POLICY PAPER

83

Issues and Challenges in Shifting Cultivation and its Relevance in the Present Context

NATIONAL ACADEMY OF AGRICULTURAL SCIENCES, NEW DELHI

December 2016

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CITATION : NAAS 2016. Policy Paper No. 83 Issues and Challenges in Shifting Cultivation and its Relevance in the Present Context, National Academy of Agricultural Sciences, New Delhi: 16 p.

EXECUTIVE COUNCIL 2016

Published by Mr H.C. Pathak, Executive Secretary, on behalf of
NATIONAL ACADEMY OF AGRICULTURAL SCIENCES
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Preface

Shifting cultivation in India has been trapped in a low-level and unstable equilibrium owing to two opposing paradigms that operate at the policy and institutional levels. A discussion has started among policy makers, practicing managers and scientific community that shifting cultivation is a wasteful and ecologically dysfunctional system, detrimental to forest vegetation and soil therefore, needs to be curtailed by inducing cultivators to adopt other forms of livelihood. The second perspective, being presented by others and some international organizations, is that due to failures in the past, the practice is a legitimate and economically viable, being also firmly embedded in local cultural and social institution, should be allowed to carry on as it is without external influence, except technological interventions. The Government programmes targeted towards transformation of shifting cultivation were initiated in the 1970s with a thrust on horticulture and cash crop promotion. These plantations, established by concerned departments under centrally sponsored programmes, were meant to have a demonstration effect. It is advocated that, a single national policy for shifting cultivation might not be preferable, as there is tremendous diversity in the technical approaches for the fallow and the cropping phase cycles, as well as in the social, cultural and political system governing the use of natural resources and their management in various parts of India.

Considering the different views on existing approaches on shifting cultivation coupled with its importance and ecological sensitivity including livelihood concern of the region, the National Academy of Agricultural Sciences (NAAS) organized a Brainstorming Session on “Issues and Challenges in Shifting Cultivation and its Relevance in the Present Context” at NASC, New Delhi on August 17, 2015 with Dr. U.C. Sharma and Dr. K.M. Bujarbaruah as Conveners. The BSS was attended by eminent scientists and experts in the relevant disciplines. The deliberations were enriched by in-depth interaction on the issue in focus. The Policy Paper is an output of all the deliberations, and I gratefully acknowledge the contributions of the Conveners, the distinguished participants, reviewer and the editors of the Policy Paper.

S. Ayyappan
President

Issues and Challenges in Shifting Cultivation and its Relevance in the Present Context

1.0 INTRODUCTION

Shifting cultivation is an agricultural system in which a piece of land is cultivated temporarily, then abandoned and allowed to revert to its natural vegetation while the cultivators move on to another piece of land. The period of cultivation is dependent upon the fertility status of the soil and normally varies from 1 to 3 years. In exceptional cases, it may extend to four years. Much of Southeast Asia is dominated by mountainous topography populated by diverse cultural communities. People involved in such cultivation are called Jhumias. Expansive forests and sparse populations allowed these mountain-dwelling communities to practice variations of shifting cultivation, which enabled them to coexist in relative harmony with their environments. Slashing and burning is done in the beginning of *Jhum* cycle and for next few years cultivation practices are followed. It is only when farmers move to another piece of land after abandoning the earlier piece, the slashing and burning is done on new land. The slashing and burning in shifting cultivation systems, however, has often drawn criticism as being inefficient and a leading cause of tropical deforestation. Mutual antagonism, deep suspicion, and open conflict have characterized the relationship between foresters and shifting cultivators. Finding ways to discourage shifting cultivation and facilitate adoption of more permanent forms of agriculture continues to be a high priority policy of national governments across Southeast Asia, including India. Coupled with faulty agricultural practices, the need for fuel, forage and timber has further adversely affected the forest cover and resulted in continuous deflation of this valuable resource. The fragile ecosystem of the region is under continuous stress from different angles and there is possibility of its being deteriorating further if the corrective measures, based on traditional wisdom and the new technologies in the field, are not taken immediately. Gourou (1953) rightly summarised the importance of the above by writing - *"The disasters brought on by agricultural methods which have taken no account of the treasures of wisdom and experience accumulated in the old tropical system are a sufficient proof of latter's value, it can be improved only if the reasons for its processes are fully understood*". Unabated exploitation of forests in the region has caused ecological imbalance. *Jhum* (Shifting cultivation) in the hill areas of north-eastern India has survived all these years mainly because of high energy efficiency (output of energy / input of energy) that ranged from 34 in a 30-year cycle to around 47 in 10-year and 5-year cycles (Toky and Ramakrishnan, 1982). Sharma (1993) indicated that high agricultural potential of the region can be harnessed, provided suitable, eco-friendly and socially acceptable land use systems is put in place. Farmers practicing shifting cultivation, though not averse to newer technologies, do not adopt them due to

socio-economic reasons. However, amidst faulty agricultural practices, there exist some indigenous land use systems, developed by the tribal farmers due to their ingenuity and skill; which are eco-friendly, do not involve deforestation and take care of resources and soil health. Such farming systems need to be popularized in the region under identical agro-climatic conditions.

The duration of time that a field is cultivated now has become lesser due to increase in population pressure and consequent need for grow more food. *Jhum* is a primitive practice of cultivation started as early as 6000 BC, but with increase in demographic pressure, this practice has become uneconomical and cause of degradation of natural resources.

2.0 RECENT STATUS, PAST DISCUSSION AND EXISTING POLICY

The people in pre-historic age were less in number, primitive in cultivation practices and their needs were very limited. As their number increased their needs multiplied. The *Jhum* is followed extensively in the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, Odisha, Madhya Pradesh, Bihar and Andhra Pradesh in India. This practice involves clearance of forest on hill slopes (usually before December), drying and burning debris (February to Mid-March, before onset of monsoon) followed by cropping. After cultivating the plot for 1-3 years, land is left fallow and process of slashing and burning is repeated on a new designated piece of land. Initially, it worked well, as *Jhum* cycle was ranging from 20 to 30 years, but with increase in human population and increased demands on lands, the shifting cycle has been reduced to 3-7 years which is impacting the positive facets of 'shifting cultivation', leading to land degradation and ecological problems**.** As per North Eastern Council, Shillong, about 14.66 lakh ha area is affected by shifting cultivation in the North Eastern Region.

The statistics related to the extent of area affected by shifting cultivation and the number of families involved is quite fluid, and different studies provide widely divergent views**.** It is also contended by some workers that both area of shifting cultivation and number of dependent households have not reduced in the last few decades. However, no comprehensive and focused study has been made in this direction. Since shifting cultivation in the tropics is mainly practiced on nutrient-poor soils, forest vegetation regrowth is important for addition of sufficient crop nutrients for optimum crop growth. The practice of burning leads to decline of weeds, pest, microbe population, and more incidence of crop diseases. Fallow periods in a shifting cultivation system vary and can be long enough for forests in abandoned plots to regenerate. One FAO estimate reveals that shifting cultivation extends over approximately 360 million hectares or 30 % of the cultivated area in the world, and supports over 250 million people. The total area of shifting cultivation mapped by the land cover maps in selected countries of tropical Asia is given in Table 1 (Silva *et al.* 2011). In India, estimated

area under shifting cultivation in states other than north-eastern region is about 2.32 million ha and about 2.53 million families are engaged in this practice (Table 2). Odisha leads with the area under shifting cultivation and families involved in this practice and locally it is called '*podu*' cultivation. Annual area under shifting cultivation in north-eastern states of India is $386x10^3$ ha while total affected area is 1.46 m.ha with shifting cycle from 3 to 7 years (Table 3). Number of families involved in the practice in the region are 0.44 million.

Table 1. Area under shifting cultivation in tropical Asia

Country	Area (000' ha)	Country	Area (000' ha)
Bangladesh	1508	Myanmar	18521
Bhutan	472	Nepal	54
Brunei	15	Papua New	
India	3780	Guinea	21
Indonesia	4703	Philippines	101
Cambodia	3234	Sri Lanka	785
Laos	10901	Thailand	666
Malaysia	671	Vietnam	9928

Source: Silva *et al.* (2011)

Table 2. Shifting cultivation area and families involved in some states of India

State	Families Involved (million)	Area (million ha)
Andhra Pradesh	0.11	0.15
Bihar	0.23	0.19
Madhya Pradesh	0.19	0.38
Odisha	2.00	1.60
North-eastern States	0.44	1.46
Total	2.97	3.38

Shifting cultivation in India, ICAR, 1985

Table 3. Shifting cultivation, soil and nutrient loss in NE region

State	Shifting cultivation		Soil loss from NE states (Million tonnes)	Nutrient	Loss (000' t)	
	Annual area (000' ha)	Fallow period (Years)		N	P	K
Arunachal Pradesh	70	3-10	178.1	217	36.6	153
Assam	69	2-10	178.4	201	33.4	155
Manipur	90	4-7	64.0	76	7.4	63
Meghalaya	53	5-7	57.7	62	7.0	48
Mizoram	63	3-4	39.4	60	6.9	40
Nagaland	19	5-8	41.7	44	5.2	34
Tripura	22	4-9	15.4	26	2.7	18
Total	386	2-10	601.2	686	99.2	511

Source: North Eastern Council, Shillong (2006); Sharma (2004).

In shifting cultivation, the relationship between the time the land is cultivated, and the time it is fallowed, is critical to its stability. These parameters determine whether or not the shifting cultivation system as a whole suffers a net loss of nutrients over time. A

system in which there is a net loss of nutrients with each cycle, will eventually lead to a degradation of resources unless actions are taken to arrest the losses. The longer a field is cropped, the greater is the loss of soil organic matter, reduced cation-exchange-capacity, lowering of nitrogen, phosphorus concentrations and drop in infiltration capacity. In a stable shifting cultivation system, the fallow period is long enough for natural re-vegetation and rejuvenation of soil for a healthy crop growth. Stable shifting cultivation systems are highly variable, closely adapted to micro-environment and are carefully managed by farmers during cropping phase.

Shifting cultivators may possess adequate knowledge and understanding of their local environment and of the crops including native plant species that they desire to cultivate. Normally in a village or clan the piece of land is selected, slashing and burning is done and cultivated for 2-4 years. The next cycle of slashing and burning is done when new piece of land is selected. Finding ways to discourage shifting cultivation and to facilitate adoption of more permanent forms of agriculture continues to be a high priority policy of the central government. Even though there is destruction of forests, many consider that shifting cultivation is a land-use practice that reflects (i) indigenous knowledge accumulated through centuries of trial and error; (ii) an intricate balance between harvested produce and ecological resilience; and (iii) an impressive degree of agro-diversity. It needs improvement rather than abandoning.

Shifting cultivation is also embedded in the complex nexus of people's religious belief, attitude, self-image and tribal identity. This kind of inter-connections between different elements and domains of social life restricts the cultivators to leave shifting cultivation unless suitable acceptable alternate options are available. Annual soil loss from the NE region is estimated as 88.3 million tonnes from shifting cultivation land, 90.7 million tonnes from other agricultural land and 422.7 million tonnes from non-agricultural land (Sharma and Prasad, 1995). As high as 130.2 t ha^{-1} of soil erosion has been reported in north-eastern hill region by shifting cultivation on hills having a slope of 70%. It was estimated that annual loss of N, P, K, Mn, Zn, Ca and Mg is 686.0, 100.2, 511.0, 227, 14.0, 57.3 and 43.4 thousand tonnes, respectively (Sharma, 2004).

3.0 STAGES OF SHIFTING CULTIVATION

Shifting cultivation typically has three basic stages: (i) removing the old vegetation or clearing; (ii) burning of the vegetation; (iii) and cropping. The concept of fallow management is lacking generally in India.

3.1 Clearing

Clearing of the plot intended to be used for cultivation starts usually with the beginning of the dry season after monsoon, since many plants dry slowly and have to be cut long

before they can be burnt. If the area is not forested, grasses and bushes are generally cut late in the dry season, followed immediately by burning. There are two stages in clearing: (i) slashing and related cutting activities; and (ii) felling and related cutting activities. After trimming and pollarding, the material is spread uniformly in the plot and left to dry before burning. The size of the land selected for clearing varies considerably, depending upon the number of people to be supported, soil fertility, and the size and energy of the labour force.

3.2 Burning

The quickness of burning depends on the cut-size and type of vegetation, and the weather. The best time for burning depends upon the dryness of the debris. In the dry season three or four weeks are usually adequate for drying. If the field remains unburnt for a longer period, weeds and shoots come-up, which lessen the chances of a complete burn.

3.3 Cropping

If the physical condition of the soil is favourable following clearing and burning, the seeds are scattered on the soil surface or dibbled into holes with a digging stick or hoe. Ridges and mounds may be made if roots are planted as a first crop. The cropping phase is the most demanding and complex since many crops are cultivated simultaneously or in an overlapping way. Mixed cropping is the most common practice in the shifting cultivation system, showing the importance of space and time relations for securing a flow of crop production throughout the year.

3.4 Fallowing

Fallowing is a period in which the land is left unattended for natural regeneration. Such lands are known as abandoned *jhum*. Nutrients are taken up by the fallow vegetation from a variety of soil depths depending on their roots. Part of the nutrients are stored in the vegetation and a part returned to the soil surface in the form of litter and rain-wash. The amounts of nutrients stored in the vegetation during the fallow, return to the soil after the vegetation is burnt. The long-term success of a shifting cultivation system depends upon how well the fallow period restores or maintains soil fertility. If the fallow period is shortened, the annual addition of organic material will be reduced, leading to soil fertility deterioration.

4.0 EFFECTS OF SHIFTING CULTIVATION

Shifting cultivation causes loss of flora and fauna, including rare species of plants, shrubs, medicinal plants and minor forest products. The practice results in deforestation, drying-up

of springs, wild animals' shelter depletion, silting and flooding in plains, soil erosion and ecological imbalance. There are changes in physical, chemical and biological properties of the soil after burning. Immediately after burning, the soil properties undergo a complete change. The pH rises initially, favouring the release of soil nutrients for the benefit of the succeeding crop (Table 4). There is substantial increase in organic carbon, and available P and K. However, this increase depends on the amount of vegetation burnt. Therefore, sufficient time has to be given between two *jhum* cycles to help rejuvenation of sufficient vegetation for the success of the practice. Much of the microbial population may perish during burning due to intense heat and high temperature in the surface layers of soil. Some species of microbes may resist this heat. The perished microbes are likely to be there in deep layers of the soil and may re-establish in the surface soil with the passage of time. However, detailed studies are required on this aspect.

Table 4. Changes in soil properties after burning of vegetation for *Jhum*

Stage	pH	OC (%)	Av. P(kg ha^{-1})	Av. K(kg ha^{-1})	Exch. Ca (me / 100g)
Before burning	4.9	0.51	5.2	185	5.6
After burning	5.6	0.82	9.6	530	7.2

Source: Waste land management" by V.V. Dhrubanarayan (ICAR, 1992)

5.0 SOCIO-ECONOMIC ASPECTS OF SHIFTING CULTIVATION

The rationale behind the persistency of this system is in its compatibility with physio-social environment of sparse population, community land tenure system, land undulation, poverty, and meagre resources available, with the tribal people. It may not be possible to stop shifting cultivation in a short space of time but the tribal communities can be persuaded and educated to adopt modern technologies to manage their resources on a sustained basis. Agriculture is that sector of human activity in which there is greatest interaction between the environment and the culture of the people. The environment, local conditions and the values are invariably connected with the agricultural practices that have evolved in the area. The people are socio-culturally attached with shifting cultivation. All operations of shifting cultivation are associated with some religious rites or festivals. For example, in Garo Hills of Meghalaya, the festivals susch as *galmaka, rongchugala* and *wangala* are associated with different operations of shifting cultivation. In every Angami village in Nagaland, there are some persons who play major role in various operations of shifting cultivation. They are *Kemovo* (Earth Priest), *Zhevo, Tsakro* (the first sower), and *Lidepfu*, the first reaper. The *Tsakro* is the old man whose duty is to begin the sowing. Until he has formally inaugurated the sowing of the crop, it is a taboo for any other person to sow. In some villages there are different *Tsakro*s for different crops. A ceremony called *Gnongi*, marks the completion of sowing of *Jhum* land; *Thekrangi*, marks the sowing of

the paddy; *Likwengi,* marks the beginning of sowing and *Lideh* marks the opening of the rice harvesting. In short, the shifting cultivators have different ceremonies and rituals to be observed with every operation.

There are as many as 65 or more ethnic groups in India practicing shifting cultivation. The shifting cultivation areas are inhabited by various tribes and their economy can conveniently be divided into hunting, nomadism, pastoralism, shifting cultivation and now, settled cultivation up to some extent. The social sanctions and belief system in these areas maintained a balance between resource potential and their utilization for a long time but due to the increase in the demographic pressure and indiscriminate use of natural resources, imbalance has been created. The fast growing population has pressurized the food production base, and to satisfy their needs, the people have mismanaged and misused natural resources. Due to anthropogenic and natural factors; like prevalence of shifting cultivation, land tenure system, free range grazing, deforestation and heavy rainfall; there has been large-scale land and environmental degradation. To sustain the fast growing population, there is strong need for integrated approach for natural resources management and livelihood security. The important issue is to promote the conservation and sustainable use of natural resources which allow long term economic growth and enhancement of productive capacity, along with being equitable and environmentally acceptable.

The shifting cultivation also provides full social security to the members of a clan. In earlier days of hunting and food gathering, the entire expedition used to share whatever was collected, though the brave and the leaders could get a major share, but those who were left behind, such as old and infirm or women, had also a well-defined share in the collection. The individual's welfare was the social responsibility of the society and it continued to be honoured in shifting cultivation phase also. The clearing of forest is a community operation, where everybody contributes according to his ability. The old may only accompany the group and tender advice out of their past experience, while the youth may provide bulk of the physical labour. The old, infirm and widows are given fields in the middle and the young on the periphery. Many operations in the shifting cultivation are community based, where everybody works according to his capacity but gets according to his needs. Thus, they are not dependent on their own children for their needs. Normally, operations having intensive labour requirement are done collectively and individuals work in each others' field on reciprocal basis.

6.0 EXISTING PROGRAMMES/SCHEMES

The Government of India and the respective state Governments, since independence, have started many schemes/projects to wean away the cultivators from shifting cultivation or improve the practice through technological inputs and awareness for long-term

sustainability. The programmes have, however, met with little success. The Planning Commission approved implementation of Scheme of Watershed Development Project in Shifting Cultivation Areas (WDPSCA) in seven states of North Eastern Region, i.e. Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura with 100% special Central assistance to the States as per directions of National Development Council (NDC) in 1994-95. In Odisha, keeping in view of the extent of the area and population affected by shifting cultivation, the state government has attempted to tackle the problem by controlling or nationalizing the practice. The colonization programme was introduced during the sixties in the problem areas to divert the primitive tribes to the settled agriculture by providing cultivable land, necessary inputs and residential accommodation. During the initial stages of the programme, a number of colonies have been established in the tribal areas. In most of the areas, however, the scheme has not achieved the desired targets. Besides the colonization scheme, the programme of rational land use on watershed basis has been taken up by the state government through soil conservation department. The programmes included (a) providing land to the tribals who were willing to give up cultivation on hill slopes; (b) plantation of economic species useful for tribal community; (c) introduction of conservation farming to allow tribal people to obtain higher production from crop land; and (d) utilization of steep slopes for production of timber. Under the above scheme a suitable watershed in the shifting cultivation area is selected and rational land use programme is executed on the existing catchment. A schematic land classification of watershed management units together with land use programmes was recommended for watershed areas for rationalization of shifting cultivation. The above programme was first started in selected catchments of Koraput district on pilot basis and then it was extended to other problem areas in Phulbani, Kalahandi and Keonjhar districts. However, these programmes were inadequate in view of the vast population and the area affected by shifting cultivation. In June 1987, Ministry of Agriculture, Government of India, launched a pilot scheme for control of shifting cultivation. It has two-fold objectives *i.e*. (i) restoring ecological balance in the hill areas; and (ii) improving socio-economic conditions of tribal shifting cultivation families by weaning them away from the practice with 100% central assistance. The ICAR Research Complex for Northeastern Region, Umiam, Meghalaya with its regional centers in each of the remaining states, was set-up with main mandate to develop technologies for the replacement of *jhum* cultivation. It has developed a model based on land capability. The model aims at (a) to promote forestry on upper reaches with silvi-pasture development; (b) to break middle slope length for annual or perennial fruit trees and inter-crop; and (c) to put lower slopes under agricultural crops. However, this model remained at the research station or did not get the acceptance of the *jhumias*.

The main objectives of the programme are to (a) protect hill slopes of *Jhum* areas through soil and water conservation measures on watershed basis and to reduce further land degradation; (b) encourage shifting cultivators to develop *Jhum* land for productive uses

with improved cultivation and suitable package of practices leading to settled cultivation; (c) improve socio-economic status of *Jhumia* families through household/land based activities; and (d) eliminate or mitigate bad effects of shifting cultivation by introducing appropriate land use as per land capability and improved technologies. The government programmes and efforts to wean away the cultivators from the practice of shifting cultivation have met with little or no success, mainly because the shifting cultivators are socio-culturally and socio-economically attached with the practice while interventions through land tenure system and land development, are beyond the capacity of the individual farmers.

7.0 PROBLEMS AND THE APPROACH

The problem has become serious because of the shortening of the fallow cycle and associated unsustainable practices in the management of shifting cultivation lands, rather than the shifting cultivation practice itself, which differ widely in different states, ethnic groups as well as within ethnic groups. Major constraints in improving shifting cultivation systems from the perspective of fallow improvement are; (a) remoteness or inaccessibility; (b) jurisdiction of various line departments; (c) prevailing land tenure system; and (d) transitory land use. Shifting cultivation causes loss of flora and fauna, which includes precious species of tree plants, shrubs, medicinal plants and minor forest products, and destroys habitats and threatens ecosystems. One hectare of land when subjected to deforestation releases about 450 metric tons of carbon into the atmosphere. This carbon eventually reaches the Earth's ozone layer, where it contributes to the greenhouse effect and global warming. Forest fires and the resulting smoke also contribute to air and water pollution. Because of the rapid increase in human population densities and the high demands for food and other necessities, the practice of shifting cultivation has gradually been intensified. Cropping becomes more intensive and prolonged, while fallows are shortened, resulting in deterioration of the physical condition and nutrient status of the soil. In the evergreen and semi-deciduous lowland forest zone, some runoff and erosion occurs during the period between burning and the establishment of an effective cover by the first crops, especially on steep land. Therefore, erosion may become a serious problem if more intensive cropping is practiced on steep land. Exposure and disturbance of the topsoil during clearing, cropping, and weeding can lead to acceleration of soil removal by surface runoff. The studies conducted on the economics of shifting cultivation at ICAR Research Complex for NEH Region have indicated that the practice is not economical. Against output/input ratio of 2.1, 1.9 and 1.8 in livestock, horticulture and agriculture based farming systems respectively, the shifting cultivation has an output/input ratio of only 0.6.

The issues involved in the problem of shifting cultivation are very complex and multifaceted. Over the years, various Working Groups and Committees have given considerable thought and recommendations. An open house seminar held in Aizwal, Mizoram in 1986; the task force on shifting cultivation in 1983; deliberation of National Board on Shifting Cultivation

at Kohima in 1985, have suggested the extent of the problem and the means to tackle the problem. However, the approach to solve these problems needs different pathways, attitude and financial involvement. Despite these efforts, hardly there is any reduction in *jhum* affected area.

This problem is getting aggravated because of reduction in *jhum* cycle and non-availability of additional areas for shifting cultivation. In several areas, abandoned *jhum* lands could not be improved because of variable land tenancy system. When land is not owned by individuals, nobody is there to take care for abandoned *jhums*. Therefore, the first priority should be improvement in land tenancy system. The immediate pertinent issue of rehabilitation of shifting cultivation areas is thus, two-fold: (a) scientific management of fallow cycle to maintain sustainability of the land; and (b) creating effective local institutions that could support such scientific interventions for sustainable development. Further, it may be noted that while clearing the land for cropping, many farmers keep the base for regeneration of the preferred species to not only to allow wide dispersal of seeds / propagules and rapid build-up of forest fallow after the cropping phase is over, but also to conserve the soil on the slopes.

7.1 Constraints to the improvement of shifting cultivation

The major constraints for improving shifting cultivation in India are:

Economic

i. Improved technology options are costly and labour intensive.

ii. Farmers' have limited financial resources.

Social

i. The political development and the strengthening of government have led to transfer of powers or authority from traditional leaders to government or political officials.

ii. Education and training in the form of new off-farm employment have led to a substantial reduction of active manpower in the rural areas. The youngsters are not interested in farming.

Institutional

i. Land tenure system is most important limiting factor in bringing about change in the existing *jhum* cultivation.

ii. Institutions for training, research and extension are either absent, under-staffed (quantitatively and qualitatively) or under-equipped.

iii. The local organizations at the village level are most important for the improvement of farming systems. It cannot be achieved without their involvement.

8.0 POLICY OPTIONS

A single national policy for shifting cultivation may not be feasible, because of diversity in the technical arrangements for the fallow and the cropping phases of the cycle, as well as in the social, cultural and political system governing the use of natural resources and their management in various states of India. Not only different ethnic groups follow different combinations of practices related to shifting cultivation, but also that there is significant intra-ethnic diversity in terms of experimentation and evolutionary stages in adaptations or maladaptation. Fallow management at the community level is important for a good shifting cultivation cycle and soil fertility aspects. Major policy option would be, whether to improve shifting cultivation or abandon it for good. There are underlying reasons for the actions of small farmers and shifting cultivators. In some regions, poverty-driven deforestation can occur if small-scale and subsistence farmers lack resources or secure land tenure and are forced to move into forested areas to grow food and earn their livelihoods. Although small farmers and shifting cultivators are not the main drivers of deforestation in regions where most deforestation takes place, they do contribute to it. In the long run, reducing their impacts on deforestation might be more difficult than reducing deforestation from large-scale commercial agricultural or logging operations. The international policy known as 'REDD+' (reducing emissions from deforestation and forest degradation, plus related pro-forest activities), can place value on standing forests and provide economic incentives for (a) reducing carbon dioxide emissions resulting from deforestation; and (b) increasing sequestration of carbon through forestry practices. In these programs, establishing land tenure and other entitlements for small farmers, indigenous peoples, and other stakeholder groups such as women is important for the inclusion of small farmers in a REDD+ system.

Going by the finding of NSSO that given an option, 43 percent farmers are ready to leave agriculture, there is room to expect that given the toughness and hard labour needed to practice of shifting farming (SF) and related problem of urbanization and fragmented family structures, SF might witness its own death in the years to come if something worthwhile is not done for its improvement. The policy option should, therefore, be to improve the practice scientifically in a cost effective manner. For this, technology option should not only be limited to improving productivity and production but also to minimize the downstream effect of SF on the plain land, more particularly on the river beds and wetlands. How best it is done is the issue.

8.1 Strategy for improvement of shifting farming (SF)

(i) *Adoption of silviculture in 50 percent areas above 50 percent slope in the SF areas of the country and the remaining 50 percent areas to be utilized as crop cafeteria promoting biodiversity conservation and use*. For this, each state practicing SF may work out the requirement of multi-purpose trees and also their plantation expenditure in a participatory mode with the shifting cultivators. Similarly, the unique crop biodiversity are to be registered with PPV&FRA besides promoting organic production practices

for those crops to capture the organic market through a well laid out procurement and marketing chain to be developed for high altitude produces.

(ii) *The flat land at 50 percent slopes need to be explored for jal kund concept of rain water harvesting so that the same could be used for horticultural crops to be introduced at slope below 50 percent and up to 25 percent*. Here, in between the horticultural crops, small ruminant and non-ruminant animal husbandry practices- may be 4-5 in numbers per farmer – need to be planned both for distress cash and manuring the fields. Likely financial involvement for these activities needs also to be worked out. In this area, facilities for bio-input production may also be created to support organic agriculture and animal husbandry.

(iii) *The area up to 25 percent shall have to be earmarked for agriculture particularly for crops like rice, sugarcane and oilseeds together with floriculture, mainly orchids.* For this, specially developed upland rice varieties with high yielding potential shall have to be provisioned by the research institutes and universities.

(iv) *Owing to the labour shortage in agriculture, improved farm machineries suitable for small holder hill farmers need to be developed and popularised.*

(v) Since crop land is decreasing, the above steps will provide unexplored crop land for quality food production including the food of animal origin will be right step towards improvement of shifting cultivation areas.

(vi) *Since soil loss under the influence of heavy rain is also an important issue, creation of appropriate drainage structure at the foot hill is another option, though costly.* The soil accumulated in the drains may have to be put back in the production system. Alternatively, artificial waterfalls may have to be created to channelize the uphill water which will also attract the tourists.

8.2 Intensification and Improved Fallow Management

Development of terraces along the slopes has not been an uncommon phenomenon in shifting cultivation. It is quite common in Andhra Pradesh. But the high cost of physical development has shown that the elite in the villages have been able to intensify whereas the non-elite poor have been left out. This implies that poor will be required to share a higher burden of the cost of improved fallow management in the non-terraced areas. Stable shifting cultivation systems are highly variable, closely adapted to micro-environments and are carefully managed by farmers during both the cropping and fallow stages. Shifting cultivators may possess a highly developed knowledge and understanding of their local environments and of the crops and native plant species. Complex and highly adaptive land tenure systems sometimes exist under shifting cultivation. Introduced crops for food and as cash have been skillfully integrated into some shifting cultivation systems. This type of cultivation is predominant in the eastern and north-eastern regions on hill slopes and in forest areas such as Assam, Meghalaya, Nagaland, Manipur, Tripura, Mizoram, Arunachal Pradesh, Odisha, and Andhra Pradesh.

9.0 RECOMMENDATIONS

A. The discussion during the brainstorming session culminated into the following recommendations:

- Step up social research components to understand and manage shifting cultivation system with active participation of economists and sociologists.
- Value addition of locally available forests and agricultural produce.
- Exploiting local medicinal and aromatic plants, and microorganisms.
- Value addition chain analysis to facilitate agri-based enterprises.
- Carbon balance sheet in the ecosystems that can be linked to carbon credit/trading in the future.
- Better infrastructural facilities *viz*. roads, health, education, and communication.
- Database on shifting cultivation areas needs to be updated.
- Traditional knowledge of *Jhumi* has to be documented and validated.
- Climate analogues are needed to be identified and success stories be replicated.
- Identify shifting cultivation areas where technology interventions are likely to work and areas where it is not going to work.
- Build-up of biomass is the key component of slash and burn agriculture. Settled valley cultivation is tenable in north-eastern hill region, both from economic and ecological viewpoints, to be supported.
- Nitrogen fixing trees such as alders (*Alnus nepalensis*) which coppice excellently, should find place in high densities in the agroforestry systems.

B. Action points and implementation

Based on the discussions, module for implementation of the proposed policy options across the country are hereunder:

(i) Government efforts in the past to wean away cultivators from shifting cultivation have met with little success, as the people are (a) socio-culturally attached with the practice; (b) many of them were not even aware of the government schemes being implemented, and such schemes, by and large, covered few selected beneficiaries; and (c) existence of any viable alternate cultivation system. Information sharing with cultivators. (*Action: Central and state governments*)

(ii) Alternate land use systems need to be highly productive and eco-friendly. Improving productivity in *jhum* lands. (*Action: Research organizations)*

(iii) In Sikkim and neighbouring country Bhutan, having almost similar topographical conditions, 100% cultivated area is terraced and settled cultivation is in vogue, enabling

better management of soil and water. But this is not so in North-eastern states due to several issues, particularly land tenancy system. (*Action: State governments*)

(iv) The pilot programme may be steered by Ministry of Environment and Forests through a core budgetary assistance, but at the field level it may also draw on resources from other programmes of Ministry of Environment and Forests (such as National Afforestation Programme, proposed Gram Van Yojana, Integrated Forest Protection Scheme, Biodiversity Conservation Scheme, Wild Life schemes, etc.) as well as programmes of other Ministries (*e.g*. Integrated Watershed Management Programme of the Department of Land Resources, Watershed Development in Shifting Cultivation Areas of Department of Agriculture and Cooperation, etc. and programmes of other supporting Ministries, like Tribal Affairs, Women and Child Development, Micro, Small and Medium Industries, Textiles, etc). (*Action: Ministries of Forest and Environment, Tribal Affairs, Women and Child Development, Micro, Small and Medium Industries, Textiles*)

(v) Given the uniqueness of shifting cultivation systems because of combination of socio-cultural-legal and bio-physical characteristics of the locality, replication of one model may not be successful in other areas. Due to enormous diversity, more than one pilot study in each such sub-locality are needed. (*Action: Line departments in states*)

(vi) Capacity building of the local communities for perspective land-use planning, at least in such areas where land pressure is not very high, to simultaneously accommodate forest conservation, agriculture development, and their other livelihoods concerns, should be emphasised. (*Action: Line departments in states*)

(vii) A scheme of rapid regeneration of forest fallows and its sustainable management. (*Action: Ministry of Forests and Environment*)

(viii) Successful forest-fallow management will depend on long-term security of land tenure in favour of individual or group of households to allow sufficient incentive for on-field innovation, technology adoption, and follow-up by the farmers. (*Action: Tribal societies and state governments*)

(ix) Providing employment opportunities and income generation on a regular basis through proper utilization of the land resources, *i.e*. by equitable distribution of waste land among the tribals. (*Action: Central and State governments*)

(x) Encouraging cooperative efforts for carrying out forest-based activities, *i.e*. basket making, rope making, cane furniture processing of minor forest produce, honey collection, etc. (*Action: Central and State governments*)

(xi) Forming Village Forest Committees for the protection and development of the degraded forests. (*Action: Ministry of Forest and Environment*)

(xii) Ensuring implementation of total literacy campaign; which due to remoteness and un-supportive attitude of tribals, has not been successful. For educating tribal

women and children, services of various non-governmental organizations and voluntary agencies, besides the regular government machinery, are required on sustainable basis. (*Action: State governments*)

(xiii) Legislation for instituting flexible family or individual land ownership with limited transfer or sales rights could encourage shifting cultivators to invest more in land, thus increasing their productivity. (*Action: State governments*)

(xiv) Land settlement schemes used primarily to relax population pressure on over-populated areas could also be used as an indirect means to introduce continuous cropping needing fewer inputs. (*Action: State governments*)

(xv) Knowledge of traditional or prevailing farming systems to ensure a balance between subsistence and commercial components in the design of alternative farming systems. (*Action: Line departments of states*)

(xvi) Pricing and marketing arrangements and cost/benefit analysis necessary for choosing technologies and practices. (*Action: State governments*)

(xvii) Diversification of indigenous and alternate land use systems. (*Action: State governments*)

(xviii) Agriculture diversification and starting of agri-based enterprises. (*Action: State governments*)

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