now available which can improve the efficiency of planning, implementation, documentation, reporting of watershed progress. It would be appropriate if efforts are made to provide the required IT support at the village level so that it may help in empowering the community and improving the transparency in the transactions. Wherever needed the support for above aspect may be provided by district head from the 1.0 percent fund out of the community organization component retained at the district head level.

Success Criteria

Although circumstances may greatly vary from project to project, it is important that a few measurable and quantifiable success criteria are fixed for different categories of works/activities under the projects to evaluate their success or otherwise in terms of the stated purposes. These criteria given below are minimal in number as well as in performance standards. The State Governments may supplement these with more success criteria if found desirable or prescribe higher performance standards.

- Around 80 per cent of the watershed area is covered with treatment or development activities.
- About 50% of rainwater is being conserved/harvested in the watershed.
- Around 80 percent of the number of project activities and works are implemented through user group/self help group.
- More than 80 percent of the structures/measures (implemented for development of private land, common land and water resource) are sustainable and functioning.
- Around 80 per cent of the improved technologies for crop management/ afforestation/animal, horticulture, etc. are adopted by roughly 50% members of the user groups.
- Around 80 percent of the completed works or common property resources are taken over for operation and maintenance by the user groups or the community/village authority/village council/village dev. board/panchayat.
- More than 60 percent of new plants planted in common land and private land are surviving at the end of project period.
- At least 50 percent increase in area under life saving and supplemental irrigation through better recharging of ground water, small surface storage structures, perennial waterholes and streams, substitution of high water requiring crops to low water requiring crops; efficient methods of irrigation; digging of new wells, etc.
- At least 10 percent annual increase in productivity of major commodities in agriculture, horticulture, plantation crops, livestock, poultry, etc.
- Diversification of farming system by at least 25% of the families (particularly RPF) leading to at least 25% enhancement of their annual income.
- Proper capacity building of more 80 per cent of the WDT members on technological as well as participatory management aspects within first 3 month of their appointment.
- Capacity building of watershed Secretaries, Volunteers, Community Organizers on job related aspects including maintenance of records, etc. besides technological and management aspect of each component of watershed programme.
- Gradual reduction of jhum cultivation in the village land form the second year of project implementation reaching to 50% after the project period.

Improvement of existing shifting cultivation area

Second year of cultivation has been found more hazardous than the first year. It is imperative to provide some soil and water conservation measure from very first year of cultivation and introduction of crops which provide income from the third year onwards. The following measures need to be adopted for the improvement of the existing area under slash and burn agriculture.

- Contour bunds need to be developed at suitable intervals before sowing of seeds different crops.
- Intensive soil & water conservation measures along with water harvesting need to be taken up at appropriate locations to increase the moisture regime and stabilize the land slope.
- Suitable grasses and pineapple etc. need to be planted on the contour bunds.
- Areas between two contour bunds, some fruit trees of different gestation periods (orange – 7 to 8 year, guava - 2 to 3 years. Assam lemon - 2 years, papaya – one year) should be planted in half moon terraces in clocks in areas between two contours. Within two years, Assam lemon and guava and papaya will be flowering and fruiting stage. This would encourage farmers to stay back in the watershed. Suitable grass on the contour bund will provide fodder to the livestock.
- Dibbling of granular fertilizer enhances the yield of the crop.
- High yielding seeds of different crops need to be introduced.
- Suitable fodder, timber and fuel trees need to be planted on the boundaries to meet the requirement of the farmers.
- Traditional knowledge based practices of the farmers may be developed into appropriate technology for the development of shifting cultivation areas.

Conclusion

For introducing a drastic change or alternative, there is opposition from traditional farming communities, ecologists and social scientists. It is thus suggested that to overcome the problems described above the existing form of shifting cultivation may be improved by introducing inputs of seed, fertilizer implements and other in phased manner. Abrupt changes **or** alternatives should be solution in those categories of farmers who could afford this both financially and also socio-ecologically. Thus, the solution of overcoming the problems of shifting cultivation should be either replacement of the existing system or improvement of the existing system for the above two categories of farmers/situations.

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