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### **Sustainability of Maize Based Cropping Pattern in the Mid-hills of Nepal**

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#### **ABSTRACT**

Maize based cropping pattern is the most important pattern for food security in the mid hills of Nepal where agriculture is the mainstay for livelihood. Maize is the second most important staple food in Nepal. This cropping pattern finds its position in excessively drained, slopy land, shallow soil depth prone to moisture deficit and low soil fertility. Because of lack of irrigation, most of the slopy lands in mid hills are unsuitable for rice production. The study has been carried out to monitor sustainability of this system and finding causes of productivity declination of the system. Organic matter content has been higher in slopy land than flat land owing to the application of farm yard manure in the former while flat land receives more urea. Integration of livestock and forestry with that of agriculture is the common rule in mid hills of Nepal. The traditional system of livestock rearing and access to the forest resources couldn't be further sustainable as pressure on the limited arable lands had increased due to the continuous growth rate of human population and the related consequences. Traditional grazing practice contributes to the land degradation. Slopy lands are not poor in terms of phosphorus and potash contents; however, it is severely poor in nitrogen content. Soil conservation measures have not been initiated in such slopy lands leading to severe erosion each year. This cropping pattern not sustainable anymore. There is the urgent need to initiate practices like erosion control, conservation of nutrients in the soil, using land scientifically and making provision of irrigation to make mid hill slopy lands more productive and sustainable. Planting plants with good anchorage root system, for example grass species, in the eroded slopes could help recover eroded land. Soil erosion control measures should be taken in the danger zones to control further damages. Legume species fodder trees on the terrace risers should be planted to control soil erosion and as source of protein fodder with subsidiary effect on soil fertility improvement.

**Key words: Zea mays, Cropping pattern, Sustainability, Slope**

## INTRODUCTION

Maize based cropping pattern is crucial for food security in the mid hills of Nepal where agriculture is the mainstay for livelihood. Maize growing *Bari* lands are characterized by sloping terraces, excessively drained, shallow soil depth prone to soil erosion, moisture deficit and acidic in reactions. Declined soil fertility status of maize growing areas in the mid hills is one of the major constraints for increased productivity and sustainability. Question is being raised towards the issue of sustainability of maize based traditional cropping pattern. Legumes are one of the best options to make agricultural system sustainable by enhancing soil fertility, making balanced diet and protein rich feed for livestock. Now legume integration under food crops is getting popularity in many parts of mid hills of Nepal.

## OBJECTIVES

Overall objective is to find out the sustainability of the maize based cropping pattern in the mid hills. Specifically,

- ❖ To find out the soil management practices adopted by the farmers
- ❖ To examine major causes of fertility declination under maize based cropping pattern
- ❖ To highlight the importance of legume intercropping in the pattern

## MATERIALS AND METHODS

- Primary data collected from 201 households at Mankha VDC of Sindhupalchowok district, mid hill, Nepal.
- Simple random sampling was employed and data were collected using structured questionnaire.
- A total of 28 soil samples were collected from *khet* and *bari* lands representing all the wards of the VDC and analyzed for nutrient contents.

## RESULTS

Sustainability of maize based farming in mid hills has been monitored through legume intercropping and livestock integration. It has been found out that integrated farming has been practiced in the area since long time and practice of legume intercropping though is not new, the science of using such crops under maize is new for most of the farmers. The motive behind including legumes in the food crops is just to harvest pulse as per the farmers' understanding. Farmers have been found following traditional practice of cultivation and manuring albeit quite few numbers of farmers do have good understanding about legume integration and its implication in sustainable farming. Following photographs show how farmers manage manure and how they plow the land.



Indigenous practices of soil fertility management by the farmers in mid hills are: FYM application, use of ash, green manuring, leaving root and leaves of legumes in the field, crop residue burning and terrace management.

Most of the farmers apply urea as a source of nitrogen fertilizer while balanced application of different nutrients has been given less care (Table 1).

Table 1. General amount of fertilizers used by farmers and associated productivity of different crops

Crop	FYM (kg/ha)	Urea (kg/ha)	DAP (kg/ha)	MOP (kg/ha)	Productivity (t/ha)
Maize	6245	83.4	26.4	10	1.62
Paddy	6250	74	20	10	1.3
Wheat	8755	64.2	15	10	1.13
Fingermillet	-	60	34.5	-	0.86
Mustard	1090	48.4	-	-	0.37

Above table shows that the application of FYM is also less than what is recommended for sustainable harvesting. Despite knowledge of importance of pit method, farmers generally use heap method of FYM preparation. Nevertheless, with the constant use of farm yard manure and integration of legumes in maize, organic matter (OM) content is higher in *Bari* lands than in *Khet* lands (Fig1).

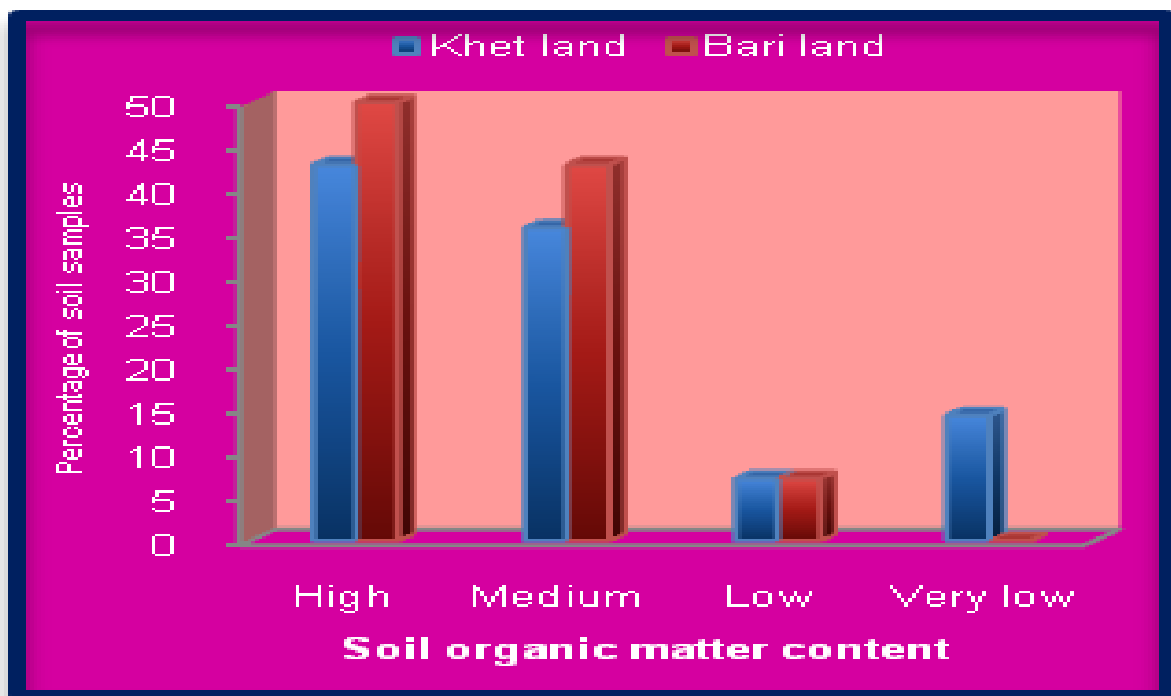


Fig 1: Comparative soil OM content according to land type

An available nutrient (N, P and K) in the intercropped soil is higher than monocropped (Fig 2). On the top of several benefits of intercropping, combined productivity of the intercropping is higher than sole cropped maize.

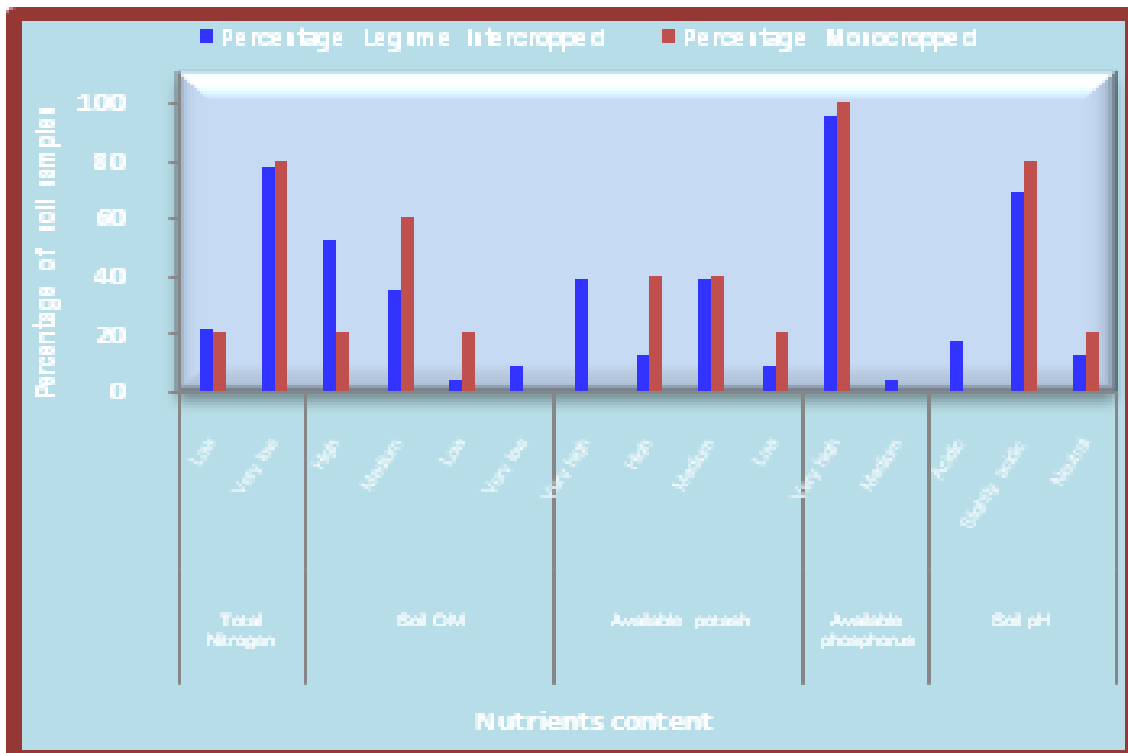


Fig: 2 Nutrients availability in the soil sample collected from intercropped and mono-cropped *Barilands*

### CONCLUSION

- As burning of crop residue in the farm is common practice, farmers should be taught about bad impacts of it.
- There is the urgent need to initiate practices like erosion control, conservation of nutrients in the soil, using land scientifically and making provision of irrigation to make mid hill sloppy lands more productive and sustainable.
- Farmers' practices should be upgraded with scientific ones and intercropping should be given due consideration.

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