

Environmental, Economic, Social and Cultural Importance of Agro-biodiversity

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Abstract— Nepal is characterized by six bioclimatic zones and hence is very rich in local species of crops. There are reports that 6973 species of flowering plants, 790 species of food value crops, 145 kinds of horticultural crops, 700 species of medicinal plants, 200 kinds of vegetables, 71 kinds of fruits, 2000 land races of rice, and 174 kinds of mushrooms exist in the country. In a field survey of the concerned regions of Province 5 of Nepal, huge agricultural diversity basically crop species was observed by this author. In Pokhara, some subsistence farming households grow as many as 22 different land races of rice. The crop diversity is the biological basis of food security. It has both direct and indirect values in terms of food and nutrition. But less attention is given to the conservation of local varieties. The farmers' groups and other sectors need to be mobilized actively for the improvement of the rural livelihood through crop biodiversity. Conservation of local landraces and increasing their commercial value through modern technique of production and processing needs to be introduced. Some recommendations are made in this article for the innovative interventions.

Keywords— Agro-biodiversity, climate change, conservation, environment, landraces.

I. INTRODUCTION

Nepal, a small land locked country with 147,181 square km in area, is characterized by six bioclimatic zones. The occupancy of land by agriculture is 28.7% (WB, 2019), forest coverage 44.8% (MoF, 2019) and others is 26.5%. Nepal's position in the world's biodiversity is 49th and mostly agro biodiversity is dominant (Butler, 2016). Agro-biodiversity covers both crop diversity and livestock diversity but this article is focusing on crop diversity. In Nepal, local landraces of crops has been used by the majority of the Nepalese for their daily requirement of food and nutrition and in livestock sector they rare for home consumption and income generation. Nepal's Terai, Hill and Mountain are also rich in medicinal plants and fodders. In the mountain areas, majority of the population depend on livestock for their livelihood and financial benefits. However, climate change is becoming one of the major environmental issues in Nepal these days. There are evidences that climate change is already affecting the biodiversity and weakening the livelihood assets of poor and marginalized communities.

II. NEPAL'S POSITION ON AGRO-BIODIVERSITY

Out of about 416 angiosperm families in the world, 203 (almost 50%) are represented in Nepal. The Biodiversity Profiles Project (1995) ranked Nepal as having the tenth richest flowering plant diversity in Asia (Agrarian Blog, 2015). Nepal's position in the world's biodiversity is 49th and mostly agro-biodiversity is dominant. More than 500 species of edible plant genetic resources are available, of which nearly 250 species are under cultivation. The number of wild species so far recorded in the country is 4 for rice, 10 for wheat, 38 for grain legumes, 41 for vegetables and 71 for fruits.

Genetic diversity in crops- both within and between species - is commonly recognized as a pre-requisite to ensure food security. Widening the genetic basis of crops as well as diversifying production is essential for developing a reliable and sustainable agriculture system. Specific genetic characters held in certain crop varieties are crucial to the development of heat, drought, salinity, pests and diseases-resistant, fast-growing, high-yielding new arieties, necessary to combat food insecurity in the face of climate change.

On-farm conservation involves farmers' continued cultivation and management of a diverse set of crop populations in the agro-ecosystem where the crop evolved or in secondary centers of diversity. It depends on farmers' active participation based on their reasons and incentives for maintaining diversity (Bellon et al., 1997). The following table (table-1) indicates that Nepal is very rich in crop diversity.

Table-1: Crop Diversity Richness in Nepal

SN	Group/Crops	No of species/cultivars/types
1	Flowering plants	6973
2	Food value crop species	790
3	Horticultural crop species	145
4	Fruit (wild + cultivated) species	200

5	Medicinal plant species	700
6	Mushroom species	174
7	Vegetables	200
8	Fruits	71
9	Rice land races	2000
10	Improved cultivars	188

Source: Joshi, Acharya, Gauchan, & Chaudhary, 2017

In a field survey of the Thakurdwara area of Bardia district in the Province 5 of Nepal, huge agricultural diversity basically crop species was observed by this author. About 28 local landraces of rice, 4 local varieties of maize, 5 local varieties of barley, 42 local landraces of finger millet, 68 local landraces of grain legumes, 4 local varieties of cotton, 3 local varieties of sugarcane, 50 different types of vegetable and fruit crops were recorded. These expressed data are shown more clearly in the following figure.

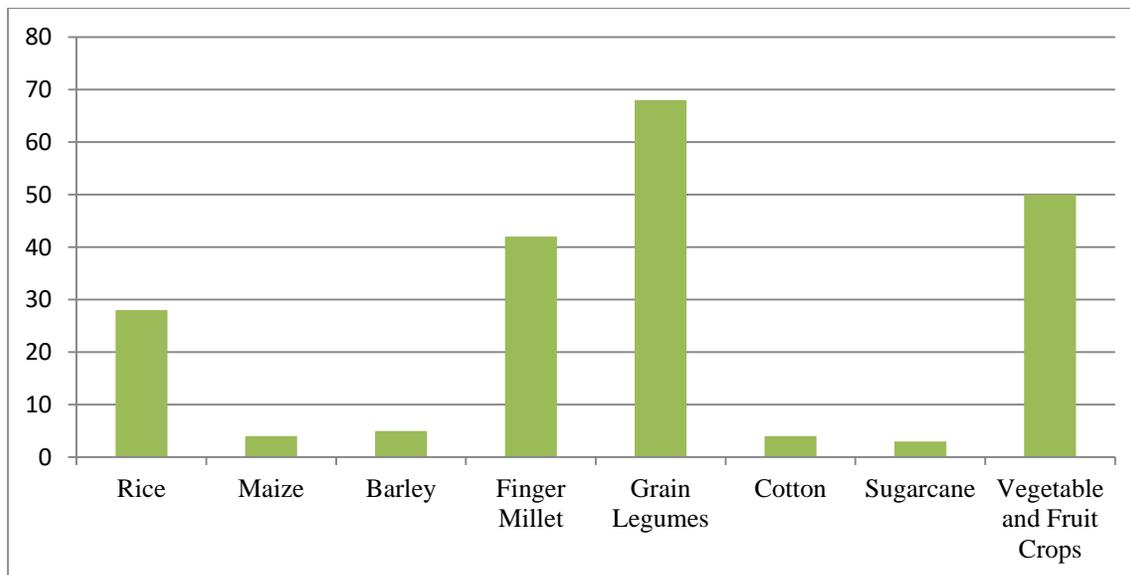


Fig.1: Agricultural Diversity in Thakurdwara, Bardia

Furthermore, there are reports from Pokhara area that some subsistence farming households grow as many as 22 different kinds of rice. The crop diversity is the biological basis of food security. It has both direct and indirect values in terms

of food and nutrition. In fact, it provides many goods and services of environmental, economic, social and cultural importance (fig. below).

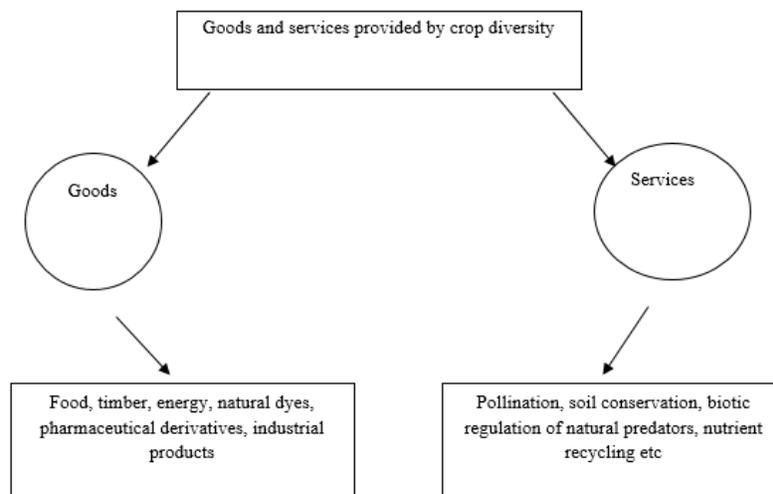


Fig.2: Goods and Services

The rural population of Nepal is widely dependent on natural resources for fulfilling the basic needs. About 60% of the total populations are dependent on the agriculture and it is of their main source of income. Agriculture in Nepal is substantial and hence, majorities of farmers are in marginalized condition. Less attention is given to the conservation and utilization of local varieties. The farmers' groups and other sectors of the community need to be mobilized actively for the improvement of the rural livelihood through crop biodiversity. Conservation of local landraces and increasing their commercial value through modern technique of production and processing needs to be introduced. The study on agro biodiversity will be helpful to find out the diversity in crop species and their proper conservation and utilization. Furthermore, it will be helpful to draw the level of awareness among the rural population about the conservation of local landraces which is the prime factor for change in their livelihood. Having made a field study on agro-biodiversity, the following innovative recommendations are made for future interventions.

III. RECOMMENDATIONS

1. Awareness Campaign

Awareness programs for conservation and management of agro-biodiversity need to be organized effectively, focusing farmers towards conservation of endemic species. For this the farmers' groups of men and women, CBOs, local NGOs and leader farmers can be mobilized properly for the

awareness campaign about the conservation of agro-biodiversity and conduct several trainings.

2. Education

Programs integrating education and agro-biodiversity conservation need to be launched together. Different education institutions are present in the study area, but still children of the poor farmers' groups are not found being schooled. Free schooling to the children of households focusing on conserving at least two or three local germplasm can be launched. Furthermore, agro diversity needs to be included in the curriculum of grade 7-10. Youths are the main resource of power for the development of the community. Knowledge about the importance of local germplasm can be provided to them by organizing trainings at frequent intervals for the conservation and management of agro-biodiversity.

3. Organic Farming

In most of the agricultural area less or no use of inorganic fertilizer and chemical pesticides is practice. In fact, the conventional farming practice is organic by default. Hence organic farming can be prioritized by declaring the area as the organic farming zone. It is because the organic agriculture promotes the cultivation of underexploited and underutilized crops, and local fruit and vegetables that can play a vital role in fighting poverty and food insecurity in Nepal. Organic certification is important for the organic product but, small farmers cannot afford the additional costs as well as the time consuming certification process. Therefore, there is a need of a support program so that a

farmer can be self-equipped and prepared for the process of certification. Furthermore, there are limited courses and activities on organic farming at school, universities and training institutions. As a result, extension services have usually faced problems of trained professionals on organic agriculture. Thus, incorporation of courses related to organic production is necessary in the education programs of primary and secondary school level, universities and training institutions for developing professionals in this field.

4. Commercial Vegetable Farming

Soils of study area are very rich in organic matter and suitable for vegetable cultivation. Market demand for local vegetable is also increasing. Income generation can be done through commercial farming of local vegetables-both seasonal and off seasonal vegetables.

5. Development of Market Center

There are inadequate market facilities in the rural areas of Nepal. For the increased demand and supply, market plays an important role. Market helps establish the value chain and provide more income to the farmers. Hence, collection centers in the production areas and Haatbazaar in the strategic points will help small farmers for maximum benefits.

6. Agro-tourism

Some areas of the Province 5 region, such as Thakur Dwara and Sworgadwari, have great potentiality to develop as tourist spots for both domestic and international tourists. The area can be developed as an agro-tourism area through the conservation and managed utilization of agro-biodiversity. Furthermore, integration of agro-biodiversity with socio-cultural diversity is important for promoting agro-tourism. In fact, agro-tourism promotes utilization of local food crops.

7. Culture Preservation

To protect the culture and uplift the socio-economic status, the natural fishing culture of Tharu needs to be preserved. The natural water source is decreasing and hence the natural fishing culture is seen rarely. Promotion of rice fish culture can be helpful to preserve the culture as well as for the conservation of agro-biodiversity.

8. Agro-biodiversity Conservation Zone

The areas in the vicinities of Bardia National Park is very ideal for declaring it as the agro-biodiversity conservation zone by promoting conservation and utilization of local germplasm.

9. Declaration of Green Belt

Areas along the roadside can be declared as green belt for planting the local fruit species and their wild varieties. This can be another way of agro-biodiversity conservation.

IV. CONCLUSION

Strengthening on-farm in-situ conservation and utilization of plant genetic resources including home garden diversification; maintaining farmer seed systems; promoting community seed banks; strengthening capacity for participatory plant breeding to broaden the genetic base for secured food production; and developing models of ecological farming, is the need of the day. In this way, poverty in rural Nepal can be reduced in a sustainable way through conservation, utilization and promotion of local land races. Poverty rate of 18.7 % in Nepal can be deducted in a sustainable way and rural life of Nepalese people can be made attractive. There is a need for integration of agro-biodiversity component within the national crop production programs. Particular attention should be paid to building on existing local knowledge, practices and innovation, including good practices on agro-biodiversity management and related sectors.

If we grow what is locally possible and eat what is locally available, food shortage areas can be shortly self-reliant. We should grow what is locally possible and eat what is available locally. If we have food production programs based on this principle and promote local food crops for production and consumption, food shortage areas can also be self-reliant in short time.

Adaptation is the best way to deal with climate change stresses. Farming communities in some parts of Nepal have already experienced these adaptation initiatives in their own local conditions and with knowledge and skills. These adaptive initiations should be documented and scale-up.

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