CHAPTER-1

INTRODUCTION
Chapter 1

INTRODUCTION

The traditional communities residing in the biodiversity rich Dimoria Block and Tribal Belt of Assam, Northeast India are directly attached with their surrounding forests for their sustenance since generations. Members from these traditional communities prefer jhum kheti or ar kheti as commonly known in this part and elsewhere known by its derogatory name as slash-and-burn agriculture or shifting cultivation or swidden agriculture as their primary form of agriculture.

Shifting cultivation remains an important land use practice over large areas of the tropics and sub tropics (Warner, 1991). Shifting cultivation is ecologically sound and well adapted to available resources, which maximizes returns to labour by capitalizing on large land resources (Raintree, and Warner, 1986).

The jhum farmers of Dimoria are nowadays cultivating in the same plot of land after every 4-years. Ramakrishnan (1992) and Singh (1996) reported that due to increase in human population, which limits the availability of land as reported elsewhere, jhum farmers has reduced their rotation.

Many workers criticize jhum as an inefficient form of agriculture (Stracey, 1967; Borah and Goswami, 1973; Valdiya and Bartarya, 1991; Nakano and Miyauchi, 1996;) however in contrast many workers have also viewed jhum favourably (Conklin, 1969; Rappaport, 1971; Ramakrishnan, 1984, Altieri and Merrick, 1997).
It is common to hear from industrialized societies that jhum kheti is resource depleting as often industries are compared with this form of sociocultural integrated farming agroecosystem. However, when today most of the people speak about sustainable the former arguments are gradually getting diverted and scientists are giving arguments that many forms of shifting cultivation are viable systems of land use and are critically important in the context of increasing dependence of high inputs in modern agricultural systems (Allen, 1985).

It is very much important to mention here that jhum kheti is an integral part of the custom, tradition and practice among the traditional communities not only of Dimoria but also of other parts in the entire Northeast India. Therefore, jhum is considered as a significant land use practice, which cannot be directly suppressed by so-called developmental programmes and instead efforts should be taken to develop programmes with active participation of the jhum farmers, scientific communities and other stake holders. Scientific findings will definitely be useful to the communities if it is disseminated respecting the traditional knowledge.

Soil organic matter (SOM) or soil organic carbon (SOC) encompass all organic constitutes and fractions in the mineral soil, including plant and animal tissue in variable stages of decomposition, living biomass of microorganisms, root and microbial exudates and well-decomposed and highly stable organic material. The labile, active pool of carbon is composed of microbial biomass and easily decomposable compounds from leaf litter and root-derived material with short turnover times (from weeks to
years). Soil organic matter is a major factor in ecosystem functioning and determines whether soils act as sinks or sources of carbon in the global carbon cycle. Carbon input, magnitude of soil organic carbon pools and generally carbon mineralization depend on many factors. Changing patterns of land use and land use management practices can have significant direct and indirect effects on soil organic pools, due to changes in plant species, primary productivity, litter quantity and quality and soil structure. However, the impact of land-use changes on organic carbon pools in the mineral soil depends also on long-term site-specific factors (e.g. climate, topography and parent material) and is often overridden by the high spatial heterogeneity of soil organic carbon. Consequently, effects on SOC pools are evident only with the most intensive practices (Schwendenmann et al, 2007).

The conservation of soil organic matter is important at global, farming systems and soil process scales. At the same time, the mineralization of decomposing residues is an important source of plant nutrients in farming systems receiving low external inputs as in the case with jhum kheti. Complexes of soil organic carbon are responsible for improved nutrient and water retention, the promotion of soil aggregation leading to reduced erosion and the complications of toxic cations in soils all of which lead to a more productive rooting environment.

Microbial characteristics of soil are being evaluated increasingly as sensitive indicators of soil health because of the clear relationship between microbial diversity, soil and plant quality and ecosystem sustainability. Soil nutrient maintenance and
fertility buildup is dependent on microbes. Microbes are the major agent of nutrient transfer and release in soil and are especially important for supplying nutrients to crop plants. Moreover, many mineral nutrients including micronutrients held in an unavailable organic combination are also released in an available form by microbial decomposition. Microbial communities in soil underpin the vital ecosystem functions of nutrient cycling (Robinson, et al. 1992). Plant species also acts as important drivers of soil organic microbial biomass and soil microbial activity by influencing net primary productivity and litter input to the soil (Beare et. al., 1995, Wardle and Lavelle; 1997). Under nutrient limiting conditions, species effects could be significant on soil microbial biomass (Hungate et. al., 1996).

The maintenance of soil fertility in the mid hills of Dimoria, Assam is a severe problem due to more frequent perturbation and elemental losses related to it. Frequent perturbation is due to short jhum cycles. Incidence of erratic rainfall and often heavy rainfall within a short span of time induces poorer soil fertility recovery in these frequently visited jhum fallows. Moreover, due to the ecological and socio economic conditions that prevail in this area, management options for maintaining, indeed improving, soil fertility has to be by manipulation of biological processes only.

Therefore keeping the above vital points in mind and looking at the importance and the highly significant role of microbes in soil organic matter buildup and also the important role of secondary vegetation on soil fertility in jhum kheti (Nye and Greenland 1960; Brown and Lugo 1990; Döckersmith et al. 1999) the present study was
carried out to observe the impact of certain biological factors on some nutrients and soil organic matter for maintenance of soil fertility in hot humid and high rainfall receiving Dimoria Block, Assam, Northeast India.

The present study entitled 'Impact of certain biological factors on some nutrients and organic matter content in shifting cultivated hills in Dimoria Block, Assam' was carried out with the following objectives --

(i) To understand the complex interactions between vegetation and soil biological factors.

(ii) To determine how shifting cultivation alter the complex interactions.

(iii) Framing different acceptable management strategies for soil, fertility management.