

Research Paper :

Energy flow pattern of micro-watershed based farming systems in hills

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ABSTRACT

The farming system of north eastern hills is complex due to practice of shifting cultivation prevalent in the region. Alternative farming systems to native shifting cultivation system were evaluated in long term evaluation to check viability, vulnerability and profitability of these farming systems. Among the eight alternative farming systems three *i.e.* agro-pastoral (FSW₄), agri-horti-silvi-pastoral (FS-W₅), horti-silvi-pastoral (FS-W₆) were evaluated during 1999-2004 for five consecutive years. Input supplied and output obtained or recycled were converted into energy equivalents and analyzed for profitability. Agri-horti-silvi-pastoral system was found to be highly remunerative with regards to output: input energy ratio.

Key words : Farming system, Hill farming, Micro-watershed, Energy flow

Energy is key component of every work. There is a need to look into all energy demanding sectors for efficient allocation and utilization of the energy. Agricultural sector in India involves more than 70 per cent of the population. In this sector sun energy could be harnessed to produce crop with higher energy efficiency. However, during this process also some amount of energy is being invested in the form of inputs (seeds, fertilizer, farm yard manure, irrigation, labour etc). The energy efficiency of the crop depend upon it characteristics, growth and environment

At the Experimental Farm of ICAR Research Complex for NEH Region, Umiam, Meghalaya, micro-watershed based land use systems was evaluated for their self sustainability and *in situ* conservation of natural resources such as soil and water (Anonymous, 2000-2004). Eight different types of land use systems namely dairy based (FS-W₁), mixed forestry (FS-W₂), silvi-pastoral (FSW₃), agro-pastoral (FSW₄), agri-horti-silvi-pastoral (FS-W₅), horti-silvi-pastoral (FS-W₆), natural forest (FS-W₇) and timber forestry (FSW₈), were conceptualized and evaluated for their suitability to farmers of the region and to sustain a family on these systems. Over the years a set of improved land use practices, livestock rearing practices etc have been tested for their performance and economic returns to farming community for sustaining a family along with livestock if any by recycling of produce and utilizing resources in more efficient ways. The resource allocation pattern although analyzed in terms of economic returns, their utilization and flow pattern needs to be assed.

METHODOLOGY

Among the eight farming systems tested over the years, agro-pastoral system (FSW₄) and agri-horti-silvi-pastoral (FSW₅) was found to be highly remunerative as per the economic analysis is concerned. These two systems were monitored for five years from 1999- 2004 to access the resource and energy flow pattern of the micro- watersheds. All the resources allocated for growing crop, livestock raising, jungle cleaning and other maintenance activities were recorded daily for last five years. The production and by product recirculation/selling etc were also recorded. The different resources were converted into energy equivalent using the energy constants recommended by Mittal and Dhawan (1989) for various agricultural, livestock products and by products. The input energy was estimated using the energy supplied for maintaining individual crop/trees, livestock rearing etc while the output energy was estimated using the similar energy equivalents for useful products and by products.

RESULTS AND DISCUSSION

The results obtained from the present investigation are presented below :

Agro-pastoral –system:

The agro-pastoral system (Fig. 1) was developed for mid altitude areas in which the upper reaches were having natural forest of about 33 per cent and areas were converted into terraced beds. The terraced beds are utilized for growing crops while the risers were utilized for growing grasses. The grasses on risers were helpful in not only stabilizing the risers, but also acted as additional production which led to keeping one cow and one calf in