APPLICATION OF SLOPING WATERSHED ENVIRONMENTAL ENGINEERING TECHNOLOGY (SWEET) IN RESTORATION OF DEGRADED JHUMLANDS OF ARUNACHAL PRADESH

S.K. Barik
State Forest Research Institute Van Vihar, Itanagar, Arunachal Pradesh

Agriculture is the main occupation of about 80% of the population of Arunachal Pradesh. Being a mountainous state, majority of them practice shifting cultivation along the mountain slopes. The Task Force on Shifting Cultivation constituted by the Ministry of Agriculture in its report of 1983 estimated the number of shifting cultivator family in the state to be 54,000 and an area of about 700 sq. km is brought under shifting cultivation every year. As per the State of Forest Report, 1999 of the Forest Survey of India, an estimated 0.23 million ha of area has been affected by shifting cultivation during the period 1987-97 in Arunachal Pradesh. Due to limited arable land and increasing population growth, the farming on the ecological fragile and marginal mountain lands including those situated on more than 30^0 slope will continue. Considering the adverse impacts of the shifting cultivation such as loss of precious top soil, nutrients and forest biodiversity, destabilization of slopes and its low productivity, sustainable farming alternatives need to be developed and implemented. If the shifting cultivation in its present form is allowed to continue, land degradation and the impoverished living conditions of resource-poor upland farmers are bound to worsen with time. However, as yet we have no viable alternative to shifting cultivation practice successfully tested and widely accepted by the people. Therefore, it is urgent to seek new options for farming sloping lands that can enhance crop yield, stabilize the slopes, conserve the soil to an acceptable level and modify the existing practice of shifting cultivation suitably so that they can be accepted widely by the people in the mountain areas.

Taking into consideration these objectives, the State Forest Research Institute (SFRI) made an effort to apply the Sloping Watershed Environmental Engineering Technology (SWEET) for rehabilitating the degraded jhum lands of Arunachal Pradesh. The SWEET was originally conceptualized by the G.B. Pant Institute of Himalayan Environment and Development, Almora as a regenerative technology and the SFRI adapted the technology to test it works as an alternative to shifting cultivation in the Eastern Himalayan state of Arunachal Pradesh. The adaptive test was carried out in the form of an action research project entitled, "Application of SWEET in restoration of degraded Jhumlands in Arunachal Pradesh" sponsored by the G.B. Pant Institute of Himalayan Environment and Development, Almora. The project was started in 1996 and concluded in 1999.

The salient feature of this action research project was the active involvement of the villagers during the entire project implementation phase beginning from the planning and design stage of the project. An intensive PRA exercise for deciding the project components, the development of project on the farmer's own land, carrying out various project activities by the farmers themselves including contour marking and a detailed scientific analysis on various aspects of the project were other highlights of the projects. Although originally planned for 4 sites at different altitudes of Arunachal Pradesh, viz., Yazali, Julie, Boleng and Dirang, only 2 models at first two sites situated at two different altitudes could finally be developed. The logistic problem faced due to long distance was the main reason to abandon the model development works at Boleng and Dirang halfway. Along with the development of model, various research works such as assessment of nutrient build up, performance of different hedgerow species, trends in biological and economic productivity, and impact of the models on weed population density were carried out in order to assess the potentiality of the models to sustain continued agriculture and to examine their ecological and economic viability. The data obtained from the model plots were compared with that of adjacent jhum plots (both cropping and fallow) to compare the performance of the models in relation to the traditional jhum.

As already stated, the models under the project were planned and designed with active involvement of the villagers as possible alternatives to shifting cultivation in the given socio-ecological setups, the project components as well as the crops to be planted in the model plots were decided by the villagers and all the projects works were done by the land owners and villagers together, this helped the people in understanding the project philosophy in a better manner and ensured the acceptance of the models by the people.

The hedgerows (green terraces) were created along the contour lines as an alternative to bench terraces and cropping was done continuously in the alleys (inter-contour spaces). The relative performance of 5 hedgerow species viz., *Alnus nepalensis, Bahunia purpurea, Morus alba, Tephrosia candida* and *Thysanolaena maxima* was assessed. As hedgerow species, *Bahunia purpurea* and *Tephrosia candida* performed better as evidenced by higher economic yields per unit area and better nutrient build up than the other three species tried.

When compared with the adjacent jhum plots, the model plots and higher or similar output/input ratios, substantially reduced weed density and had higher biological and economic productivity. The output/input ration for SWEET model plots showed a continuous increasing trend from year to year and in the third year of the project the ration increased manifold.

In spite of continuous cropping, most soil nutrients in the SWEET model plots either remained constant or showed an increasing trend over a period of three years, however, in the adjacent jhum crop fields, all the soil nutrients got depleted significantly over the years.

Although a time span of 3-4 years period is too short to assess and conclude the performance and effectiveness of such models, initial results were quite encouraging and did indicate that the models have potential to work as viable alternatives to shifting cultivation in the given socio-ecological set ups. However, in order to confirm the conclusions, the SWEET models need top be maintained for at least five years and data on various aspects need to be collected for longer time period.