



Assessment of Indigenous Crop Diversity Threat Status in Benishangul Gumuz Regional State

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Abstract

Ethiopia is endowed with diverse crop genetic resources. Thus, the country is one of the Vavilovian centers of origin and diversity for various crops. The study was aimed to assess the threat level of local crop species in the Benishangul Gumuz regional state where there have been high diversity of crops. Data have been collected through field visit and through interview of the local farm communities. The data was collected from 13 districts of the region. From each of the districts two villages were purposively selected. This study reveals, of the 17 crop species local cultivars studied the highest percentage of local cultivar loss is scored by haricot bean (17.86%) followed by maize (14.29%). The least threatened local cultivar scored is 3.75% which is scored by 12 crop species among the total 17 species studied which implies that crop species in the region are under threat of losing land races/farmer varieties through time unless prompt response is taken.

Keywords: Germplasm; Climate Change; Trait; Agro-biodiversity; Subspecies

Introduction

Higher plants of Ethiopia constitute about 6000 species of which 10% are considered to be endemic. 12 major vegetation types are found in the country; out of these six are forest vegetation types [1]. Ethiopia is endowed with diverse crop genetic resources due to the presence of various cultures, ethnic groups, farming systems and diverse agro-ecological conditions. Thus, the country is one of the Vavilovian centers of origin and diversity for various crops [2].

Some of the major cereal crops commonly grown in the country are tef, sorghum, wheat, barley and maize. For instance, tef (*Eragrostis tef*) genetic diversity is found significantly which enables the crop to grow under various agro-ecologies [3]. Four morphological farmers' varieties of *Sorghum bicolor* (bicolor, guinea,

caudatum anddurra) are grown and adapted to different agro-ecological conditions in Ethiopia.

Similarly, the wide variation existing in wheat and barley germplasm created important traits including adaptation to stresses such as drought and disease prevalence. In addition, farmers' varieties have greater performance in terms of biomass production and yield under marginal conditions [4-6]. Within the species *Hordeum vulgare*, Ethiopia's endemic varieties evolved are reported. Wild relatives of rice, *Oryza barthii* and *O. longistaminata*, are also found in the western plains of the country and around Lake Tana. In Ethiopia many pulse crops species have high diversity rate and in various characters of faba bean, chickpea, lentil, grass pea, cowpea and field pea high diversity is reported. A unique subspecies of field

pea in *Pisum sativum* has found in Ethiopia and wild forms of field pea also exist in the higher elevations of the country.

Ethiopia is a center of origin or diversity for Ethiopian mustard (*Brassica carinata*), noug (*Guizotia abyssinica*), sesame (*Sesamum indicum*) and linseed (*Linum usitatissimum*). Six Brassica species (*B. campestris*, *B. carinata*, *B. integrifolia*, *B. juncea*, *B. nigra* and *B. oleracea*) are cultivated in Ethiopia. Indigenous cotton species like *Gossypium arboreum* and *G. herbaceum* are cultivated in backyard for traditional weaver use [7,8].

In Ethiopia, crop species like Finger millet (*Eleusine coracana*), Pearl millet (*Pennisetum glaucum*), Emmer wheat (*Triticum dicoccum*), Pigeon pea (*Cajanus cajan*), Hyacinth bean (*Lablab purpureus*), Fenugreek (*Trigonella foenum-graecum*), Lupin (*Lupinus albus*) and Yam (*Dioscorea sp.*) are underutilized crops which are not widely grown by farmers. The numbers of farmers' varieties are becoming reduced due to different factors like climate change and replacement by high yielding ones. The best example for this is the loss of farmers' varieties of wheat ('Shehan', 'Gerey' and 'Gomad'), barley ('Demhay' and 'Gunaza') and sorghum ('Gedalit') in the Ti-gray region of the country [6,9,10].

Studies on sorghum also revealed that some important farmers' varieties have disappeared either locally or regionally in 30 years' time, and many other farmers' varieties have become out of production [11]. For the loss of crop genetic resources triggering factors are displacement of local varieties by improved ones, shift to cash crop production, diseases and pests, frequent drought, and erratic rainfall.

In Ethiopia Horticultural crop species grown are root and tuber crops, fruits and vegetables, stimulant and beverage, and herbs and spices and of these the most commonly known root and tuber crops of Ethiopia are enset (*Ensete ventricosum*), anchote (*Coccinia abyssinica*), Ethiopian potato (*Plectranthus edulis*) and yams (*Dioscorea spp.*). huge variation among enset varieties were also studied in morphological characters, disease resistance, product quality and use value. One of the species in the genus *Plectranthus*, *P. garckeausis* is endemic to Ethiopia. Other root crops occurring in the country like taro (*Colocasia esculenta*), tannia (*Xanthosoma saqiifolium*), cassava (*Manihot esculenta*), potato (*Solanum tuberosum*) and sweet potato (*Ipomoea batatas*).

About 38 fruit plant species are cultivated in Ethiopia. Some of them are pineapple (*Ananas comosus*), papaya (*Carica papaya*), sweet orange (*Citrus sinensis*), mango (*Mangifera indica*), banana (*Musa paradisca*) and avocado (*Persea americana*) which are acclimatized to the agro-ecologies of the country [8]. Some of the widely cultivated vegetable species are pepper, garlic, shallot, tomato, cabbage, carrot, beetroot, pumpkin and okra. Because of wide coffee phenotypic diversity found in Ethiopia, the crop trait in caffeine content and liquoring quality and response for different biotic and abiotic factors vary.

Objective of the Study

The objective of the study is to assess the indigenous crop diversity threat status in Benishangul gumuz regional state.

Materials and Methods

Site description

The assessment was conducted in benishangul Gumuz regional state which is found in the western part of the country situated at latitudes 09°17'N and 12° 'N and longitudes 34°10' and 37°04' E. Assosa is the capital of the regional state which is located at 667 km from Addis Ababa the capital of the country. The region is bordered by Amhara National Regional State to the north, Oromiya National Regional State to the east and south, and the Republic of the Sudan to the west. The topography of the area is characterized by undulating elevation which decreases gradually toward the western part to an average altitude of 500 m along the Ethiopia -Sudanese border. The geology of the area is mainly outcrops of very old Precambrian rocks that underlay all the other rock types in Ethiopia [12]. Poly-deformed and Poly-metamorphosed crystalline rocks overlay the Precambrian rocks and is one of the areas in Ethiopia where these rocks are exposed [13]. These rocks hold most of the mineral deposits, particularly gold but also copper, lead, and zinc. In addition, there is an important occurrence of marble, which are to some extent utilized. Nitisols and Acrisols are the predominant soil types in the region (BGNRS) [14].

The area experience a unimodal rainfall pattern that ranges from April/May to October/November. The average annual precipitation varies from 900 mm to 1500 mm. The mean monthly minimum and maximum temperature varies from 14°C to 18°C and 27°C to 35°C, respectively.

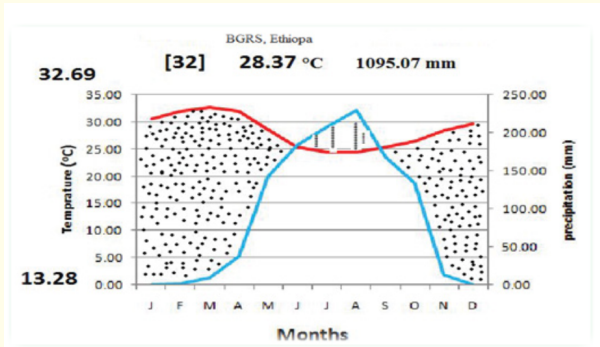


Figure 1: Climate diagram of BGRS (Mosisa D. and Wakjira D. (2020).

Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA), the Benishangul-Gumuz region has a total population of 784,345, consisting of 398,655 men and 385,690 women. The ethnic groups include the Amhara (25.41%), Berta (21.69%), Gumuz (20.88%), Oromo (13.55%), Shinasha (7.73%) and Agaw-Awi (4.22%). Main languages are the Berta (25.15%), Amharic (22.46%), Gumuz (20.59%), Oromo (17.69%), Shinasha (4.58%) and Awgni (4.01%). Concerning religion, 44.7% were Orthodox Christians, 33.3% Muslim, 13.53% were Protestant, and 7.09% practiced traditional beliefs. It had a projected population of 1,127,001 in 2018 [15].



Figure 2: Map of benishangul gumuz regional state.

Method of data analysis

The assessment has been taken place in districts found in the 3 zones and one special district of Benishangul Gumuz regional states, namely Metekel, Kamashi and Asosa zone. The districts are purposively selected based on the crops diversity cultivated and threat level found in the areas. Besides, drought prone districts due to illinino have been considered in the selection. The districts included in the study are Belojiganfoi, Kamashi Agalometi from Kamashi zone, Bambasi Kurmuk and Sherkole districts from Asosa zone, Mao-komo special woreda, and Guba, Dangur, Mandura, Dibate, Bullen and Womber are selected from Metekel administrative zone. The total number of districts included in the study was 13 in number from the 20 districts of the regional states. From each of the district 2 villages are purposively selected based on the NGO intervention story in the districts, one of the villages with a minimum or no intervention by development projects so far and the other relatively higher intervention history.

The data have been collected through asking respondents individually and with focus group discussion when needed based on the questionnaire prepared. The focus group discussion included target groups like agriculture office experts, village elders and village/kebele leader. Besides, field visits were undertaken in some selected villages of the districts. And the data collected were analyzed using excel and tabulated.

Result and Discussion

As it is indicated in the table most of the indigenous crop species that have been cultivated in the region has been threatened by anthropogenic and natural factors. These are replacement of the local cultivars with high yielding ones, replacement of the species with market oriented cash crops, frequent drought in semi arid area of the region like Kurmuk, Sherkole, Dangur and Guba districts, occurrence of erratic rainfall and pests due to climate change. In some highland and mid land districts of the study areas (Wombera and Mao-komo districts) some local crops like field peas, faba bean, teff and barley are found in threatened status as the yield per unit area is becoming decreasing due to soil and climatic factors.

This is in line with the result of [11] who Studied on sorghum in Northeastern Ethiopia shown that some important farmers’ varieties have disappeared either locally or regionally in 30 years’ time, and many other farmers’ varieties have become marginalized due

No.	Crop species	Number of Local cultivars	Districts	Threat level	Cause of threat
1	Maize	4	In all districts	Threatened	Shifting to improved varieties
2	Sorghum	2	>>	>>	Bird pest and high labor consumption
3	Finger millet	3	>>	Threatened	High labor need and shifting to cash crops
4	Teff	2	In wombera and mao-komo districts	>>	Shifting to improved varieties and yield reduction
5	Haricot bean	5	All districts	Lost/highly threatened	Marginalizing from the crop field
6	Sesame	1	>>	>>	Replacing with improved variety
7	Niger seed	1	All districts	Threatened	High labor consumption
8	Pepper	1	>>	Lost/highly threatened	Difficulty in harvesting
9	Rice	1	Mao komo	>>	Due to bird pest
10	Chick pea	1	All districts	>>	Pest attack
11	Peas	1	Wombera nad Mao-kom districts	>>	Yield reduction
12	Bean	1	>>	>>	>>
13	Barley	1	>>	>>	Disturbance of erratic rain fall and yield loss
14	Wheat	1	>>	>>	Replacing with improved varieties
15	Ground nut	1	All districts	Threatened	>>
16	Bambara ground nut	1	Belojiganfoyi and kamashi districts	Threatened	Soil born pathogens and wild animal pests
17	Lin seed	1	All districts	Threatened	Marginalizing from crop field

Table 1: Threat level of indigenous crop species in the study area.

to displacement of local varieties by improved ones, shift to market oriented crop production, diseases and pests, frequent drought, and unreliable rainfall.

Documenting of endangered local crop species by their local name is important for prioritizing the conservation activities of a country. The above table (Table 2) shows the indigenous crop species in the study areas coined in their local name by the existing local languages. This is the ethno botanical data of the crop species which are found in different status of threat that demands explora-

tion, accession collection and conservation actions by the Ethiopian Biodiversity Institute and the respective key stakeholders.

As it is indicated in the above chart the local crop species studied are found in different status of threat. From all of the species listed the highest percentage of local cultivar loss is scored by haricot bean (17.86%) followed by maize (14.29%). The least threatened local cultivar scored is 3.75% which is scored by 12 crop species among the total 17 species studied [16-18].

No.	Species common name	Local name of crops under threat in local languages				Remark
		Amharic	Gumuzigna	Oromifa	Rutana	
1	Maize		Etacha,eagorambia, Eashachiqua and limeria			
2	Sorghum	Nech mashila,mera				
3	Finger millet	Nech, tikur, keyi				
4	Teff	Keyi and nech teff				
5	Common bean	Keyi bolokie,tikur bolokie	Gagoneha, abagufaya, agotigina			
6	Sesame	Keyi selit	Botigimgua			
7	Niger seed	Tikur nug				
8	Pepper		Tezho			
9	Rice	Ruz				
10	Chick pea	Shimbira				
11	Field peas	Ater				
12	Bean	Bakeila				
14	Barley			Matadudie		
15	Wheat	Sindie				
16	Ground nut	Lewuz				
17	Bambara ground nut		Akala		Almedemes	
18	Lin seed	Keyi telba				

Table 2: Local name of crop species under different level of threat.

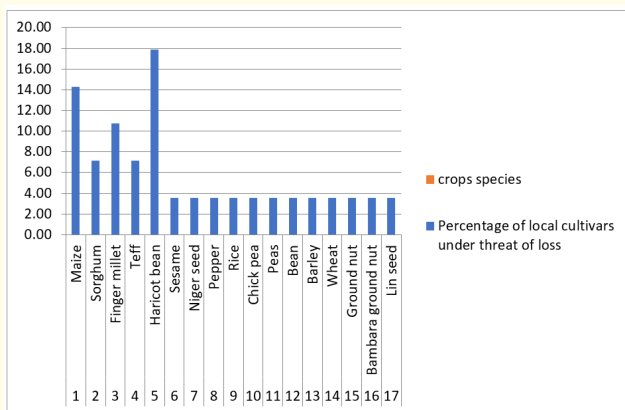


Figure 3: Percentage of threatened local cultivars.

Conclusion

Ethiopia is the vavilovian center of origin and diversity for various crop species. Nowadays, the existence of indigenous crop species in a sustainable manner in the developing nations like Ethiopia is under question. Some of the reasons for this is shifting of the agricultural policies to improved crop production and interest of farmers for high yielding grains and cash crops cultivation like maize, sorghum, sesame and ground nut. These focuses on the monocropping activity would endanger the existing indigenous crop diversity within species and among species. As this study reveals many of the indigenous crops species known by the community elders are either locally extinct or highly threatened. Therefore, the concerned bodies of the international community and the country’s biodiversity sectors should pay attention for the

conservation and sustainable utilization action for the agro-biodiversity resources of the benishangul Gumuz regional state which is the most remote and marginalized region of the country.

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