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# Case Study of Local Varieties and Landraces of Vegetable Crops in Korça Region

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**Abstract**

This paper explores the status of the local varieties and landraces of some vegetables and the knowledge associated with them in the communities of Korça region. After the great political changes that took place in Albania in 1990, the country's agriculture underwent great transformations, towards a market economy. Farmers began planting high-yielding imported varieties, replacing the country's cultivars. In remote mountainous areas of the country, such as the Korça region, many small, vegetable-growing farmers still use landrace populations, mainly by subsistence farmers. Thus, an assessment of the status of vegetable landraces in the period 1990 - 2020, showed that a significant loss has occurred. Although many vegetable crops are still maintained as landrace by small subsistence farmers, only 38% of them cultivated landraces and saved seed in the villages assessed. Their average age was over 53 years old. The notably loss crops included carrots, melon, watermelon, turnip and spinach, for which no cultivated landrace. The vegetable crop landraces that are still grown included tomato, pepper, onion, leek, pumpkin and fresh beans, while limited farmers also maintained white cabbage, lettuce and orach. This deterioration of the situation will have an impact on the future agricultural productivity of the region and the country, as the genetic diversity within vegetable landraces can be seen as the source of interest for coping with changing environmental and climatic conditions.

**Keywords**: conservation, farmer, landraces, on farm, vegetable crops.

## 1. Introduction

After the great political changes that took place in Albania in 1990, the country's agriculture underwent profound transformations, moving from a planned and centralized economy to a market economy. Consequently, the agricultural structure has already changed completely. Changes in the structure and methods of production in agriculture are important developments that have affected the state of genetic diversity in agricultural crops. New farms established after the 1990s in the low and coastal area of the country, which is the main and most intensive area of Albanian agriculture, have had and continue to have a different structure and objectives, where the maintenance and use of few crops is generalized occurrences and large amounts of inputs have been used, in an effort to maximize the return on investment made. They increasingly use modern varieties of agricultural crops and support agricultural production in intensive methods.

Over the past three decades, the ratio between different agricultural crops has changed significantly. The area cultivated with cereals has been greatly reduced and that cultivated with fodder crops has been increased. Such a change is due to the growing demand in the markets for livestock products, in addition to those for fruit and vegetables. This process is also influenced by economic factors (cereal production does not provide the targeted income; input prices are high, while their yields and market prices of products are relatively lower).

Meanwhile there is a tendency to increase the number of vegetable crops. Thus, for example, while in 1990 and 2005, 23 and 30 vegetable crops were cultivated in the low and coastal area, respectively, currently the structure consists of 38 crops.

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There is a tendency to increase the diversity of modern varieties in vegetable crops, mainly hybrids, coming from large multinational seed companies. This is because they guarantee high and stable production yields, and, at the same time, have lower production costs, although, in contrast to traditionally cultivated forms (landraces, ecotypes, local populations and older varieties), although they have generally lower organoleptic characteristics.

In the case of vegetables for fruits (tomatoes, peppers, eggplant, cucumber, melon, watermelon, squash, etc.), but also in other vegetables, changes in the production-consumer chain, having different interests, have worsened situation. Agents in the chain (seed producer, farmer, wholesaler, retailer and consumer) are often dominated by wholesalers, who have launched such varieties that have better durability and long shelf life in stores. Generally less attention has been paid to the qualities and values of fruits, characteristics required by consumers.

In the overall development of the country, the genetic diversity of crops is clearly expressed even among agricultural areas. In the lowland and coastal area, as we spoke above, farmers mainly use modern varieties, generally hybrids with high production capacity; which means that local varieties and landracies in these areas have been replaced and are currently difficult to find in commercial agriculture. This process of loss of genetic diversity among and within populations of the same species is known as genetic erosion. It has been linked to the progressive industrialization of agriculture, and as a phenomenon has been reported in other European regions (Hammer et al., 1996a; Hammer et al., 1996b; Hammer et al., 2009; Laghetti et al, 1999;). In the other two areas of the country, less intense (in the hilly and mountainous ones), in addition to the modern commercial varieties, local cultivars and landraces are still used. In remote mountain villages, farmers support agricultural production mainly in traditional production methods (with low inputs). This means that older varieties and local landraces have not yet been replaced and can be found in family garden and for small local markets.

Due to the distance from the urban markets and the poor road infrastructure, farmers in the hilly and mountainous areas have preserved the local varieties and landraces, based on the long tradition of producing special crops. Their varieties are distinguished for special organoleptic characteristics (flavor, taste, etc.), specific resistance to diseases and pests, as well as good adaptation to specific climatic and soil conditions. But the main difficulty in continuing to cultivate these varieties preserved and inherited between generations, even by subsistence farmers, lies in the fact that in recent years the young population of these areas has migrated and continues to migrate to urban areas.

In most cases, in the management of agricultural production, in hilly and mountainous areas, women are responsible for family gardens, while men are more involved in livestock management, forage production, corn production, fruit trees and grapes. In the process of processing fruits and grapes (dried fruits, jams, alcoholic beverages, etc.), men are also assisted by women.

In agricultural production, in remote villages, in hilly and mountainous areas, generally are used traditional practices and knowledge, such as: crop rotation, organic fertilization, organic mulching, mixed crops, furrow irrigation, etc. Agricultural processes are most often performed by hand and using horses and cows. Disease and pest control without the use of pesticides, applying local agricultural practices. The products are mainly used for consumption in peasant families, as fresh and processed products. Excess production is given to neighbors, sent to relatives and very little goes to local markets.

In this study, we present the results of a survey conducted in the southeastern area of the country, the Korça region, which aimed to recognize and assess the genetic erosion of traditional vegetable varieties. Their accessories were collected during the study (field survey), for conservation in the National GeneBank. Awareness of the current state of cultivation of these varieties enables the identification of deficiencies which should be taken into account in the recovery program for these materials, in order to promote their on-farm conservation.

## 2. Material and Methods

### *2.1. Study Area*

The study for the assessment of local landraces and varieties was conducted in the Korça region. It is the largest region by area (3,711 km²), and with more than 204,000 inhabitants.

The main surface of agricultural land in this region is the Korça Plateau. It has an average altitude of 850 m above sea level. It is surrounded on all sides by high

mountains: on the east side rises the Morava mountain range, with a height of 1800 m, in the northeast Mali Thate, with a height of 2262 m, from the west it closes with the mountains of Gora, Voskopoja and Vithkuq, in the south the mountains rise of Qarri, while from the north it ends with the tuff hills of Grabovica. The Korça plateau has a generally flat area of 108 km$^2$, with a slight slope to the north. It is crossed by a net of streams that descend from the slopes of the mountains, especially those of the Morava.

The region has a continental Mediterranean climate. The average annual temperature is 10.5°C. It is distinguished for cold winters (average temperature of January 0°C) and for cool summers (average temperature of July 18.3°C). Regarding the average seasonal temperature, it is around 1.7°C in winter, 9.3°C in spring, 19.3°C in summer and 11.5°C in autumn. Extreme temperatures reach: absolute minimum -24.2°C and absolute maximum 35.5°C.

The region receives smaller amounts of precipitation (an annual value of up to 600 mm). During the winter there is snowfall. The poorest season of precipitation is recorded from May to September, which is usually the very dry period of the year. The main factors that condition the amount, intensity, annual, seasonal and monthly distribution of precipitation in the study area are the geographical position and the features of the relief.

More than 90% of farmers are small landowners, generally owning only 1-1, 65 ha (Table 1).

**Table 1**. The dates on the rural area of Korça municipality.

| Administrative Units | No. villages | No. families | No. farms | Arable land, ha | | Vegetable & melons land, ha | |
|---|---|---|---|---|---|---|---|
| | | | | Total | Irrigated | Vegetables | Melons |
| Lekas | 11 | 327 | 194 | 482 | 207 | 30 | 0 |
| Vithkuq | 13 | 742 | 556 | 1282 | 454 | 42 | 0 |
| Mollaj | 5 | 1401 | 1000 | 1580 | 972 | 91 | 0 |
| Drenove | 9 | 2620 | 1831 | 2465 | 1110 | 91 | 2 |
| Voskopoj | 5 | 722 | 715 | 1223 | 110 | 20 | 2 |
| Voskop | 7 | 1626 | 1600 | 3250 | 1800 | 170 | 9 |
| Bulgarec | 13 | 3240 | 3240 | 4260 | 2930 | 260 | 23 |
| Totali | 63 | 10680 | 9140 | 14810 | 7583 | 704 | 36 |

*Source:INSTAT 2020*

### *2.2. Vegetable Landrace Assessment and Field data collection.*

Local varieties and landraces of vegetable crops grown in the Korça region have always been monitored by our institution (Jani, et al 2016). During the period July - September 2020, the next assessment of their situation was made in villages of Korça municipality.

This study has been focused on four areas (administrative units): Bulgarec, Drenova, Voskop and Mollaj, to assess the condition of local varieties and landrace in this region. Farms and the agricultural market were visited, as well as meetings with 136 farmers. Farmers were identified in each village, who were asked about the cultivation of vegetables, the varieties they use and the destination of the product. Additional data were also collected in the other administrative units and municipalities of the region.

The method of this research work was based on:

a) Field visits in different villages and communes, holders of vegetable diversity, as well as monitoring of local varieties and landraces of vegetable species cultivated;

b) In-depth interviews with farmers, to document the diversity of vegetable crops at the farm level, the reasons for the erosion of vegetable species and varieties, production characteristics and preferences for landraces, etc.

c) Interviews with consumers in local markets, their preferences for vegetable products in the market.

The collected material was processed statistically and presented in tables when the results were discussed. The material object of the interviews is designed, computerized and analyzed for average, standard deviation, etc.

The study included data from surveys, vegetable crop management, site and environment, as well as the characterization and evaluation of local varieties and landraces.

At the end of the visits and interviews, the seeds of the local varieties and landraces, collected by the farmers, were submitted for conservation to the Plant Gene Bank of Tirana.

## 3. Results and Discussion

### *3.1. Knowledge of varieties and production practices*

The traditional varieties of cultivated plants, which were found by our research and collecting missions, are known by the term "landraces", but in the literature and technical language, they can also be called "farmer varieties", "country varieties", or “primitive varieties”, which are constantly maintained by the community in their biological, cultural and socio-economic context (Negri et al. 2009).

The farmer varieties in Korça region are mostly autochthonous landrace. We came to this conclusion based on the local name of the varieties, from the literature dates [Ballauri, 2011; Habibi, et al 1972; Jani, et al 2018; Oktrova A, 1964; Oktrova A, 1966; Oktrova A, 1967; Oktrova A, 1971; and Qafëzezi N, 1957], and the information gathered directly from the interviewed farmers, who declare that they have inherited it and planted it for more than 80–100–150–200 years; of course, there are not always documents for this, mostly they are oral evidence. This is also the judgment of local specialists, part of our group, who conduct interviews with farmers. On the other hand, the special climatic and soil conditions of these areas are not easily withstood by the introduced or selected plant forms. The inhabitants themselves have claimed that they did not know the modern varieties before and that they entered in the market very late, only at the beginning of this century (after 2000 years). The growers have practiced to produce just for the local market, and for consumption in villages and by subsistence farmers based on their traditional varieties in the home garden.

Based on the meetings held with farmers, interviews and testimonies of residents of the areas included in this study, it turns out that traditional varieties (local varieties and landraces) have been grown, maintained and inherited from them, generation to generation.

It is interesting to mention here the agricultural practices used by the community of such zone. Almost all farmers contacted, for all the traditional species and varieties of vegetables that they cultivate, they use traditional knowledge such as: crop rotation, organic fertilization, organic mulching, furrow irrigation, etc.; manually and using horses and cows. Especially they use abundant amounts of organic fertilizer (100 -150 ton / ha), which they distribute before tillage. It is of great interest the fact that farmers in these areas do not use chemical fertilizers and pesticides.

In recent years vegetable crops are grown in the home garden and mainly used for family consumption, as fresh and as processed products.

Given that in recent decades climate change has a significant impact on vegetable production and at the same time farmer varieties (local varieties and landraces) are preferred by local consumers, this leads to the assumption that further research should be done to prove better adaptation of these varieties to climate change, which is also supported in scientific opinions [Hammer, et al 2009; Negri, et al 2009; Mercer, et al 2010].

### *3.2. Characteristics of vegetable production in the Korça area.*

The urban areas of the Korça region, such as the cities of Korçë, Pogradec, Maliq, Bilisht, Ersekë and Leskovik, but also some villages around them, are mainly supplied with fresh vegetables coming from the low and coastal area of the country. Farmers in the Korça region produce very few vegetable products for the city markets, mainly onions, leeks and white cabbage. One more reason for this are wholesalers and retailers who, contrary to consumer demand, fill showcases and shelves with uniform products, coming from modern varieties that are long shelf life and stay undamaged in the market.

In terms of vegetable production in the region, it can be said that it is based on small family farms. Although the number of family farms growing vegetable crops has been high, the area cultivated with vegetable crops in each of them has always been declining (Table 2). This is most evident in villages far from urban areas. In the administrative units that are closer to the city of Korça (Bulgarec and Drenove region) only 39 and 34% of farms grow vegetable crops. Vegetable production is mainly based on modern varieties. Some farmers of the Bulgarec unit produce vegetables for the local market and the street market, a small number of farmers produce for the consumption in their families and neighbors. The average area occupied for vegetable production in the villages of this unit is relatively larger than in other

units; it is about 0.22 ha. In the Drenova unit, farmers who produce vegetable crops destine the product for the supply of tourist resorts, restaurants, box market, street market and most of them produce for the consumption in their families and neighbors.

In the other two other administrative units (Voskop and Mollaj), which are further away from urban areas, the number of families growing vegetable crops is higher, respectively 75% and 95% of farms. But as can be seen, the average area cultivated with vegetables is smaller, respectively 0.15 and 0.10 ha. Some farmers in the villages of the Voskop destine vegetable products for the street market and the box market, and most of them produce for the consumption in their families and neighbors. The farmers in the villages of the Mollaj, being located in the hilly-mountainous area and away from urban areas, use the produced vegetable products for the consumption in their families and neighbors. Important is the varietal structure (varieties used) of vegetable crops, in the last two units, which consists mainly of local varieties and landraces.

**Table 2**. Growers of vegetable crops and average area per household, in the Korça area.

| Administrative units | No of farmsin admin-Unit | No. of farmers interviewed | Growers of vegetable crops | | Area (ha) with | | Average vegetable area per household, ha |
|---|---|---|---|---|---|---|---|
| | | | No of families | % | Vegetable | Melons | |
| Bulgarec | 3240 | 52 | 1280 | 39 | 260 | 23 | 0.22 |
| Drenove | 1830 | 34 | 630 | 34 | 91 | 2 | 0.15 |
| Voskop | 1600 | 28 | 1200 | 75 | 170 | 9 | 0.15 |
| Mollaj | 1000 | 20 | 940 | 94 | 91 | 0 | 0.10 |

*3.3. Farmers that maintain and cultivate local varieties and landraces.*

Taking into account the results collected during the survey with farmers and gardeners, as well as field visits, it was estimated that there are relatively few small, subsistence farmers in the Korça region that maintain local varieties and landrace of vegetables (Table 3). In the villages of this region it was estimated that only about 38% of small growers have cultivated local landrace and saved seed. The lowest was the percentage of farmers using and saving seeds in the villages of Bulgarec and Drenove, which are located near urban areas, respectively 22 and 23%; while the highest in those villages that are further away and in the hilly-mountainous area, respectively 49 and 68% in Voskop and Mollaj. This trend is disturbing, as growers, even those producing for consumption in their families and neighbors are placing more support on other types of seeds (imported seeds) compared to local varieties and landraces, which can bring devastating results for the future production of vegetable crops due to rapidly declining diversity.

Most worrying is the situation regarding farmers working in the production of vegetables; their average age is always increasing. The average age of farmers cultivating vegetable crops was 53 years old, ranging from 45 in Mollaj, 55 in Voskop, 52 in Bulgarec, and 58 in Drenove. The small number of growers cultivating vegetable landraces, the high emigration of young farmers to EU countries, demographic migration, abandonment of rural areas and the movement of the population towards the cities, after the political changes of 1990, along with aging farmer populations have most likely directly resulted in the loss of landraces over time. This assessment indicated that there are few young farmers involved in the cultivation of vegetable landraces and the seed saving process of in the Korça region. This phenomenon is similar to what has happened in many other areas of the world in which the younger generation has little interest in farming as a profession [Walters, et al 2018].

The estimated loss of local varieties and landrace of vegetable crops over the last 30 years by farmers in the villages assessed was very high, from 50 to 80% of what these areas had in 1990 (Table 3). In many villages they are completely lost. However, according to the administrative units, the losses are different. The two administrative units located closest to urban areas, Bulgarec and Drenova, had experienced the loss of 75-80% of vegetable landraces over the last 30 years, while the other two units (Voskop and Mollaj) were assessed at 50-65%. This estimated loss of vegetable crop diversity in this area was very high, compared to the fact that by 1990 about 90-95% of the total vegetable area was grown with local varieties and landrace, and all markets in the region consumed

mainly local vegetables produced on large state farms and cooperatives in the region; so it is clear that this trend is expected to continue in the near future. In the created situation, it is necessary to organize the "on-farm conservation" network of local varieties and landraces. This was also the opinion of the farmers and specialists interviewed.

**Table3**. Assessment of farmers cultivating vegetable crop landraces in four units of Korça region.

| Administrative units | % of Growers cultivating and saving landrace seeds | Farmer age cultivating local landraces | % Landraces lost during last 30 years |
|---|---|---|---|
| Bulgarec | 23 | 56 | 75 |
| Drenove | 22 | 58 | 80 |
| Voskop | 49 | 55 | 65 |
| Mollaj | 68 | 45 | 50 |

### *3.4. Local varieties and landraces still cultivated*

In addition to the data collected on landraces that are currently being cultivated in the administrative units of the Korça region (Table 4), special farmers that maintain and cultivate landraces of vegetable crops were registered. Some farmers in Bulgarec, Voskop and Mollaj still continue to maintain and cultivate numerous landrace of vegetable crops. For example, the farmer Kadilli in Bulgarec, maintained a total of 9 landraces of vegetable crops, the farmer Kostandini in the village of Polen in Voskopi maintained 6 landraces and the old farmer IsmetDemirsha in Voskop maintained 8 landraces on his small farm and sells vegetable products at the street market near the home. Meanwhile, other farmers in remote villages were estimated to cultivate and maintain two or three landraces of vegetable crops. In these villages we found that farmers exchanged seeds produced in the home garden.

At the end of the field visits to the farms of the villages of the above-mentioned administrative units, our mission collected seeds of local landraces and placed them for long-term conservation in the Plant Genetic Bank.

**Table4**. Local varieties and landrace of currently grown vegetable crops, and those lost over the last 30 years.

| No | Administrative units | Vegetable crops, which still have local landraces in cultivation | Vegetable crops with significant losses |
|---|---|---|---|
| 1 | Bulgarec | Tomato, pepper, onions, leek, summer squash, white cabbage and fresh pod beans | Carrot, melon, watermelon, turnip, lettuce, orach and spinach |
| 2 | Drenove | Tomato, pepper and pumpkin | Carrot, melon, watermelon, onions, white cabbage and spinach |
| 3 | Voskop | Tomato, pepper, onions, summer squash, melon, white cabbage and fresh pod beans. | Carrot, watermelon, turnip, lettuce, and spinach |
| 4 | Mollaj | Tomato, pepper, onions, garlic, pumpkin and white cabbage | Turnip, lettuce and spinach |

## 4. Conclusions

The Korça region has been and remains one of the richest areas of cultural heritage in agricultural sector, both for the diversity of old varieties (landraces) and for the agricultural practices of cultivation and use in the gastronomy.

Traditionally cultivated forms (ecotypes, populations and old varieties), with generally high organoleptic characteristics, have gradually disappeared or have remained only in some home gardens.

Their maintenance and use is most critical in villages near urban centers.

The landraces, that contain high genetic diversity, are disappearing at an alarming rate due to limited use by growers in many areas of the country.

A narrowing of the genetic base is occurring, as a need to cope with the level of competition of the vegetable products market, in an increasingly globalized economic market, which will have a devastating impact on future generations and food production.

An integrated approach is required, especially to increase agricultural productivity, for today and the future, to strengthen farmers' resilience to environmental change, because local varieties and landraces are more adaptable to climate change.

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