

## The Chestnut Market and Consumption in Kosovo

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### Abstract

Chestnut fruit, unlike other fruits like walnuts, hazelnuts, etc., is very rich in starch, low lipids, soluble sugars, monosaccharide and disaccharide. Chestnuts are rich in fiber, vitamins and minerals. Chestnut leaves are widely used in pharmacy, chemical, cosmetics, food and stockbreeding, beekeeping (it is estimated that 1 ha forest with chestnuts in the flowering period, are taken about 400-600 kg of honey), from chestnut can be produced chestnut flour which finds high use in the food industry (for baking cakes, cookies, ice cream, pasta, chocolate, etc.). Asia provides about 87% of world production. Europe produces about 7% of the total quantity of chestnuts, America 2,96% and Africa 0,01%. The greatest chestnut manufactures and consumers per capita are Asian countries. Consumption in the US is around 280 grams per capita per year; in Europe about 500 grams per capita while in Asia about 1000 grams per capita per year. Demand for fresh chestnuts is expected to continue, to rise for 10-25% each of the next 5 years. US market will be unlimited market available for many years to come. Kosovo local chestnuts are among the highest quality in the region and beyond. From the research results it appears that consumers appreciate quality and country of origin before the price.

**Keywords:** Chestnut fruit, chestnut leaves, chestnut flour, fresh chestnut, treated chestnut.

### Introduction

European chestnuts (*Castanea Sativa* Mill) originate from Asia Minor. Name *Castanea* is likely to have the old name for the sweet chestnut as in Latin as well as ancient Greek. Chestnut is secular plants and by its longevity literature can exceed well over 4000 years (in Etna Greece, found a brown plant with over 4000 years old which has a trunk circumference of about 54 m). Is part chestnuts *Fagacea* family, represented gender *Castanea* (Ukaj, 2010; Xhomara, 2011). The genus includes 12 species of chestnuts (Fabio Mencarrella, FAO).

Table 1. Botanical species of chestnut

Species		
European	Asian	American
Castanea sativa	C. crenata ( Japanese chesnut) C. mollissima ( Chinese chesnut) C. seguini (China) C. davidi (China) C. henryi (China)	C. dentate ( Eastern States) C. pumila (Eastern States ) C. ashei (Southern States ) C. floridana (Southern States) C. alnifolia (Southern States) C. paupispina (Southern States)

Source: Project TCP / CPR / 8925 "Integrated pest management and conservation of Chestnuts in Xin Xian county, Henan Province, China", by Fabio Mencarrella (FAO). Regarding the chestnut tree has medium hardness. It is easily workable and very rich in tannin. High tannin content increases its resistance to atmospheric and biological

factors. Today, widely is used for vine yards poles, stakes, household furniture, farm implements etc.

Chestnuts belong to the Mediterranean climate plants. They vegetates in countries with average annual temperatures of 8 to 13 °C, and optimal growth is about 12 °C. Feels difficulty in regions with annual average temperature over 20 °C. Chestnuts endure low temperatures to -25 °C. During the winter silence, for a short period of time (2-3 days) chestnuts can bear even to -30 °C.

The main function of the Chestnut ecosystem is the production of fruit and timber. Fruit production is annual, while timber production has a long cycle. Secondary functions are the production of leaves, flowers, husks that are widely used in pharmacy, chemical, cosmetics, food and stockbreeding, beekeeping.

Chestnut vegetation ecosystem has hydrological and protective function. It protects the soil from erosion, reduces the speed and force of the water movement in the soil and does not allow a high evaporation, favoring a direct absorption by vegetation. Also, the chestnut forest regulates the movement of groundwater and resources. It prevents strong winds and protects them from damage, from strong rainfall damages, avalanches etc.

In addition to these functions, chestnut wood is considered an indispensable part of the landscape, a public good that is deemed to tourism and of interest to visitors of the forest. Chestnut fruit, unlike other fruits like walnuts, hazelnuts, etc., is very rich in starch, low lipids, soluble sugars, monosaccharide and disaccharide. Chestnuts are rich in fiber, vitamins and minerals.

Because of the compounds, chestnuts are very good for those who have fatigue from seasonal flu and colds. Chestnut flour does not contain gluten and is suitable for people who suffer from Celiac disease<sup>1</sup>. Thanks to their content of folic acid, chestnuts used during pregnancy and in case of anemia. This fruit can prevent and improve hypertension. Studies show that increased consumption of calcium, potassium and blood pressure may be low. Because of vitamin B2, which is located in chestnut, chestnut consumption can improve the skin.

This fruit gives the body energy and stimulates the metabolism of fats, because of carbohydrate contained. It saves energy supply roles in kidney, stomach and promotes intestinal health. The combination of calcium and phosphorus strengthens bones and teeth.

Component fiber help decrease blood cholesterol levels by limiting the absorption of excess cholesterol.

Besides specific taste that fruit has, pollen from chestnut honey extracted is quite healthy and tasty which has dark brown color. Tea produced from Chestnut leaves is used to cure asthma and bronchitis diseases.

Chestnuts is found widespread mainly in the mountainous regions of the Caucasus, in the southern part of the Caspian Sea, in the Sub-Alpine mountain in Spain, in

<sup>1</sup> Celiac disease is a serious autoimmune disorder that can occur in genetically predisposed people where the ingestion of gluten leads to damage in the small intestine. It is estimated to affect 1 in 100 people worldwide. Two and one-half million Americans are undiagnosed and are at risk for long-term health complications. Read more at <https://celiac.org/celiac-disease/understanding-celiac-disease-2/what-is-celiac-disease/#wZPRRPHqpspfH8Vk.99>

France in the suburbs of Paris and Normandy in particular forests. It is found almost everywhere in Italy. In Central Europe it is found widespread in regions with favorable as in Valley Fohn (Switzerland), in the canton of Ticino, in the area of the Rhine (Germany), especially in the Western part of the Black Forest. Chestnuts found wholesale in Turkey, Syria, Algeria, Tunisia, Morocco, then in Australia etc.

Besides Europe, chestnuts grow in Asia, where about 87% of world production is provided by this continent. China is leading with 445.000 ha, followed by South Korea with 430.000 ha, Turkey with 392.000 and Japan with 283,000 ha (FAO, 2008).

### Chestnut production in Kosovo

Chestnut fertility in Kosovo is always fruitful, however, insufficient. Hakija Hadrovic (Peja, 1977) in his dissertation explored fertility of some Chestnut bodies, which ranges from 41 kg to 109 kg (the average 75 kg per body).

In one ha of area production should be 100 to 120 trees. This number of trees is for the European *Castanea* species. Asian species has the largest number of trees per hectare. Higher productivity can go up to 4.5 t/ha. In determining production efficiency is the cultivar. Today in our ecosystem aren't achieved these yields. The causes are varied: the lack of services and care, the negative effects of diseases and pests, etc. (Nikoçi, 2016).

According to Hakija Hadrovic in the territory of Kosovo are a total of 3,500 ha with Chestnut trees. In the same report it argues that 1 kg chestnut contains 3400 calories, and the annual yield of chestnut fruit in this country expressed in energy value is approximately 8.5 billion calories. Accordingly, the annual yield of fruit chestnut is 2500 t. Of total 3500 ha area with Chestnut tree in Kosovo, the yield per ha, according to this should be about 715 kg/ha.

Chestnuts in the past is sought and used as a food, is used to feed the poor residents of rural areas. This was due to the low standard of living. Its processing and food benefit from chestnut is made by families and not by processing industry. However, today the use of chestnut is done for other purpose. Is not used as the base of food in the family, but rather as a result of which provides pleasure in consumption, provides high nutritional value, vitamins and minerals.

Table 3. Chestnut market prices

Chestnut (1kg)					
Chestnut	The market	Market Price	Average price		
			Min	Mes	Max
	Retail	Domestic	1.39	1.47	1.56
		Import	2.68	2.99	3.31
	Wholesale	Domestic	1.19	1.28	1.36
		Import	2.49	2.79	3.1

Source : [www.sitkosova.org](http://www.sitkosova.org)

### The research

Chestnut Market Research is done through collection of primary and secondary data. The research was based on collection of primary data through surveys in the field. This research has preceded the preparation of two questionnaires, the questionnaire for final consumption and production consumer survey. Research has already started in March and continued until October. Field survey was carried out during the months of May and June. The survey was conducted in 7 regions: Region of Prishtina, Mitrovica, Gjilan, Ferizaj, Prizren, Djakovica and Pec.

In the whole country were 327 total final consumption surveys and consumer 46 production surveys. Those surveyed are of both sexes, different ages (15 to 65 years) and include urban and rural areas of each city. The selection of respondents is done at random.

Regarding the production consumption in the entire territory of Kosovo are conducted these interviews: 17 interviews with bakers, 3 interviews with companies involved in the processing of starch and starch products, 4 collection points, 10 companies involved in the production of biscuits, production of canned pasta and cakes, 12 companies involved in the production of macaroni, spaghetti and similar products from flour.

To explore the final consumption are used citizen surveys, while companies for the production consumption, including interviewed experts in the field. Secondary data were collected from institutions and organizations that have to deal with chestnuts. To come up to the results of this research, firstly is made the encoding of the questionnaires, and then is made the determination of data in the computer program Microsoft Excel. Later is made the transfer of data in SPSS (Statistical Package for Social Sciences). Testing the hypotheses raised it is done through bivariate correlation.

Table 5. Socio-demographic information for consumers

Variables	Description
Region	1- Prishtina, 2- Prizren, 3- Mitrovica, 4- Peja, 5- Gjilan, 6-Ferizaj,7-Decan, 8- Gjakove
Gender	0 for female,1 for male
Age	15-25, 26- 35, 36 -45, 46-55, 56-66, > 66
Education	1- Primary education, 2- Secondary education, 3- Bachelor, 4- Post university
Incomes	1) 200, 2) 400, 3) 600, 4) 800, 5)1000
The number of members of families	2- 4, 4 – 6, 6- 8, >8
Employment	Employed 2) Nonemployee

Source: Results from Own Survey, 2016, Department of Agricultural Economics, Faculty of Agriculture and Veterinary at Prishtina University

Table 6. Variables determining consumer behavior

Variables	Description
The reason for the non consumption of chestnuts	1) Lack of close markets 2) They are expensive 3) The quality is poor 4) No consumer habits 5) For health reasons 6) Something else, what?
Chestnut purchased sources	1) By self collection, 2) In the retail markets, 3) In local markets, 4) From different collectors
Use of chestnut	As food, 2) Preference for taste and composition, 3) Habits in consumption, 4) Other
Household consumption during the year	1 – 10 kg, 2) 10 – 20 kg, 3) 20 – 30 kg Over 30 kg
A local chestnut consume or imported	Local, 2) Imported, 3) Both
How do you assess the quality of local chestnut compared with imported ones	The Bad, 2) The same, 3) Better, 4) Do not know
Furthermore prefer chestnuts:	Roasted, 2) Boiled, 3) Both
Who are the main factors affecting the determination of the purchase of chestnut	1) Price 2) Quality 3) its properties, 4) Place of Origin
Do you know the Chestnut properties and benefits of its use	0=Yes, 1= No
Have you ever heard of chestnut products (flour, bread, and other products from chestnut flour)	0= Yes, 1= No
Do you consume chestnut products	0= Yes, 1= No
What is the reason of non consumption of chestnut products	Failure on the market,2) Lack of knowledge about these products,3) Their high price, 4) Another reason
What products do you use mostly	1)Chestnut flour, 2) Chestnut bread 3) Pasta and spaghetti from chestnuts ,4) Chocolate 5) Starch, 6) Other, please identify the: _____
Where usually buy these products	In markets, 2) In bakeries, 3) In another country, please indicate the target?

Source: Results from Own Survey, 2016, Department of Agricultural Economics, Faculty of Agriculture and Veterinary at Prishtina University

### Analysis of hypothesis

During this research, we focused on the following assumptions:

- H<sub>0</sub>: Customers recognize the benefits that chestnuts offered
- H<sub>1</sub>: Consumers do not know the benefits that chestnuts offered
- H<sub>0</sub>: Price impacts on request chestnut
- H<sub>1</sub>: The price does not affect the application of Chestnut
- H<sub>0</sub>: Consumers with high preference for local chestnuts than imported
- H<sub>1</sub>: Consumers have high preference to local chestnuts
- H<sub>0</sub>: Consumers in rural areas consume more chestnuts than urban consumers
- H<sub>1</sub>: Consumers in rural areas consume no more chestnuts than urban consumers

#### Customers recognize the benefits offered chestnuts

To prove the hypothesis whether or not consumers recognize the benefits of chestnut, are analyzed the hypothesis through the correlation method in this way have included the consumption of chestnuts and chestnut reason for using.

Table 7. The correlation between consumption of chestnut and chestnut purpose of use

		C h e s t n u t consumption	The reason of use
Chestnut consumption	Pearson Correlation	1	-.955**
	Sig. (2-tailed)		.000
	N	327	327
The reason of use	Pearson Correlation	-.955**	1
	Sig. (2-tailed)	.000	
	N	327	327

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Based on the results of the analysis, which is using bivariate correlation method, the coefficient between the consumption of chestnut and chestnut purpose of use is -.955 and p value of .000% for 2-tailed test of the significances. In this case we can say that although consumers use chestnuts don't recognize its benefits. So, the hypothesis 0 is valid.

#### Price impacts on the chestnut request

To prove the hypothesis if the price has an impact on the demand of chestnut, it is analyzed by the method of correlation hypothesis. In this method it is including the purchase of chestnut and factors influencing the determination of the purchase of chestnut.

Table 8. Correlation between buying chestnuts and factors influencing the determination of the purchase

		Buying chestnuts	factors influencing the determination of the purchase
Buying chestnuts	Pearson Correlation	1	.627**
	Sig. (2-tailed)		.000
	N	327	327
factors influencing the determination of the purchase	Pearson Correlation	.627**	1
	Sig. (2-tailed)	.000	
	N	327	327

\*\* Correlation is significant at the 0.01 level (2-tailed).

Based on the test results, according to bivariate correlation method that can be seen that the ratio between the purchase of chestnut and the main factors affecting the determination of the purchase of chestnut is -.627 and p value of .000% for the 2-tailed test.

Based on these results we can say that the hypothesis 0 is not significant and does not affect the purchase price of the chestnut. So, the hypothesis 0 is not valid.

### Consumers with high preference for local chestnuts than imported

Table 9. The correlation between consumption of local vs. imported chestnut

		Consumers	Consumption of local vs. imported chestnut
Consumers	Pearson Correlation	1	-.182**
	Sig. (2-tailed)		.001
	N	327	327
Consumption of local vs. imported chestnut	Pearson Correlation	-.182**	1
	Sig. (2-tailed)	.001	
	N	327	327

\*\* Correlation is significant at the 0.01 level (2-tailed).

Based on the results of the analysis, with bivariate correlation method, we can see that the ratio between consumption of domestic or imported chestnut is -.182 and p value of .001% for 2-tailed test of significances.

Based on these results we can say that the hypothesis 0 is valid only in 0.1% of cases. So, the hypothesis 0 is valid.

**Correlation between consumption and area of residence**

Table 10. Chestnut correlation between consumption and area of residence

		Chestnut consumption	Urban/Rural
Chestnut consumption	Pearson Correlation	1	-.077
	Sig. (2-tailed)		.166
	N	327	327
Urban/Rural	Pearson Correlation	-.077	1
	Sig. (2-tailed)	.166	
	N	327	327

Based on the test results, we can see that the ratio between urban area consumption and rural areas consumption is -.077 and p value of 0.166% for 2 tailed test of the significances is higher than 0.05%.

Based on the analysis results, we can say that consumers in rural areas use more only in 1.6% of cases, so hypothesis 0 is significant in 1.6% of cases. So, the hypothesis 0 is valid.

**Discusion of results**

Results of this research indicates that the chestnut tree is preferred for consumption for the majority of respondents, 75.84% of respondents are customers of chestnuts and 24.16% did not consume chestnuts. From 24.16% of the respondents who do not consume chestnuts, 5.5% did not consume because of its lack of nearby markets, 2.8% for health reasons and the rest due to the price and consumption habits.

From these noncurrent consumers, 3.7% will eventually begin to consume, 10.1% would probably start consumption, 5.8% are undecided whether to start consumption or not, while 4.6% do not consume mainly due health reasons.

The results claim that 67.9% of respondents consume chestnuts along with all other members of the family. According to the results, chestnut is mainly consumed only during its season, 63.3% of respondents said they consume only during the autumn season, and 12.5% during autumn and winter.

Buying chestnut is usually in retail markets (34.3%) and in local markets (28.1%). Result shows that the majority of those who live near the chestnut, care for the collection of chestnuts that will consume. For the purchase of chestnuts in the family, mainly is the husband or father who takes care.

About 68.8% of respondents consume on average 1-5 kg chestnuts during the year. It turns out to be 32.7% of those who share together with family, consuming an average of 1-10 kg during the year, while 26.9% of respondents, along with family consume 10-20 kg chestnuts during the year.

According to the results, 68.8% of respondents use chestnuts because of its taste and composition, while 5.8% consume due to consumption habits.

Local chestnuts are among the highest quality in the region and beyond. About 49,5% of the local customers consume only local chestnuts, 1,5% consume only imported, and 24,8% of them consume both. This indicates that 36,1% prefer chestnuts of Decan municipality, 10,4% chestnuts of the Peja municipality and 6,7% chestnuts of municipality Junik. Many buyers visit these markets during the chestnut season.

Chestnuts can be used as fresh, boiled or baked. It turns out that 31,5% of respondents prefer more baked chestnuts, 15,6% prefer more boiled chestnuts, while 29,1% prefer both. These data are useful for them who intend to start a business, offering roasted or boiled chestnuts to the market.

It turns out that for 27% of respondents, price is not a factor affecting the purchase of chestnut, 20,8% are unsure whether or not the price is influential factor in the purchase, while 26% agree that the price is a factor affecting the purchase of chestnut. All this is because this tree is seasonal, it is of specific taste and texture. According to the results the country of origin and quality (specific taste and texture) are key factors affecting the determination of the purchase.

Of big importance was also the respondents' knowledge about the properties and benefits of the use of chestnut. The importance of this lies in promoting this culture of arboriculture. Results show that 60,2% of respondents do not know the properties and benefits of its use, while 15,6% know.

It is known that chestnut flour can specifically be used for the production of flour-based products. Results show that 24,2% are aware of this possibility, while 75,8% had no knowledge about this possibility. Regarding the consumption of chestnut products, all respondents stated that they don't consume. The main reason was the lack of knowledge about these products and their absence in the market.

Regarding the production consumption, the results show that none of the surveyed companies do not use chestnut flour as raw material, as well, have not used even earlier. Besides collection points, 30,9% of companies recognize this opportunity of chestnut, while 69,1% did not know. All these companies have stated that they don't have demand from their customers for chestnut products. Reasons for not using the chestnut as raw materials were lack of knowledge about this opportunity, the lack of demand for these products, using chestnut flour is more specific.

In the chestnut flour are lacking types of proteins Prolamin and Gluten, and as result of the lack of gluten, flour bread has no capacity-building. To produce bread from chestnut flour it must necessarily be added about 50% of the amount of wheat flour or rye flour (Ukaj, 2010).

Regarding the collection points, around 200 tons per year are stockpiled and exported to the European markets. The main countries where is exported are: Switzerland, Germany, Austria and Italy.

Collectors selling price is around 1-2 € / kg. In the European market, the average price for fresh chestnuts is around 4-5 € / kg and about 25-30 € / kg of roasted chestnuts. Chestnuts exported to European countries are used for final consumption and production consumption.

According to the results, the demand for this product is estimated to be growing. The main reasons why foreign market is interested in Kosovo chestnuts is quality and their natural property.

## Conclusions and recommendations

From this research is learned that the chestnut tree is a viable and profitable, especially for the local community. This may be based on results, where 75.8% of the interviewed turns out to be regular consumers of chestnut and from 24, 16% current non consumers, 19.6% of them can become customers. The results show that the average consumed amount ranges from 1-5 kg per capita. Apart final consumption, production consumption is expecting to be growing, especially in the foreign market.

Kosovo Chestnut market consists only of the final consumption market. Collection points accumulate fresh fruit quantities to export to the overseas market, mainly on the European market.

The chestnut fruits of this tree are consumed by consumers of all ages, sexes, those with income higher as well as those who have the lowest incomes, consumers of all ethnic groups and no differences in terms of religion. The reason is the taste and the benefits it has.

General knowledge about the possibility of processing and the existence of chestnut products leave much to be desired. This is because, the results show that 69.1% of surveyed companies do not recognize this opportunity, on the other hand, 75.8% of respondents for final consumption were not familiar with these products, so they did not know that from the chestnut can be gained flour which can be used for production of various products based on chestnut flour.

It can be concluded that based on the results, roasted chestnuts are preferred by respondents.

Chestnuts preferred by residents of all regions in Kosovo. More are preferably local chestnuts, especially chestnuts originating from the municipality of Decani.

Fruits are mostly consumed during its season. Key factors in determining the purchase are quality and country of origin, before the price.

As natural resources with secure market, increasing demand and supply deficit, this tree deserves better attention, as well as from institutions and of local residents.

Community area where chestnuts lies together with the municipality, must take concrete measures for the protection, either by illegal logging or by various pests and diseases, providing sanitation services and agricultural technology, developing ecosystem chestnut plan, for long-term and sustainable development.

From the results it appears that consumers appreciate quality and country of origin before the price. This means that for the market should be provided qualitative chestnuts from municipalities of Decani, Peja and Junik, to care more about the tree and expand surfaces and to promote its cultivation.

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