Research article

CONTRIBUTION OF MARGINAL LAND AND INDIGENOUS CROPS ON FOOD SECURITY: A CASE OF EASTERN CHITWAN, NEPAL

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ABSTRACT

People have utilized indigenous and underutilized crops available in the marginal land for their food. However, little is known about the contribution of these crops to food security. To assess the contribution of these crops to food security of local people, a survey was done with 107 respondents selected from community forest users of the eastern Chitwan of Nepal in 2020. The findings revealed that fiddle head fern (*Matteuccia struthiopteris L.*), air potato (*Dioscorea bulbifera L.*), stinging nettle (*Urtica dioica L.*), and white yam (*Dioscorea alata L.*) were consumed mostly compared to other indigenous and underutilized crops. Community forest was a major source of underutilized crops followed by marginal land. Though air potato was available only for four months, its contribution to food security was higher than the other crops. Indigenous crops were found gradually disappearing due to producers' poor access to land to cultivate, misuse of land, and ineffective implementation of the Land Use Act. Further, local people's engagement on off-farm employment had increased marginal land fallow. The study found that the prices of indigenous and underutilized crops offer income-generating opportunities. Thus, a marginal land use plan considering indigenous and underutilized crops is needed for both food security and income of local people.

Keywords: Food system, marginal land, COVID-19

INTRODUCTION

The concept of marginal land was used in the 19th century by Ricardo (1817). The less fertile, low productive, unutilized, or under-utilized lands are generally considered marginal lands (FAO, 1976; Lal, 1991; Edrisi & Abhilash, 2016). Depending on time and place, marginal land may also refer to idle, excess or abandoned lands, lands occupied and used by politically and economically marginalized populations (Kang et al., 2013). Barren and marginal land not used for farming has challenged the food security in Nepal (Timilsina et al., 2020). Farmers' preference to grow crops only in plain and productive land has resulted in fallow-marginal land. Although data about the marginal land area in Nepal is not available, it is estimated that about 17 to 60 percent of rural holding are uncultivated, a higher percentage in the hills of Nepal. In some cases, landowners do not rent out idle land for fear that tenants will claim rights under land legislation that grants tillers the right to claim a share of cultivated land (USAID, 2018).

Though most of the abandoned land is marginal and unproductive, a plethora of indigenous and underutilized crops (IUCs) are available in the marginal lands with the potential to contribute to food security (Khanal et al., 2015). Moreover, IUCs help mitigate poverty and famine caused by natural disasters and climate change (Ajani, 2013).

Local people have their unique methods to utilize indigenous crops and produce them in the marginal lands for sustaining their livelihoods (Khanal et al., 2015). Indigenous crops available in the marginal land nearby community contribute to nutrition and increase income, especially for women (Ghosh-Jerath et al., 2016). Despite the abundance of marginal land, cultivation of IUCs have not been given importance in Nepal,. Thus, the promotion of these crops in the marginal land leads to improved land use status, supports income of local people, built community resilience, and supports food security (Williams & Haq, 2002; FAO, 2004; Piya et al., 2019). However, little is known about the contribution of IUCs available on the marginal land to food security and income. Previous studies on IUCs in the Chitwan district of Nepal were limited to the Chepang communities and not focused on marginal land use. Moreover, the lack of information about IUCs available in marginal land in Nepal, particularly in Chitwan, indicates the research necessity in this area.

The COVID-19 pandemic has created pressure to utilize the marginal and fallow land to mitigate the problems of sustained food supply and job loss. This pressure has created a probability of change in marginal and fallow land use (Deuja, 2020). Besides the COVID-19, change in the use of marginal land has been occurring due to urbanization and the availablity of farming technologies like scale-appropriate farm machines. In addition, agricultural lands have been exploited for non-agricultural infrastructures (Upreti et al., 2017). The study assessed the contribution of IUCs to food security and income of local people living near the community forests of eastern Chitwan. Moreover, this study explored the potential use of marginal land for IUCs cultivation and use. The findings of the study can contribute to mainstreaming the IUCs in the food security and utilization of marginal land.

MATERIALS AND METHODS

The study was conducted in the eastern part of Chitwan district of Nepal. The community forest users living nearby community forests were the study population. Chitwan district has 92 community forests (CFs) and 27 buffer zone community forests. Among them, 56 CFs and 14 buffer zone CFs are situated in the eastern Chitwan (DFO, 2021). A sampling frame was developed using community forest users list. Consequently, a simple random sampling technique was used to select 107 households for a survey.

During 2020 June and July, six focus group discussions (FGDs) were performed with following community forest users groups; a) Kankali Community Forest Users Groups, Khairahani-4 b) Udayapur Community Forest Users Group-Kalika c) Kuchkuche Bufferzone Community Forest Users Group-Rapti d) Shree Parewashwori Community Foresrt Users Group, Rapti-Pipley e) Shree Jana Sakti Bufferzone Community Forest Users Group-Rapti, Pipley, and f) Mrigakunja Bufferzone Forest User-Ratnamagar-6. People involved in community forest management were selected for FGDs.

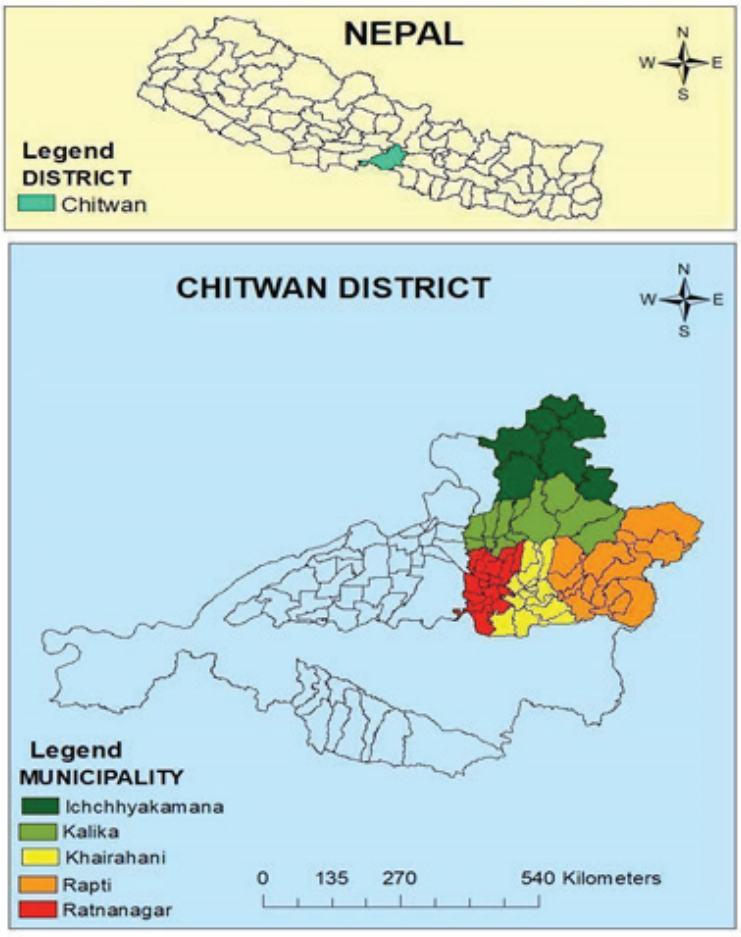

Figure 1. Study sites in eastern parts of Chitwan district, 2020

To explore the marginal land use and IUCs availability, the researcher did field observations along with survey. Furthermore, 10 key informant interviews (KII) were performed with the Chairman, Vice-Chairman, and Past Chairmans of community forest users committee of estern Chitwan to understand the marginal land and IUCs use. To collect data from the sampled households, mWater surveyor App (mWater Co.) was used. Computer software MS-Excel was used to analyze the data.

This research was focused on the IUCs, available on marginal land, used mainly by community people but not cultivated by them. The indigenous and underutilized crops (IUCs) were selected during preliminary field visits and key informant surveys. Fiddlehead fern *(Matteuccia struthiopteris L.),* air potato *(Dioscorea bulbifera L.*), stinging nettle (*Urtica dioica L.*), and white yam or greater yam (*Dioscorea alata L.*) were identified as commonly available IUCs. Except white yam, remaining three IUCs are wild in nature; however, they are semi-domesticated. Thus, these four crops were selected to represent IUCs for the study area.

RESULTS AND DISCUSSION

Sources of major indigenous and underutilized crops (IUCs)

The finding of this study revealed that more than 95 percent of the respondents' primary source of IUCs-under study was community forest followed by marginal land nearby houses, and community-marginal land, respectively (Figure 2). As white yam is wild and was available only in forest areas, it is not included in figure 2. Less than 10 percent of the households were found buying fiddlehead fern for home consumption. It was learned during the field observation that community marginal lands in the study area were less utilized.

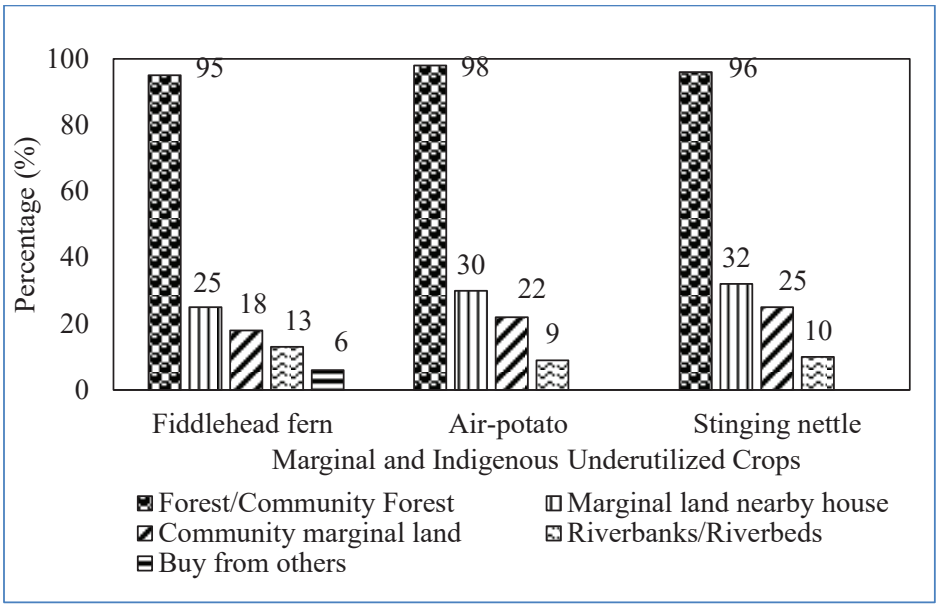

Figure 2. Source of IUCs collection and harvesting at study area, 2020

Haphazard management, politicization, encroachment, and exploitation are the leading causes of land underutilization (NPC, 2015). Moreover, lack of participatory management and lack of sense of ownership of community land by the community people were the reason for less use of marginal land. This situation indicates the need for designing proper land use and protection measures in close collaboration with the community people.

Availability of indigenous and underutilized crops (IUCs)

Findings from the Key Informants Interview (KII) revealed that fiddlehead fern and stinging nettle were available throughout the year. However, people prefer to consume stinging nettle during winter. Similarly, people don't prefer to consume fiddlehead in the rainy season due to the availability of leech and leech eggs in the fiddlehead fern. Air-potato was available only for four months (March to June); whereas, white yam is available from November to April (Table 1). During the survey, respondents proclaimed that the

decision of the community forest program has compelled community people to reduce the collection of IUCs. Regarding the availability of underutilized crops, results were somehow similar to the field observation of previous study done in the Chepang community of Nepal (Piya et al., 2019).

Table 1. Available months of IUCs in the study area

Crops	Jan	Feb	Ma	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fiddlehead fern	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Air-potato			✓	✓	✓	✓						
Stinging nettle	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
White yam	✓	✓	✓	✓							✓	✓

Tick (✓) marks indicates availability

The research concluded that the ethnic community-Chepangs consumed these crops almost throughout the year. They mainly consumed fiddlehead fern and air-potato during the dry seasons (February to May) to overcome the shortage of locally produced crops (Piya et al., 2019). After the onset of September, harvesting period of major cereals like rice starts, and due to the availability of major cereals, the consumption of IUCs reduced by the local community. As availability of IUCs in dry season months and lack of farm vegetables and cereals coincide, the consumption of IUCs increases from February to May. Thus utilization of the community marginal land promoting indigenous crops use and cultivation could be the option to support food security in the lean period.

Consumption trend of indigenous and underutilized crops (IUCs)

This findings revealed that the average days of consumption of air-potato during its peak available period of March to May ranges from 11 to 13 days per month (Figure 3). Likewise, the average peak consumption of fiddlehead fern was 12 days per month, from March to May, although it is available throughout the year.

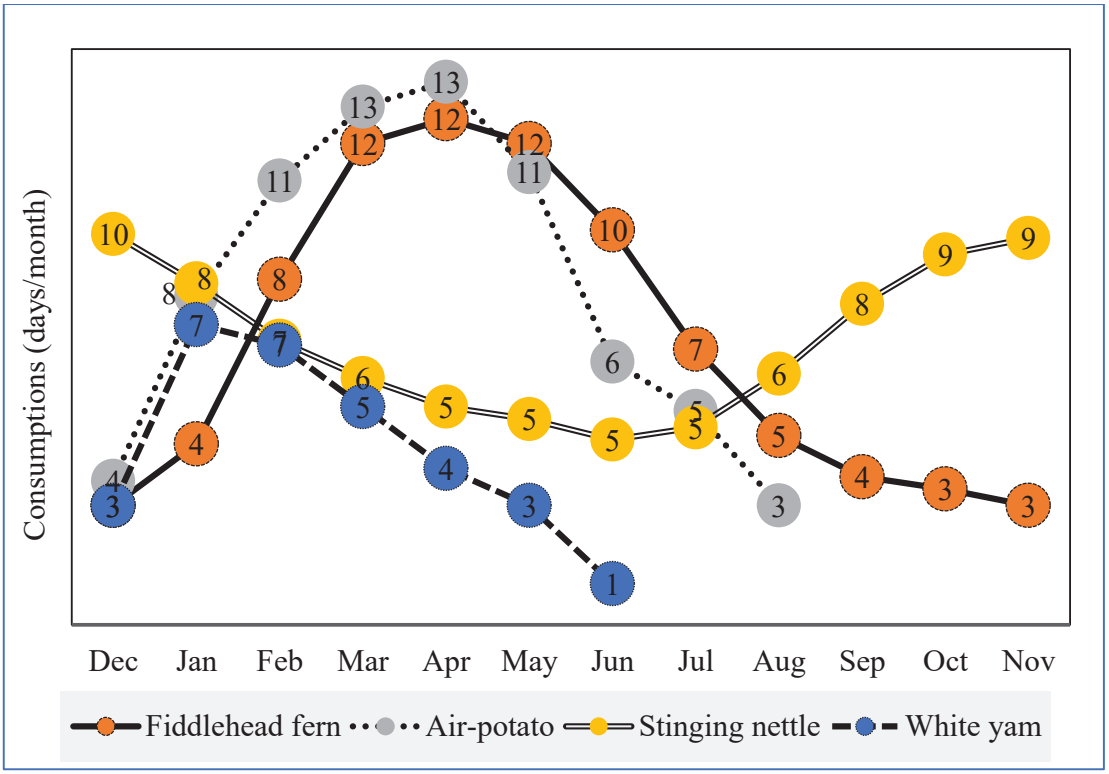

Figure 3. Consumption trend of indigenous and underutilized crops; days per month

Despite year-round availability, stinging nettle was consumed 8 to 10 days per month during the peak period, September-January (Figure 3). Its consumption was at a lower level during summer. In the case of white yam, maximum average consumption was found seven days per month during January and February. Harvesting of white yam tuber is difficult as it is a deep-rooted tuber crop. The time of maturity and harvest of white yam is December to Feburay (Ghimire et al., 2016). Thus its consumption in other months was minimal.

Relation between consumption of IUCs with food sufficiency months of households

Compared to other IUCs, air potato had more contribution to food security (Figure 4). While relating with the food sufficient months and consumption trend of air potato, the households (9.78%) having less than three months of food sufficiency consumed 188 kg of air potato in a year; whereas, it was 118 kg for three to six months food sufficeint household (19.57%). Six to nine months of food-sufficient households (27.17%) consumed 122 kg of air potato, whereas more than nine months of food-sufficient households (43.48%) consumed 76 kg of air potato in a year. Nepal Living Standard Survey (2011) reported that 38 percent Nepalese living under calories deficit (CBS, 2011). Thus poor nutrition and food insecurity have remained a challenge in Nepal.

Stinging nettle stood second in terms of contribution to food sufficiency for both less than three months and less than six months. Similar consumption trends were observed in the case of white yam and fiddle head fern (Figure 4).

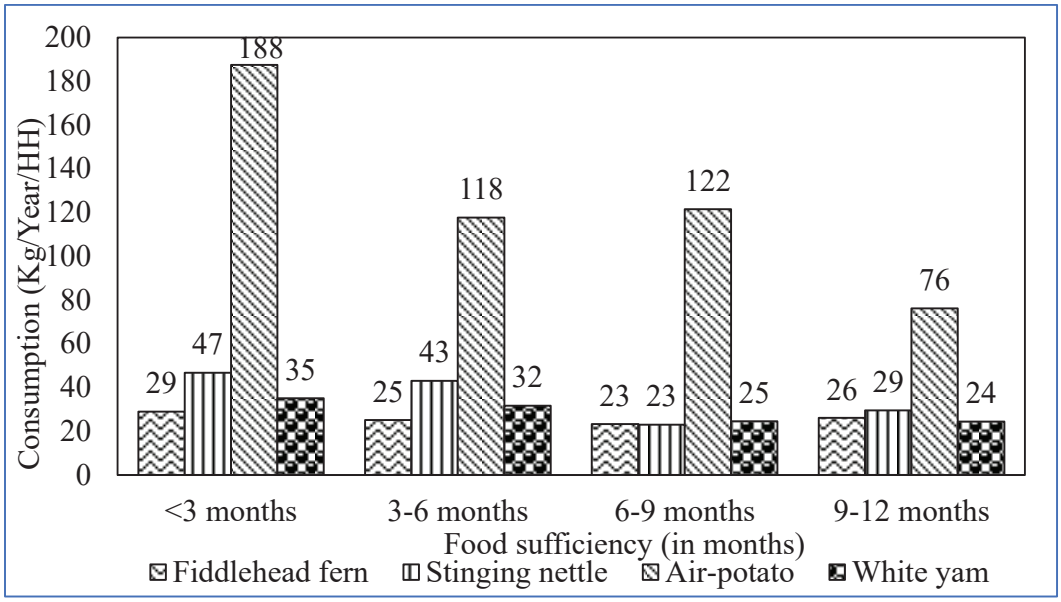

Figure 4. Relation between consumption of IUCs with food sufficiency months

KC and Race (2019) argued that food insecurity in Nepal would increase if the current trend of underutilization and abandonment of marginal land continues. This research indicated that IUCs contribute to food security. Therefore, a suite of policy tools for promoting IUCs consumption and cultivation on the marginal land and buffers zone based on the local context is necessary.

Reasons for decrease in IUCs land

Respondents were asked about the scenario of IUCs available land area. Out of 107 respondents, about half of them responded that IUCs area has been decreasing in recent years.

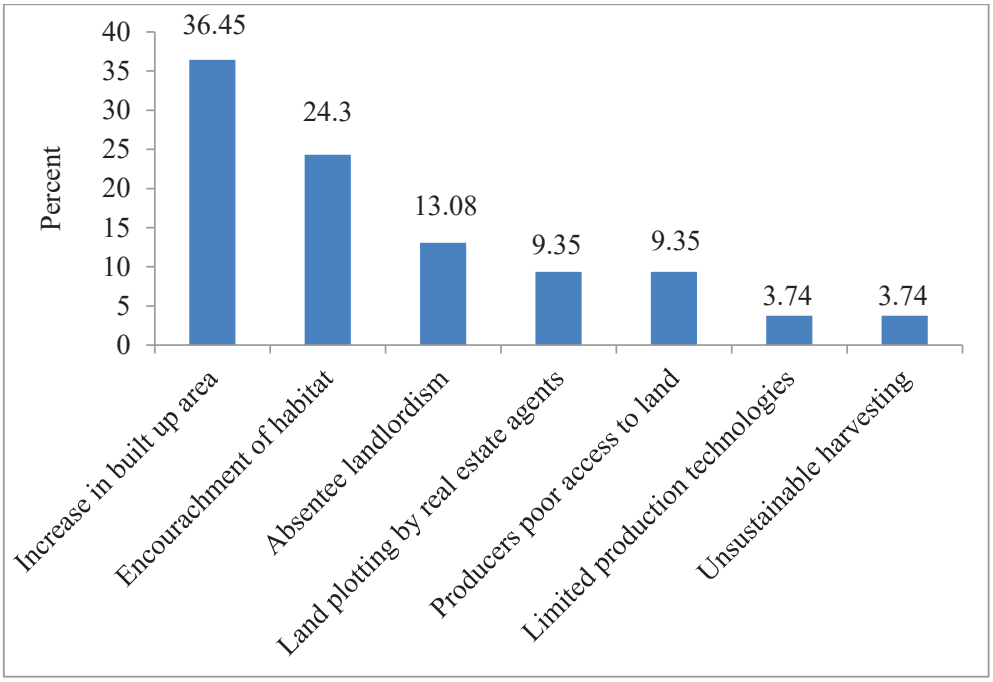

Figure 5. Reasons for decreased IUCs area

They perceived main reason for the decreasing trend of IUCs area was increased built-up (36.45%) followed by the encroachment of habitat (24.30%), absentee landlordism (13.08%), land plotting (9.35%), and producers' poor access to land (9.35%); Figure 5.

Consumption trend of IUCs in recent years

Since this survey was performed during the COVID-19 pandemic, the consumption trend of IUCs during pandemic also studied. Findings of the survey revealed that IUCs consumption increased during the Covid-19 pandemic. The data indicated that 51% of respondents believed IUCs consumption was in an increasing trend, whereas 30% of respondents felt the consumption decreased and the remaining viewed the constant consumption trend (Figure 6). During COVID-19, due to transportation halt, agricultural-product damaged and food supply affected (Kandel et al., 2020). As a coping strategy, people consumed indigenous and underutilized crops to sustain their life.

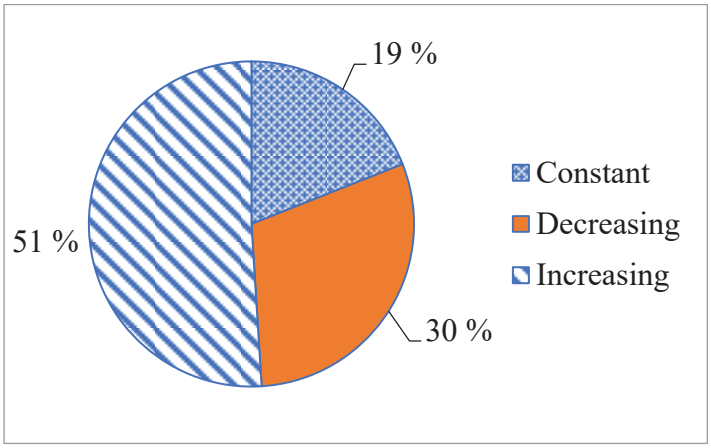

Figure 6. Consumption trend of IUCs in the recent years

The perception of the respondents on the reasons behind increased IUCs consumption were; easily and freely availability of IUCs (65%), followed by the medicinal value (42%), organic nature (33%), conservation of habitat (26%), and the nutritive value of IUCs (20%); Figure 7.

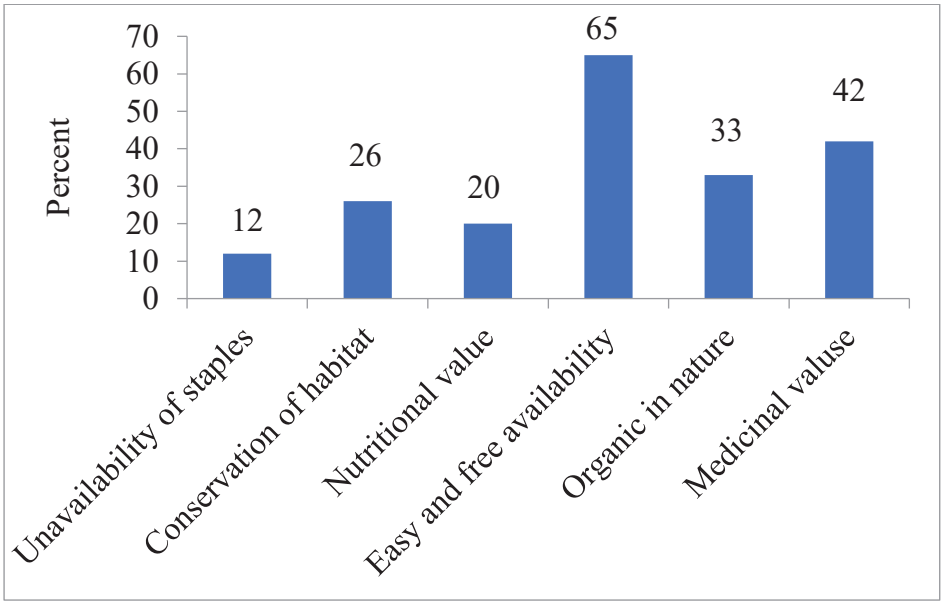

Figure 7. Reasons for increased consumption trend of IUCs in recent years

Thirty-five percent of the respondents perceived that the decreased consumption of IUCs' was due to consumers' preference for processed food followed by increased household income (26%), availability of other crops like pulses (19%), and preference to cereals (12%).

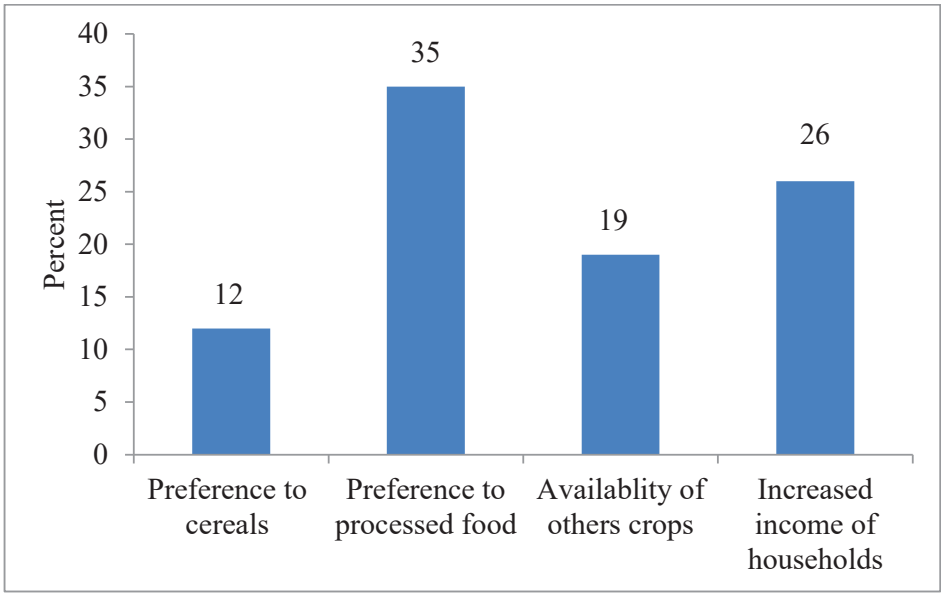

Figure 8. Reasons for decreased consumption trend in recent years

Besides, decreased use of local crops at the community level and low demand were due to eroding indigenous and local knowledge to use indigenous crops. Moreover, processed and packaged food preference by the people, globalization in agriculture, and industrialization contributed to the declining use of IUCs (Seburanga, 2013; Kerr, 2014).

Income through IUCs: A case of income generation through fiddlehead fern

Among the IUCs under study, fiddlehead fern was found commercialized. Mostly, women were involved in the IUCs collection from March to August whereas, men usually played a key role in marketing. Key informants interview revealed that a person collects on an average of five kilograms of fiddlehead fern in a day. However, collection depends on the availability of the fiddlehead fern in the forest and marginal areas, the ability of the person to collect, and time restriction to enter and exit the forest area. It was estimated that a

person regularly involved in collection earns up to 144,000 Nepali Rupees per annum, which is a substantial amount for a low-income household.

Fiddlehead fern was either consumed at home or sold. Surplus quantities were sold through local hawkers within the same or adjacent community. Collector, community-level middlepersons, distant middlepersons, and distant traders were found involved in the marketing of fiddlehead fern. Sometimes, harvesters may directly contact distant traders. The phenomenon of direct contact between consumers and producers was not yet reported (Focus Group Discussion, 2020 July). This created a market information gap between the IUCs harvesters and consumers, resulting in less profit margin for harvesters and high prices for consumers.

CONCLUSION

Indigenous and underutilized crops like air potato, fiddlehead fern, and stinging nettle can contribute to food security for those who can not produce adequate food for year-round consumption. IUCs consumption by the local people has increased since they are readily available even during transportation halts. Moreover, IUCs can replace the consumption of processed food as people's preference for organic foods has increased. Additionally, IUCs also possess medicinal value. Thus, the increased demand for IUCs in the market indicated the potential to develop as enterprises for local people.

This research revealed that community forest land, marginal land nearby house, and community are the major sources of IUCs. However, an increase in the built-up area and encroachment of habitats affects the availability of IUCs on marginal land. Besides, local people's engagement in off-farm employment had increased marginal land fallow. This research concludes that, in order to conserve and use IUCs, effective implementation of the Land Use Act 2019 and production enhancement technologies of IUCs are imperative. Furthermore, this situation indicates the demand for local land use plan and IUCs promotion measures in collaboration with the local community.

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