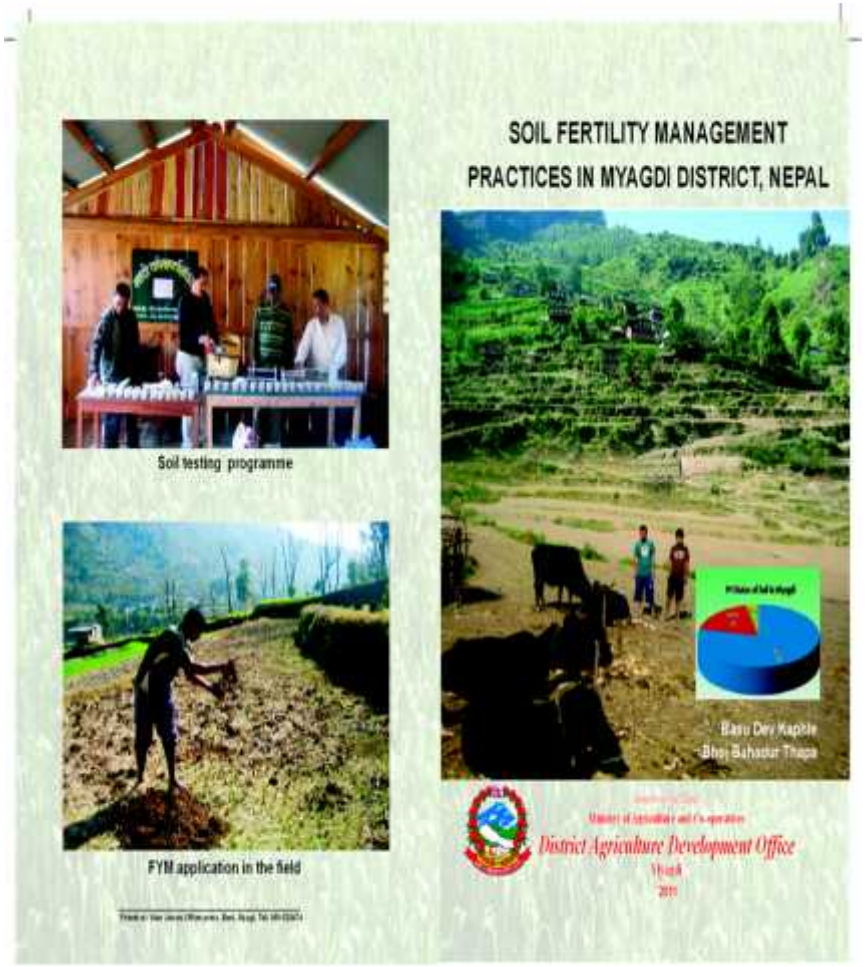
Improved cattle shed with manure pit

Nursery bed preparation with FYM application

Inclusion of legume (Local bean intercropped with maize)

Heaps of FYM in the field



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ABSTRACT

This study was conducted at three Village Development Committees of Myagdi district in 2011 to document the soil fertility management practices. Detail study was done at Babiachaur and Singha Village Development Committees (VDCs) with soil sample analysis. Forty farmers of selected VDCs were surveyed with semi structured interview schedule. In addition, key informant interview with field observation was carried out during this observation. Overall study revealed that application of farm yard manure (FYM) was the principle practice for maintaining soil fertility followed by use of chemical fertilizer (mainly urea and diammonium phosphate), inclusion of legumes and terracing. Insitu manuring was found only in Mudi VDC which lies comparatively higher altitude (Bagara Village up to 2300 masl). Farmers reporting on declining trend on soil fertility were confirmed from our finding of soil chemical analysis that in most cases soil was poor quality with low nutritional status and higher acidity.

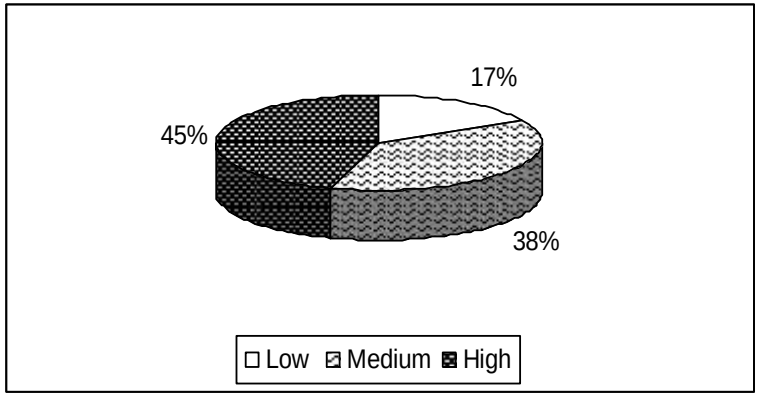
1. INTRODUCTION

1.1 Background

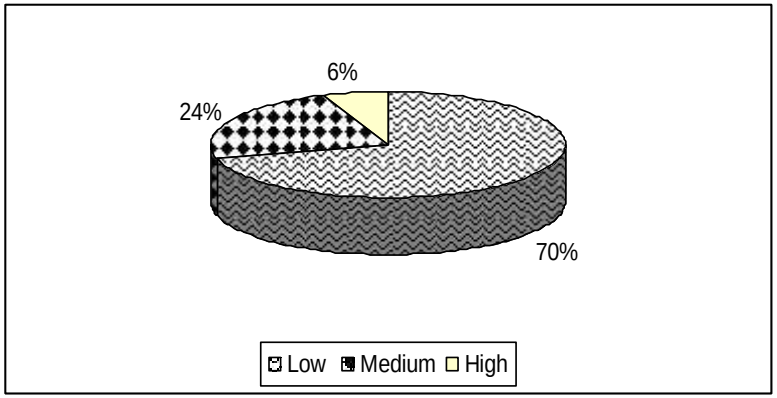
Nepal's economy largely depends on its agriculture sector. Sustaining soil fertility is essential for agricultural growth in Nepal. Farming in the mid-hills of Nepal is characterized by a close relationship between crop production, livestock and forestry, with trees and crops providing fodder and bedding materials for livestock, which in turn provide draft power and manure. Nowadays the linkage linkage between forests, livestock, and cropping systems is becoming weak. Soil fertility is largely maintained by the application of compost and manure, but in recent years a decline in soil fertility has been reported (e.g. Shrestha *et al.,* 2000). Historical trends increasing crop intensification, decreasing livestock numbers, increasing use of chemical fertilisers, reduced labour availability, and change in the climate over the last 30-40 years) showed a decline in soil productivity (Desbiez, *et. al.,* 2004).

4. CONCLUSION

Soil is fundamental to all agricultural systems. The agriculture production and productivity are mainly determined by the soil management. The finding showed that the principle practice for maintaining soil fertility was application of FYM, however, its use was found in decreasing trend due to decrease in livestock number resulted from shortage of labour and grazing land. Farmers reporting on declining trend on soil fertility were confirmed from our finding of soil chemical analysis that in most cases soil was poor quality with low nutritional status and higher acidity. Based on this research it has been concluded that integrated nutrient management approach focusing on FYM application and balanced use of chemical fertilizer to improve the soil fertility would be sustainable approach.



Figue .6 Phosphorous status of soil

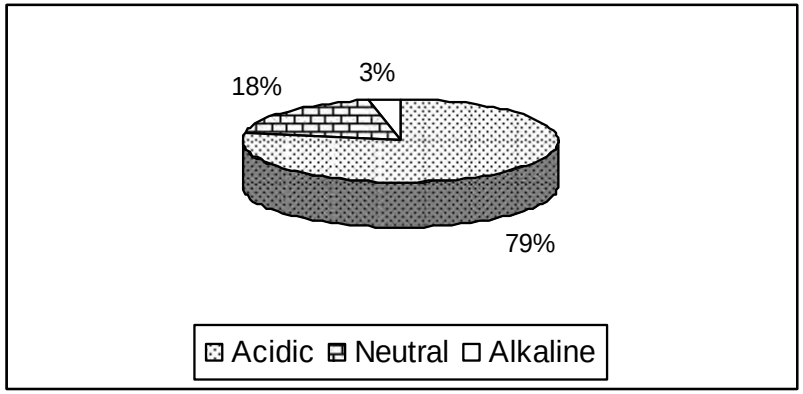


Figue 7. Potash status of soil

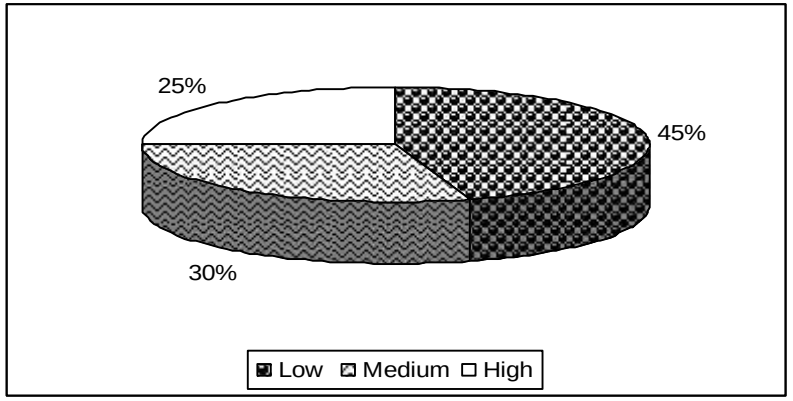
Declining soil fertility has been considered one of the major problems in the hill and mountain areas of Nepal as a result of recent changes in agricultural practices and increasing resource constraints. Hartemink *et al.* (2008) cited in Bista et. al. (2010) documented several constrains in soil fertility management in Nepal because of deforestation and other land use changes. These changes include non-agricultural uses of fertile land, land fragmentation and cultivation in marginalized areas, cultivation on the slopes, overgrazing, burning of crop residues, imbalanced use of agrochemicals, and declining use of organic manure. In South and South-East Asia, the principal soil degradation processes associated with land use changes include accelerated erosion by water and wind, salinization, flooding, water logging, and soil fertility The pace of soil degradation issue is the highest in mountains because of the fragile environment and the steep slopes (Acharya and Kafle, 2009). Moreover, due to rugged mountainous topography, active tectonics and concentrated monsoon

precipitation, Nepal is naturally highly vulnerable to soil erosion on slopes and flooding in the low-lands

Agriculture Perspective Plan (APP, 1995) put emphasis on boosting up the agriculture production through use of chemical fertilizers and irrigation in high production potential areas. Researchers have noted the emerging deficiencies of micronutrients especially zinc, boron and molybdenum and are increasing in extent in intensively cropped areas in different ecological belts of the country. Zinc has become a yield limiting in the major rice producing areas of the country. There is likewise a growing concern of the long-term impacts of fertilizer inadequacy and mismanagement in the rapid deterioration of soil health. The country's researchers have conducted a wide range of soil nutrient conserving activities that included management of acid soils, the adoption of sloping agricultural technologies, the use of biofertilizers.The national level of chemical fertilizer application rate is very low due to unavailability at



Figue 4. PH status of soil



Figue 5. Nitrogen status of soil

or section, proper analysis of that sample to determine the levels of available nutrients, and use of the results to determine optimum fertilizer rates. Soil testing program was oragnized in Singha and Babiachaur where 208 soil samples from 6 VDCs were analysed. Among them 115 samples were from Babiachaur and Singha. From this analysis it was found that, soil was acidic in nature having low nutritional status in most cases (figure.4, 5, 6, 7). In many cases, farmers' reporting on decreasing trend of soil fertility were confirmed findings from soil analysis. The reason might be the increase crop intensification as 30 years ago only rice was grown on low land and maize-millet on upland and decreasing trend of FYM use. Now there are three crops on lowland (rice, maize and wheat) and three crops on upland (maize, millet, wheat).

right time, remoteness and poor purchasing power of Nepalese farmers. Generally, there is the indiscriminate use of chemical fertilizer. Farmers do not have sufficient knowledge about use of chemical fertilizer.

The soil classification systems of the hill farmers of Nepal have already been documented (Tamang, 1991, 1992; Turton et al., 1995 cited in Dsbiez *et. al.* 2004), and these studies have shown that farmers use a range of criteria for soil classification among them; soil colour and texture are the dominant criteria. They also see the actual fertility of a soil at any time as a function not only of these longer-term soil properties, but also of the current and past management regime.

In Myagdi district 86 percent of the people are engaged in agriculture for their livelihood where crop and livestock farming is common (DADO, 2010). This district is highly mountainous district with geographical variation and rich in biodiversity.

Soil management is very important for them. Thus this study is designed to assess the soil fertility management practices in Myagdi district.

1.2 Rationale of the study

Soil fertility management is an important requirement for sustainable farming The Nepalese farming system is strongly interlinked among livestock, forestry and agriculture. The traditional agriculture is based on organic source of input and largely depends upon the forest resources and livestock raising practices for soil fertility management. Fertility status of soil can be increased by judicious application of both organic and inorganic fertilizers with other good soil management practices. Nowadays, the organic inputs are gradually being supplemented by inorganic sources especially in assessible area. However, chemical fertilizer application rate is very low in myagdi district specially due to remotenes and unavailability at right time as indicated by

However, most farmers believed that their land was less fertile and more compact than 10 years back.

3.5 Response of farmers towards the use of chemical fertilizer

Many farmers in the study area felt that the continuous application of chemical fertilizer was causing the soil deterioration resulting the decrease in crop productivity specially millet and legumes. According to them there were no alternatives as soil demands chemical fertilizers.

3.6 Soil sampling and analysis

Soil testing plays an important role in nutrient management and crop production. It tells key nutrient levels, as well as pH levels of the soil. Soil testing mainly involves three-step process: the collection of a representative sample from each field

allowing them to graize in the forest during the day. In our transact walk in Mudi. it was observed that Animals are moved from one peg to another every 2-3 nights so as to competely manure the field. Specially it is done in April after the wheat or barley harvest, and before maize or millet planting. In Bagara of Mudi, rotational grazing of buffalo in forest was very common practice which is less labour intensive practice. However, loss of manure and urine occurs in this practice.

3.4 Farmers perception on soil fertility

All the respondents in the study area showed the positive response on the use of FYM to increase the fertility status of soil. It was found that there was the decreasing trend of livestock raising due to insufficient labour and grazing land. It has resulted the decreasing trend of application rate of FYM for 10 years. The study revealed that most of the farmers have increased the application rate of chemical fertilizer due to its accessibility whereas decreased the use of FYM during last 10 years.

DADO Myagdi. Efforts have been made to develop research and development programmes both by government and non government institutions that would address the problems related to soil fertility, however, achievement is not upto the expected level. Keeping these points in view this study attempts to document the soil fertlility managemet practices in Myagdi district so that some concrete plan can be formulated to enhance improved practices of soil fertility management.

1.3 Objectives of the study

The broad objective of this study was to document the current practices of soil fertility management in Myagdi district with the following specific objectives

- to identify farmers perception on soil fertility
- to list down the soil futility management practice
- to analyse the soil

2. METHODOLOGY

This study was carried out in Singha, Babiachaur and Mudi Village Development Committee of Myagdi district of Western development region. This district is highly mountainous district with geographical variation and rich in biodiversity. Geographical pattern of this district is structured by 8 percent plain valley, 58 percent hill and 36 percent Himalayan Mountain (DDC 2009). Myagdi river is a major river which flows west to east in the lower part. There are much variation in altitude and topography resulting climatic and soil variation. Singha, and Babiachaur lie on lower altitude whereas Mudi in higher altitute. Comparatively Babiachaur is more irrigated than Singha and Mudi as indicated by DADO Myagdi. Detail study was done in Singha and Babiachaur with field observation, soil analysis and household interview selecting 40 farmers. Information on farmers' perceptions on soil fertility and the indicators they use to assess the fertility status of their fields was

also improve other soil physical properties, provide ground cover and reduce soil erosion, increase soil organic matter. In the study area inclusion of legumes was the common practice in which local bean namely *Bhatte simi, Gahate simi, Sarade simi and chirkimirke simi* were intercropped with maize. Pea intercropped with wheat was also common practice as observed in the field. The farmers incorporated the crop residue specially stems and roots in the soil to maintain soil fertility. Soybean intercropping was also common in the bunds of rice field.

3.3.5 In-situ manuring

In-situ manuring is a traditional way to maintain soil fertility. In-situ manuring, the manuring of fields by tethering the animals directly in the fields, is an important strategy developed by farmers. This practice was common in Mudi VDC as seen in the field where manuring of agriculture field was done by folcking the animal in the field at night and

mentioned that they did not apply the recommended dose of chemical fertilizer as they used their own judgment. Mostly they used urea in maize and wheat but not rice. It is to note down that there is the transportation subsidy in chemical fertilizers in Myagdi district for few years.

3.3.4 Inclusion of legumes

Leguminous crops can play an important role to maintain soil fertility and sustain crop production. Legumes are an important source of nutrition to both humans and livestock by providing the much needed protein, minerals, fiber and vitamins. Cultivation of legumes is essential for the regeneration of nutrient-deficient soils. Legumes can be incorporated into cropping systems as green manure, intercropped or rotated with cereals and as leguminous shrubs in improved fallow systems. By biologically fixing nitrogen (BNF) in the soil, legumes provide a relatively low-cost alternative of expensive inorganic nitrogen in the soil. Legumes

gathered through individual semi-structured interview schedule. Topics covered included soil fertility management practices, local methods used to assess the fertility status of a field, and perceived trends in soil fertility. Whereas In Mudi only field observation and key informant survey were done. The relevant information was also collected through literature review. The data collected was analyzed using simple statistical tools.

3. RESULTS AND DISCUSSION

3.1 Farmers' soil classification system

Based on their experience, the farmers in the study area have developed a local system of soil classification. The farmers used the terms *malilo* and *rukho* for fertile and unfertile soils. The soil was classified according to recognizable and easily identifiable soil and field characteristics. Most of the farmers classified the soil according to its colour rather then texture. In their perception, black soil

was highly valued for crop production as it contains organic matter and has high water holding capacity.

3.2 Farmers indicator of soil fertility

In our study area the farmers' indicators of soil fertility was yield, soil colour the topographic position of the field, and the stoniness. Farmers ranked these criteria in the following order: yield > topography > soil colour > stoniness (Figure 1). Yield was the most important criterion, and farmers are also aware that soil productivity is closely related to its position within the landscape.

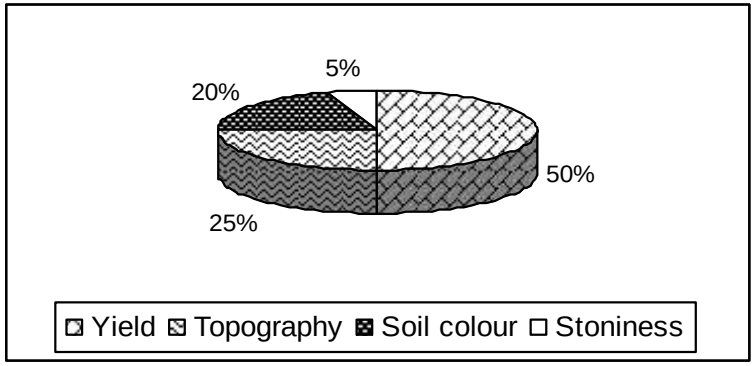


Figure: 1 Farmers indicator of soil fertility

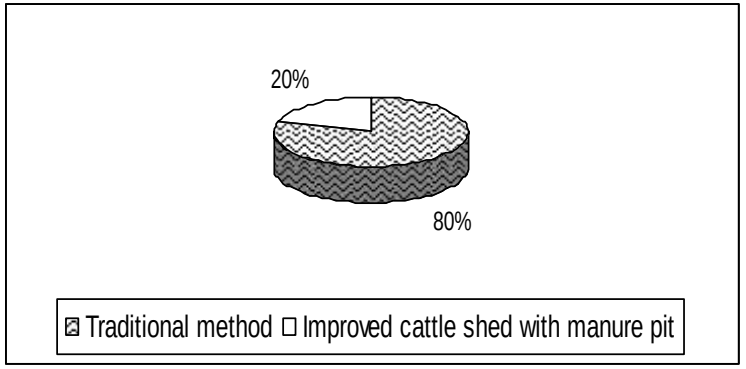


Figure: 3 FYM preservation methods

3.3.3 Application of chemical fertilizer

The important soil fertility management practice in the study area was use of FYM followed by chemical fertilizer. Most of the farmers in the study area used chemical fertilizer along with FYM rather than their sole use. The commonly used fertilizers were Urea, Diammonium Phosphate (DAP) and Muriate of Potash (MoP). However, some commercial farmers used micronutrients like multiplex. Basically, they used chemical fertilizer on maize at knee height stage. All the farmers

farmers followed that practice, which allowed maximum loss of nutrients from manure heaps either by sun or leaching by heavy down power in early monsoon. Chitwan farmers were more aware of these negative consequences of early manure application in the field and only 21.5 percent of them followed that practice, not knowing the negative effects. Knowledgeable farmers followed the application of manure at the time of planting and incorporated it in soil, which was common in Chitwan (78.5 percent). In our study also the most of the farmers (fig 3) were more aware of these negative impact of manure application prior of field preparation as they apply FYM just before field preparation. 15 years back they applied FYM about one month prior to field preparation and seed sowing. When asked about their familiarity, they reported that they were familiarized it by District Agriculture Development Office (DADO) and Agriculture Service Centre (ASC) as they are located in assessable area.

3.3 Fertility management practices

The farmers in the study area were found using several soil and nutrient management activities, such as, use of farm yard manure (FYM), use of chemical fertilizer, inclusion of legume crops in cropping system and terracing. However, application of farmyard manure (FYM) and of chemical fertilizer were noticed principle practices for maintaining soil fertility in which combination of both was most common (figure 2). Shifting herds for in situ manuring was mainly found in Mudi VDC.

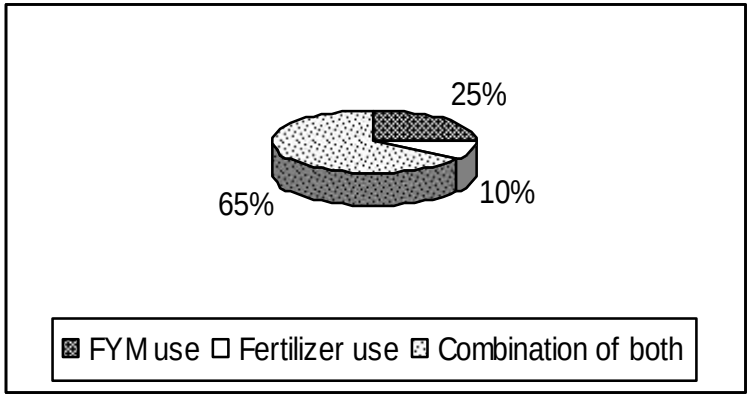


Figure: 2 Fertility management practices.

3.3.1 Application of farm yard manure

Animal manure is the main source of soil fertility in upland hills in Nepal (Suresh *et.al.*1999). In the study area there was the well integration of crop and livestock in which in which livestock provides FYM to crops. Quality and amount of animal manure is importance to enhance soil fertility. Most of the farmers reported that they used well decomposed manure in the field. They perceived that partially decomposed manure does not mix well with soil. It also increases infestation by insect pests. Again fast decomposing crop residues also influence soil fertility. The amount of FYM used in crop varied according to crop and field status. Generally in irrigated and partially irrigated area maize is followed by rice and the farmers practice was application of FYM only in maize. In the wheat growing area, they used FYM during field

preparation. In vegetable all the respondents used FYM.

3.3.2 Farm yard manure preservation and application time in the field

The improved heap or pit method of FYM preparation, along with improved cattle sheds made by farmers helped reducing the nutrient loss from manure pits, which better supported the growth of the corps. The time of organic manure application and the method of its preservation in manure pits play an important role in its nutrient availability. Leaving the manure for long time in small heaps facilitates the loss of nutrients either by volatilization or leaching**.** Most of the farmers in the study area followed the traditional method of manure piling in open piles rather than improved cattle shed with manure pit (Figure. 3). A study conducted by Bista *et.al.* (2009) on assessment of soil fertility management practice in Nuwakot and Chitwan found that more than 55 percent of the Nuwakot