

Review Article**AGRICULTURE LAND USE IN NEPAL: PROSPECTS AND IMPACTS ON FOOD SECURITY****R. H. Timilsina^{1*}, G. P. Ojha¹, P.B. Nepali², and U.Tiwari¹**¹Agriculture and Forestry University, Nepal²Kathmandu University, Nepal

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ABSTRACT

This paper reviews the agricultural land use pattern of Nepal based on published information. Agricultural land use in Nepal is closely related with the United Nations Sustainable Development Goal Two, which deals with the food security. To meet the increasing food demand, the ecological belts; Terai, and Hills should have a sustainable agricultural production system. However, land fragmentation is high in rapidly urbanizing Terai whereas increasing fallow land and landlord absenteeism is widely prevalent in Hills; both of these scenarios has brought changes in land use pattern for agricultural crops. Under this context, this paper attempts to discuss the changes in major crops grown areas in different time periods and their consequences along with factors responsible for such changes. Multiple factors such as- migration, real-estate business, and an increment in land use for off-farm activities are thought to be responsible for such change in the cropping area. On the other hand, increase in production of major crops has its low level of impact to the progress in food security which is rather related to the swelled purchasing capacity of food through remittance. To address the inefficient land use and low crop production issue, Government of Nepal has endorsed the Land Use Act, 2019 whereas its proper implementation at field level is quite important. Since, poor land management practices have significantly affected soil quality and crop production, urgent steps are needed to reverse the trends in land degradation while maintaining productivity of land through sustainable land management approaches.

Key words: Food security, land, crop, Nepal**INTRODUCTION**

Land issue is one of overarching concerns for every nation. For developing countries such as Nepal, it is more important in order to meet most of the United Nation Sustainable Development Goals (SDGs), particularly, reducing poverty and enhancing food security by promoting sustainable agriculture. More than ten SDGs are directly or indirectly related to land issues, and most of the SDGs are not expected to be achieved if land issues are not properly addressed (UNCCD, 2019). This has called for proper use of the available land. Land use in Nepal is still unplanned and rampant. Because of improper and unscientific use, benefit from land is unsatisfactory. It is more serious in case of agricultural land (Upreti et al., 2017). Along with the increase in population and semi urban areas, there is huge change in land use from agricultural to other purpose where land plotting business is flourishing more in Terai region of Nepal (Rimal et al., 2018). To rectify this wrong emerging trend, Constitution of Nepal (2015) has directed the government to make arrangement for protecting and promoting rights and interests of peasants and utilizing the Land Use Policy. It further urge for increasing production and productivity of agriculture through regulations and management of land, maintaining an environmental balance (GoN, 2015).

It is now well recognized that-globally, significant proportion of land and natural ecosystems are degrading and are at the further risk from climate change and biodiversity perspectives. These trends are especially alarming in the face of the increased demand for land-intensive crops. The case is more obvious in the fast developing South Asian region including Nepal (UNCCD, 2019). This paper attempts to discuss the changes in major crops grown area in different time periods and their possible consequences along with factors responsible for the agricultural land use changes in Nepalese context.

RESULTS AND DISCUSSION**Land use status of Nepal**

Out of the total 147,181 square kilometers land area of Nepal, agricultural land is 28 percent (of which 21 percent is cultivated and 7 percent uncultivated); forest area is about 40 percent and pasture covers 12 percent (CBS, 2013). However, a recent study by FRTC (2019) revealed that cultivated land occupies 21.88 percent of total land. This indicates the recent increment in crop land area in Nepal. Similarly, forest covered area looks increased from 40 to 44.4 percent. After forest, other land occupies 28.68 percent of total area. Settlement and wetland, on the other hand, cover 1.15 percent and 1.22 percent of the total area, respectively.

Out of the total arable land in Nepal, Terai and Hill occupy around 56 percent and 36 percent respectively (CBS, 2013). In spite of the fact that Mountain region occupies 35 percent of national geographic area of Nepal, it only has 8 percent of temporary crop area as topography, climate and soil types are not suitable for seasonal farming.

Terai has experienced an increase in population, urban built-up and an intensification in agriculture whereas Hill has increased rate of out-migration (Jaquet et al., 2019). This implies that land management issue is more crucial in Terai and Hill compared to the Mountain.

During a decade (2000 to 2010) (Table 1), overall crop land and vegetation area was increased whereas the forest area was decreased, but as of now it has increased its coverage area. This kind of land cover change is one of the most important drivers of farming system change.

Table 1. Land use change in Nepal (in square kilometer)

Land Use Category	Area (2000)	Area (2010)	Net area change
Forest	63650	63532	-118
Vegetated areas	35112	35157	45
Croplands	36757	36830	73

Source: (MoFE, 2018)

Land use and food security

Global Hunger Index (GHI) (2019) indicates that the level of hunger and undernutrition worldwide falls on the transition of serious to moderate, at a value of 20. However, food security problems are particularly acute in South Asia which records the highest number of extremely poor people and hunger index, 29.3, which is serious. Thus land use and food security issue, which are interlinked, had drawn the attention of policy makers. Nepal has experienced rapid improvement in reducing hunger; the reason may be increased buying capacity of people through remittance, but not due to increased agricultural productivity (Dhungana & Pandit, 2014).

The average landholding per family in Nepal is less than 0.68 ha (CBS, 2013) which is gradually decreasing for last three decades. Furthermore, agricultural land has been fragmented regularly for multiple reasons, particularly in Terai belt of Nepal (Shrestha, 2011). Terai occupies 23 percent of total land, popularly known as grain basket of Nepal. Hill, occupies 42 percent of total land, has absentee landlordism problem (CBS, 2013). Causes of fallow land and fragmentation are inheritance; land markets; and cultural norms (Sugden & Gurung, 2012). Land fragmentation has multiple negative impacts such as it reduce the scope for irrigation, questions practice in soil conservation, and there by affect productivity and efficiency. In this scenario, the only alternative to increase food security is intensification of production on available land and its proper use (Khatiwada et al., 2016).

A prominent notion of food insecurity in Nepal is micronutrient deficiency, known as hidden hunger, is also related to the poor dietary diversity (WHO, 2018). Dietary diversity signifies bio-diversity which can be achieved by increasing access to land, its proper use and natural resources management (Frison et al., 2006). Here, the challenge for country's policy makers could be visualized as the provision of incentives to the real farmers is needed to discourage land abandonment and misuse so as to retain them in farming activities, as present government efforts became futile to increase the agricultural production and productivity.

Nepal has varying topography ranging from Terai, Hills, and Mountains that covers 23, 42, and 35 percent of land area, respectively (ABPSD, 2013). Availability of several niches and variation in micro climate with the potentials to diverse high values crops and food crops enhanced biodiversity and support food system. Agricultural households are mainly concentrated in Hill and Terai regions which hold about 94 percent of total population with over 91 percent of land holding (CBS, 2013). Although farming is fundamental for the livelihood for majority of the people, population engaged in agriculture has continuously been decreasing from 91.1 percent in 1981 to 60.4 in 2011 (CBS, 2013).

Mountain and Hill are persistently suffered from a food deficit situation (Joshi et al., 2017). The deficit needs to be fulfilled by the surplus production in Terai. However, rapid increase in urban population has already converted rural Terai and Hill to peri-urban and urban area and the trend is continuing. This has posed a challenge to meet the food demand mainly due to decrease in production area.

Land distribution in Nepal from agricultural perspective

Agricultural land use for temporary and permanent crops grown show a opposite trend, as land under temporary crops decreased land under permanent crops has increased as shown in figure 1 (MRSMP, 2018). Besides, the number of land parcels has significantly increased from 10975 thousand in 2001 to 12096 thousand in 2011, where most of the parcels fall on the landholding size from 0.2 to 2 ha (CBS, 2013). This data support the fact about increased land fragmentation trend in Nepal. Nepal still has 31 thousand hectares of unused arable land (MRSMP, 2018). But the possibility of acquisition of unused arable land in Terai and Hill increased, since both the regions have escalating land demand for emerging cities and urban built-up.

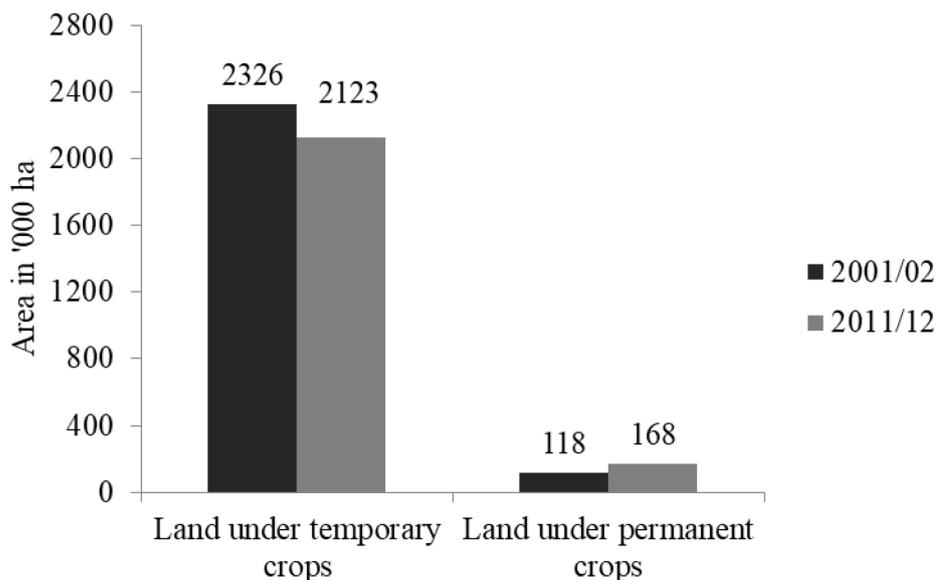


Figure 1. Change in land use during fiscal years 2001/02 and 2011/12 (Source: MRSMP, 2018)

Figure (2) depicts that share of temporary crop has declined rapidly in the Mountain compared to Hill and Terai. Due to difficult topography and terrain in Mountain region, farming practices being predominantly done manually. However, farming became challenging in the Mountain due to increased wage rate.

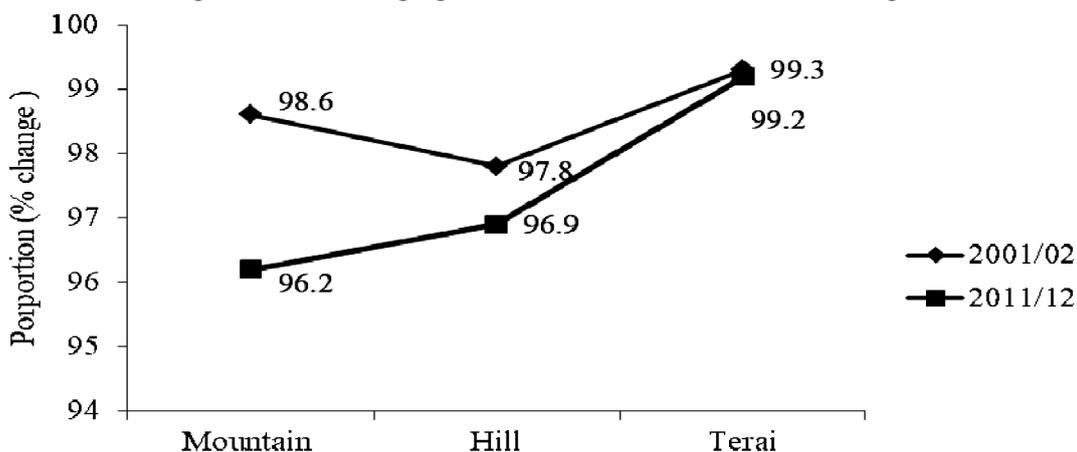


Figure 2. Share of arable land under temporary crop in different ecological regions during fiscal year 2001/02 and 2011/12 (Source: CBS, 2013)

The decreased share of arable land under temporary crops during fiscal years 2001/02 to 2011/12 in Mountain implies the fact about decreased involvement of labor force in farming which eventually increased the trend of leaving fallow land. This could further be better described by the rapid growth in labor migration (Piya & Joshi, 2016).

Major crops grown in Nepal

The Mountain region (above 3,000 meter mean sea level) where most of the barren land is found (83.59 percent) has less scope of agricultural land use intensification mainly due to rugged topography and climatic conditions (Paudel et al., 2016). But the scope of agricultural land use intensification is more in Terai and Hill due to plain topography and suitable climatic condition for farming.

Paddy, maize, and wheat are the major cereal crops grown in Nepal. Out of the total paddy production area, Mountain, Hill and Terai region contribute 3, 26 and 71 percent (Table 2) respectively (CBS, 2013) where Hill contributes 74 percent of total maize production area and about 57 percent of wheat production area lies in Terai (MoALD, 2019). The major cereals crops production based on ecological belt shows that Terai and Hill have greater role on staple food production. Nepal is one of the top ten fastest urbanizing countries in the world with its

urban built up more in Terai and Hills mainly due to topography and access (UNDESA, 2015), but this eventually destroys the fertile arable land.

Table 2. Area of major cereal crops production (ha) based on ecological region, during 2016/17

Ecological belt	Paddy	Maize	Wheat
Mountain	55 (3)	88 (10)	53 (7)
Hill	399 (26)	664 (74)	264(36)
Terai	1094 (71)	147 (16)	418(57)
Total	1549 (100)	900 (100)	735(100)

Note: Figure in parenthesis indicates percentage (Source: MoALD, 2019; CBS, 2013)

Shrinking in cultivable areas pushes towards land use intensification to meet the increasing food demand, but this may trigger to diminish the cultivation of number of crops and crop varieties, affecting crop diversity. In the long run decrease in diversity of crop land may results increasing homogenization of diets, limiting balance diet intake (Thrupp, 2000). Thus land management is more crucial in Terai and Hills of Nepal to reduce the mal nutrition and also to conserve biodiversity besides producing more food to meet the demand.

Available statistics show that maize production area has increased whereas the wheat production area has decreased but the paddy production area has been fluctuating during 2013/14 to 2017/18 (Figure 3). In one hand Nepal is importing 1.2 million tons of cereals per annum on the other hand, percent of fallow land and absentee landlordism are increasing (Adhikari, 2019). Besides, low competitiveness of rice produced by Nepali farmers compared to subsidized rice produced in India has increased import of rice, thereby increasing food dependency to India and abroad (Joshi et al., 2017).

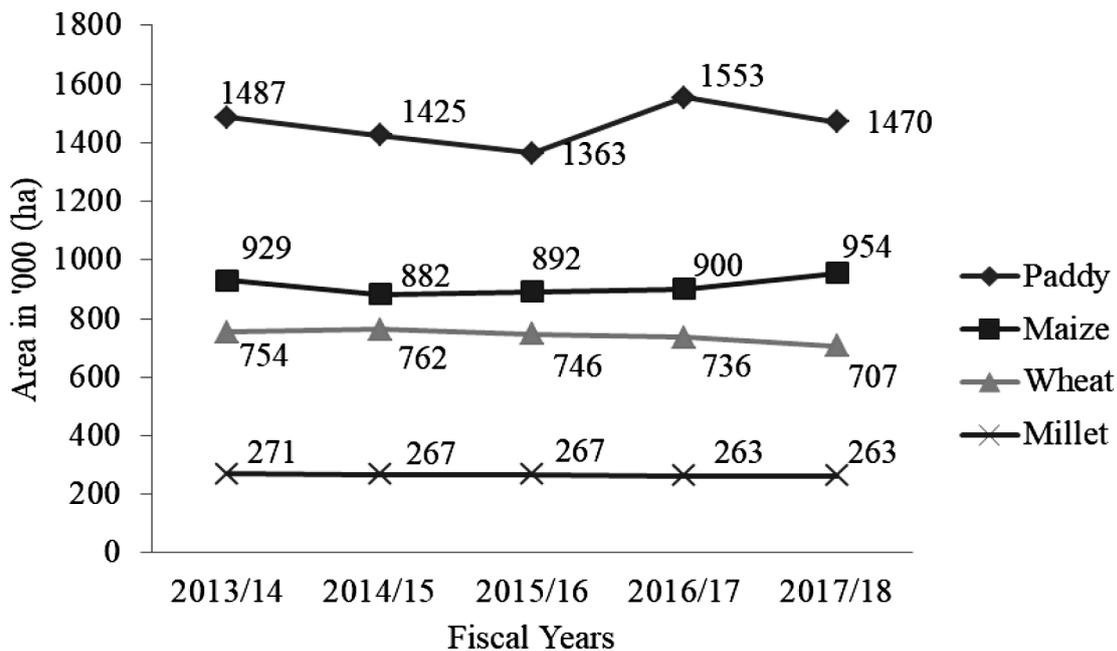


Figure 3. Major cereal crops production area based on fiscal years (Source: MoALD, 2019)

More than 86 percent of maize produced in the Hills of Nepal is used for human consumption, and 80 percent maize produced in the Terai is used for poultry and other livestock feed. There is shifting in maize demand trend from food to feed for livestock and poultry in Nepal. For example, 87 percent of the maize used in feed production during 2015/16, was imported from India (Timsina et al., 2016). This situation has somehow pushed farmers to produce more maize as demand of green cob throughout the year in the major cities of Nepal has also been increased, resulting maize one of the cash crops in Nepal. Because of these reasons, maize production is increasing. But the multiple factors such as migration, labor shortage/high wage rate, land fragmentation, land fallow, and increase in land use in off-farm activities are responsible for the decreasing crop productivity and area of major cereals, posing threats to the sustainable agriculture (Jaquet et al., 2015).

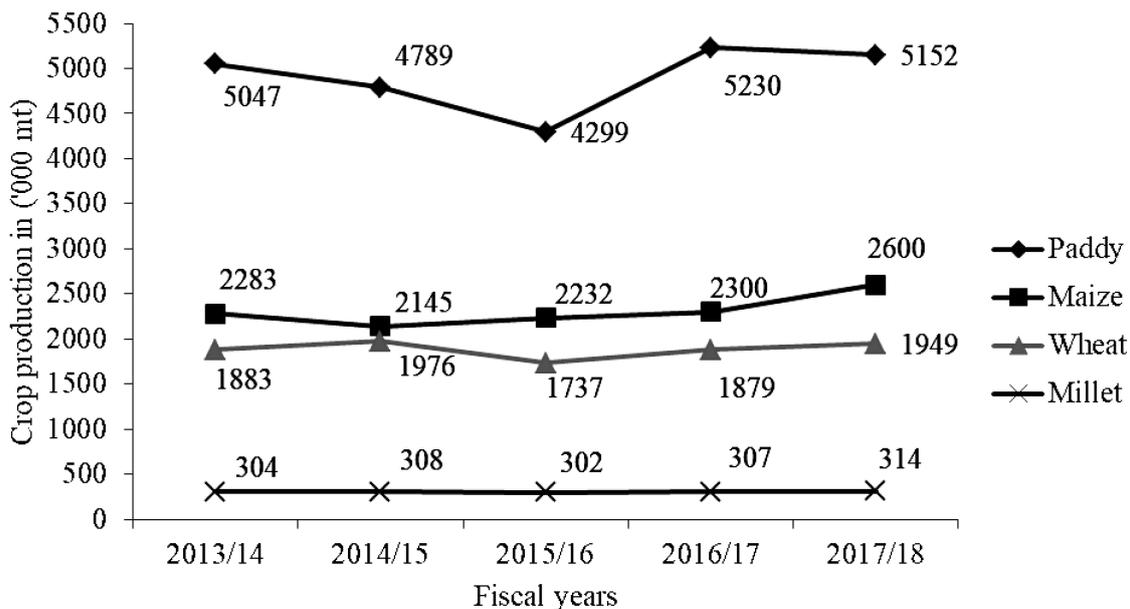


Figure 4. Cereal crops production trends during the fiscal year of 2013/14 to 2017/17 (Source: MoALD, 2019)

If we compare the statistics presented in Figure (3) and (4), the area of crops and production, especially the production of paddy seems decreased as area decreases. The same is the scenario for maize. Contrary to this, area for wheat cultivation is decreasing, but its production is increased. The case is more or less similar in the case of millet. According to MoALD (2019) the improvement in productivity of wheat was achieved by the use of improved seed and timely use of fertilizer. This implies that overall crop production could be increased by using proper inputs and technology even if area is decreased.

Major vegetables fruits, potato and oil seeds

The trend of vegetables, fruits potato and oil seed production area during last five years has been presented in Figure (5). Since vegetable farming is considered as prominent income-generating option for farmers the area under vegetable production is increasing (Rai et. al, 2019). A study finding revealed that during fiscal year 1977/78 to 2016/17 the area under vegetable cultivation has sharply increased by 222.8 percent with its increased production of 728.21 percent and productivity increment by 156.6 percent (Ghimire et al., 2018). However, due to lack of quality seeds and timely availability of fertilizer, the pace of vegetable production was not satisfactorily increased compared to the increased in area (Figure 5).

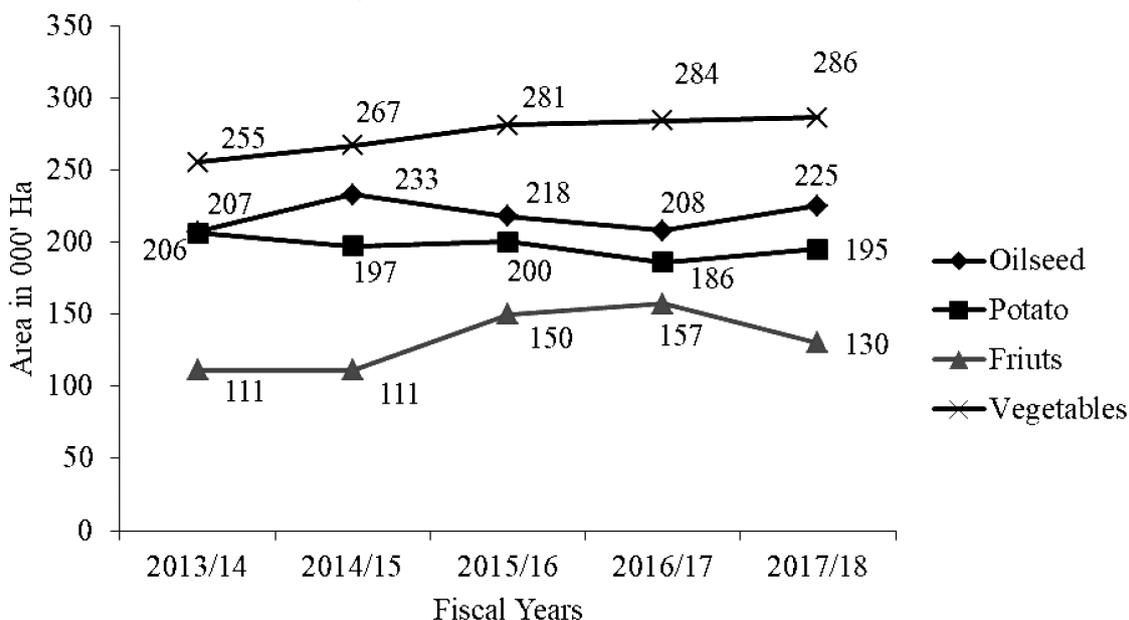


Figure 5. Other crop production trend during the fiscal year of 2013/14 to 2017/18 (Source: MoALD, 2019)

As urban areas grows, the demand for vegetable increases and this leads to increase in vegetable farming. Since vegetable farming is being popular adjacent to urban area there should be clear demarcation of vegetable pocket zone. On the top of that, roof farming is also one of the possibilities to increase in production and supply to meet the urban vegetable demand (Safayet et al., 2017).

Banana and apple are two important fruit, both in terms of transaction volume as well as value, being traded all the year round. The proportion of banana production in Mountain and Hills is far less compared to the proportion of population in these two agro-ecological regions (MoALD, 2019). Thus, Mountain and Hills have to rely on Terai for banana. On the other hand, banana cultivation has dramatically changed the land use pattern of Terai districts of Nepal, especially in the Chitwan, Kanchanpur, Jhapa, Morang, Saptari, and Nawalpur-Nawalparasi replacing mostly paddy, maize, and wheat cultivation area. Since banana farming has boomed over the last decade both in terms of plantation area and production (Ranjitkar et al., 2016), it has changed the land use for others crops in Terai regions.

Apple in Nepali market has been traded throughout the year. Mountain is the pocket area for apple production in Nepal and the inhabitants in the mountain are major suppliers to the Terai and valleys. The production data of 2015/16 suggests that 75.3 percent of apple produced in Nepal is confined in Mountain and remaining 24.7 percent in the Hill (MoALD, 2019). However, total fruit production area in Nepal in the recent years is decreased due to land abandonment and migration (Jaquet, 2019).

Similarly, Nepal enjoy to grow a wide range of oilseed crops in a great variety of environment and cropping patterns from east to far western regions, and from the high Hills to the Terai. Rapeseed and mustard are the major oilseed crops cultivated in all agro-ecological regions of the country from high hills (2500 masl) to Terai and inner Terai (60 masl). Tori (*Brassica rapa* syn. *B. campestris* var. toria) is by far, the most important oilseed crop in Nepal, occupying 83 percent of the oil crop area (NICDP, 2011).

Potatoes produced in Mountain are mainly supplies to Terai and valleys, though larger share of its production is traded and consumed in major market centers in the cities such as Kathmandu and Pokhara. Hills has fairly large share in total potato produced. In the Hills, it is cultivated both in summer and winter (MoALD, 2019). In Terai, it is cultivated as winter crop. Thus, the Hills is playing crucial role in stabilizing the supply not only to the Hills but also to the Terai and Mountains as the harvest season in Hills is different than that in Mountain and Terai (MoALD, 2019).

Factors of agricultural land-use change in Nepal and its dynamics

The land-use change is dynamic and occurs in different modes, with differences in magnitude and rate. This dynamism depends on scale (Keyser & Kaiser, 2010). Urbanization in developing countries is a pulling factor for people to move to urban and semi-urban areas from rural settings (Goldman, 2011). The speedy urban population growth rate of Nepal from 3.6 percent in 1961 to 9.2 in 1991 and 13.9 in 2011 is the evidence of this phenomenon. Thus, growing cities of Nepal are attracting people and that has changed rural economies into real estate (Goldman, 2011; Locher, 2012).

Migration and urbanization have complex implications for agricultural land and poverty. About ten percent of the urban population was at below poverty line in 2003 which was jumped to 16 percent in 2011 (CBS, 2013). Similarly, the increased male migration trend has increased feminization in agriculture. Thus, task of managing land has now fallen to those left in rural areas, primarily, women and elderly where the ownership of land by women is only about 10 percent in Nepal (UNCCD, 2019). The limited ownership of land has bereft to women in getting incentive, loan, and subsidy for agricultural production from government and financial institutions (FAO, 2019). This could be the obstacle for commercialization of agriculture sector in Nepal.

Labor shortages and increased wage rate in rural areas in Nepal often lead to more unscientific agricultural practices and land use (Khanal et. al, 2015). Because of out-migration, there is less animal husbandry practices, and therefore less manure has been collected which ultimately reduce soil fertility. In addition to this, areas where migration has not been a problem also has been experiencing soil fertility decline perhaps due to increased cropping cycles from two to three per year (Jaquet et al., 2015). The lack of economic stimuli combined with transition phase of political situation has resulted in a massive out-migration of the Nepalese productive workforce, leaving productive land fallow. Thus, Nepal's growth is increasingly reliant on highly external remittance flows which have increased the purchasing power of people, rather than increasing internal competitiveness on agriculture (World Bank, 2013).

Acquisition of farmers land for non-agricultural commercial purpose is increasing rapidly in Nepal. This directly affects agricultural production and the system as a whole. Seventy three square kilometers of crop land has increased during 2000 to 2010, particularly in the Terai whereas 45 square kilometer grass land and vegetative area were increased particular in Hill (MoFE, 2018). The reason behind this scenario can be related to the migration of people from Hill to Terai.

Land use and management practices are closely interrelated with soil quality, and the adoption of appropriate

land management practices (Oyetola & Philip, 2014). Therefore, land use planning would be helpful to restore the degraded soil physic-chemical properties and to ensure steady and sustainable productivity. Mountains of Nepal are suitable for vegetable seeds production and off-season vegetables cultivation. However, the lower part of the mountains is suitable for cereal crop production such as paddy, maize, barley, and buckwheat production. Potato, cole crops, beans, and low temperate fruit are also cultivated in the region. Crop area is annually increasing by 0.37 percent in the High Mountain (Poudel et al., 2016). The most pronounced land use changes in Terai region between 1989 and 2016 were related to the rapid increase in urban built-up cover (420 percent) and associated to the decrease in cultivated land by four percent (Rimal et al., 2018).

There were numerous flaws and negligence in the land use planning and farming practices in Nepal (Chidi, 2016). Thus after autocratic Rana regime, Nepal has been trying to resolve land use issues through several approaches, particularly discouraging to convert agricultural land to non-agricultural use. However, government has not been able to ensure the access of agricultural land to the farmers.

To date, all policies including the “Land Reform Act 1964” and amendments in Nepal have virtually failed to resolve land issues. In this regard, the government formulated the Land Use Policy (2015), based on the spirit of the Constitution of Nepal (2015) which recognized food as one of the fundamental rights of every citizen (GoN, 2015). Ensuring rights of every citizen to food means ensuring food security to everyone. Realizing the fact that poverty alleviation is not possible to attain without ensuring land to real farmers, government of Nepal has recently endorsed Land Use Act (2019).

CONCLUSION

Today’s increment in the production of crops in Nepal is a mere results of increased area of production, however, the trend of decreasing arable land, particularly in Terai due to rampant urbanization and land fragmentation between 1989 and 2016 is a major constraint to attain food security in the country. Thus there is a dire need to increase the level of land use intensification to address the problem of accelerating food demand.

Although Mountain region occupies one-third area of the country, it shares only eight percent of seasonal crop area which implies that land management issue is more important in Terai and Hill compared to the Mountain. The probability of land acquisition under the escalating urbanization of Terai and Hill regions of Nepal threatens both the used and unused arable land which could have rather been used in agricultural activities.

There is no doubt that access to and management of land resources need to improve markedly, to ensure food security. Since land management is cross cutting issue, participatory land use planning seems necessary to address the diversified issue of sustainable land management. Government of Nepal should regulate proper land use system by implementing Land Use Act (2019) at the field level. The future of nation, especially in attaining food sustainability will be shaped by how new federal Nepal implements land use policy and explores the opportunities to meet these challenges.

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