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Peach Value Chain Analysis in Kakheti Region

Tbilisi, 2016

The research is conducted in the framework of the project “Empowering Modern Research Practices of Regional Agriculture-Related Institutions”, implemented by PMC Research Center and Iakob Gogebashvili Telavi State University. The project is implemented by Georgian Rural Development Department of Georgian Institute of Public Affairs (GRDD of GIPA) in partnership with Caucasus Environmental NGO Network (CENN) and PMC Research Center and funded by European Union for Georgia ENPARD: Support to Agriculture and Rural Development. The project targets three direct beneficiaries from three different regions of Georgia: Batumi Shota Rustaveli State University of the Autonomous Republic of Ajara, Samtskhe-Javakheti State University of the Samtskhe-Javakheti Region and Iakob Gogebashvili Telavi State University of the Kakheti Region.

The research content does not necessarily reflect the view of European Union, GRDD of GIPA or CENN.

Table of Content

2. The Goal of the Research.....	8
2.1 Overall Objective of the Project.....	8
2.2 The Objective of Peach’s Value Chain Research	8
3 Research Methodology	9
3.3.1 Product Selection	9
3.3.2 Desk Research.....	9
3.3.3 Field Research.....	9
4. Research Constraints.....	11
5. Brief Overview of the Sector	12
5.1 World Peach Production	12
5.2 World Peach Trade	14
6. The Scope of the Research.....	15
6.1 Kakheti Region	15
6.1.1 General Overview	15
6.1.2 Agriculture of Kakheti Region.....	16
7. Analysis of Georgia’s Peach Sector.....	18
7.1 Peach Producing Regions of Georgia	18
7.2 Peach Varieties and Species.....	18
7.3 Export and Import of Peach	19
7.3.1 Peach Export from Georgia.....	19
7.3.2 Peach Import in Georgia	22
8. Research Results	26
8.1 Peach Production in Kakheti	26
8.1.1 Peach Producing Farmers.....	26
8.2 Description of Peach Value Chain in Kakheti	27
8.3 Grid Map of Peach Value Chain in Kakheti	27
8.3.1 Peach Value Chain Participants in Kakheti	29
8.4 External Factors Affecting Peach Value Chain	32
9. Cost and Mark-up Analysis	34
9.1 Costs and Revenues of the Producers	34
9.2 Analysis of Value-Added.....	36

10 Major Participants and Their Relationship	38
10.1 Horizontal relations in the value chain	38
10.2 Vertical Relations in the Value Chain.....	39
11. SWOT Analysis of Peach Sector in Kakheti	41
12. Peach Sector Potential.....	42
12.1 Employment Potential.....	42
12.2 Revenue Generation.....	42
12.3 Impact on Environment.....	42
13. Discussions and Recommendations	43
13.1 Major Factors Impeding Peach Sector	43
13.1.1 Factors Impeding Production	43
13.1.2 Factors Impeding Storage and Processing	43
13.1.3 Factors Impeding Sale.....	43
13.2 Recommendations.....	44
Bibliography	45
Appendix.....	46

Charts

Chart 1: Peach producing regions of the world (2013 data)	12
Chart 2: World peach production volume (2003-2013 yrs.).....	13
Chart 3: Countries with the highest yield per hectare (2013)	13
Chart 4: Peach export (including nectarines) from Georgian in 2009-2016* yrs. (thousand USD)	19
Chart 5: Peach (including nectarines) export from Georgia in 2009-2016* yrs. by months (thousand USD)	20
Chart 6: Peach (including nectarines) export from Georgia in 2009-2016* by countries (thousand USD)	21
Chart 7: Peach (including nectarines) export from Georgia in 2009-2016* by cultivars (tons)...	22
Chart 8: Import of peach (including nectarines) to Georgia in 2009-2016* (thousand USD)	23
Chart 9: Import of peach (including nectarines) to Georgia in 2009-2016* by months (thousand USD)	24
Chart 10: Import of peach (including nectarines) to Georgia in 2009-2016* by countries (thousand USD)	25
Chart 11: Allocation of peach plantations between Kakheti municipalities (2016)	26
Graph 12: Peach plantation in Kakheti by areas of land.....	30
Chart 13: Prices of peach producers in Georgia in 2006-2014 (USD/ton).....	34
Chart 14: Prices of peach producers in Georgia and in leading peach producing countries in 2006-2014 (USD/ton)	35
Chart A 1: Peach production in Georgia in 2006-2015 (thousand tons).....	46
Chart A 2: Wholesale price of peach (Kakhuri Kviteli) in Gurjaani municipality (July-August, 2016)	48
Chart A 3: Average retail price of peach (Kakhuri Kviteli) by regions (July, 2016)	48

Tables

Table 1: The major exporter and importer countries in 2015 (according to the value)	14
Table 2: Production of annual plants in Kakheti compared to other regions (based on 2014 data)	16
Table 3: Population of domestic animals in Kakheti compared to the other regions (based on 2014 data).....	16
Table 4: Production of perennial plants in Kakheti compared to the other regions of Georgia (based on 2014 data)	17
Table 5: Peach production according to the regions of Georgia (2011-2015 yrs).....	18
Table 6: Comparison of marginal profit in cases of extensive and intensive gardens.....	35
Table 7: Horizontal relations between the value chain participants	38
Table 8: Vertical relations between the participants of the peach value chain.....	39
Table 9: SWOT analysis of Kakheti peach sector	41

Table A 1: Calculation of economic indicators using sensitive analysis (for extensive gardens that are majority in Kakheti)	46
Table A 2: Calculation of economic indicators using sensitive analysis (for intensive gardens)	47
Table A 3: Documents necessary for peach export	49
Table A 4: Calculation of investment for peach garden in Kakheti region	50

Diagrams

Diagram 1: Grid map of peach value chain	28
Diagram 2: Major players of peach sector in Kakheti	32
Diagram 3: Value-added in the chain when the peach is sold on local market	36
Diagram 4: Value-added in the chain when the peach is exported.....	37

Maps

Map 1: Georgia and its regions	15
Map 2: Kakheti and its municipalities	16

1. Introduction

Agriculture has an important role in the economy of Georgia. The development of agriculture is especially significant for the regions of the country as the majority of their population are employed in this sector. Also, in many regions, agriculture is the major contributor to the economy.

Major goal of this research is to analyze peach value chain in Kakheti region. This implies a detailed study of the sector and determination of its development potential.

Soil and climate of Kakheti are favorable for peach production. This was the major factor that drove the decision to cultivate peach in this region in the last century. Today Kakheti is the major peach producing region, the sector employs a certain part of the population and consequently, is the main source of income for this group.

In addition to the local consumption, the peach is also an export product which brings revenues to the Georgian economy every year. Despite this, the sector faces numerous challenges and a holistic approach on each level of the chain is necessary for further development of the sector and for creation of higher added value for the economy of the country.

2. The Goal of the Research

2.1 Overall Objective of the Project

Overall objective of the project is to build capacity of the regional universities in the field of agriculture and to help them develop into reliable research partners for business as well as for government and donor organizations. In particular, the project aimed to deliver training course in theory in the selected universities. As for the application of theory in practice, a value chain study of the agricultural food products was planned in each university separately. This enabled the professors and the students of the beneficiary universities to apply theoretical knowledge in real life and to further enhance their knowledge in areas of modern economic research.

During the trainings, as well as research, the professors and the students of the university were actively involved in all the processes, from planning to data collection and analysis. They built relations with the representatives of value chain's various elements and this was one of the objectives of the project. We hope that their cooperation will continue in the future as well.

2.2 The Objective of Peach's Value Chain Research

The goal of the research is to analyze the value of chain of Peach – one of the most important agricultural product for Kakheti region, and determine the potential of peach production and processing industry in Georgia, especially in Kakheti region. The goal of the research is to describe the peach value chain, from peach production to end-user, reveal advantages and disadvantages of peach value chain and prepare development recommendations based on the research findings.

We hope that the findings of our research will be a helpful guide for those interested in the field and will contribute to the development of the sector and improvement of the economic conditions of the parties involved in it.

3 Research Methodology

3.3.1 Product Selection

Before the start of the research, it was important to select the agricultural product for studying it further. For this purpose a meeting was held in the Telavi Iakob Gogebashvili University and the parties related to the agriculture of Kakheti region participated in this meeting. The research of the selected product would be a pilot study, with the objective to improve professors' and students' knowledge of modern research approaches. Hence, several criteria for choosing the product were determined. The criteria were: the field should have been under researched, but should have possessed a significant potential for the region. The export of the product or its export potential was an advantage. Also, an important factor was potential of import substitution by local production. Based on these criteria, it was determined that the study of peach production in Kakheti was important and of high priority, and the participants of the meeting decided that peach value chain analysis should have been carried out.

3.3.2 Desk Research

This research is based on the analysis of the data received from field and desk research. The desk research gathered and analyzed the existing data. This implied studying and processing of various publications, including statistical publications. A modern literature on peach, articles and reports, as well as strategic state documents were studied.

3.3.3 Field Research

In July and August, field research was carried out in Kakheti region. One focus group was carried out in Telavi and Gurjaani municipalities, the farmers discussed current condition of the field, its advantages and challenges. 7 farmers participated in each focus group, they were selected based on various criteria, such as size of peach plantation, its location, gender and etc.

In addition to the focus groups, the interviews - face-to face and phone - were carried out in the region. The interviews were implemented with a semi-structured survey prepared in advance. In total 30 interviews were carried out, 90% of the interviews were face-to-face, 10% - on the phone. The interviews were held with various representatives of the value chain, such as supplier of pesticides, farmer, operator of fridge-warehouse, food processor, exporter, hired worker, transporter, expert, representative of the state agricultural agencies, customs specialist, and etc. In addition, site visits on plantations, fridge-warehouses, and wholesale market were carried out and their representatives were interviewed.

The field work was carried out by the representatives of PMC research center and the professors and the students of Telavi Iakob Gogebashvili State University.

The data received from the field and desk researches were processed and analyzed and the following issues were included in the final report:

- The peach sector was studied; the condition of the field in Georgia, as well as in the world was estimated in terms of production and international trade;

- Strengths and weaknesses, opportunities and threats of Georgia's peach sector were revealed;
- A complete value chain of peach and its participants was described;
- The warehouses existing in the region were identified;
- Vertical or horizontal relations between the peach value chain participants were described;
- Value-added at each stage of the value chain was estimated;
- Economic calculations for extensive and intensive farming were made;
- Factors impeding the development of the sector were revealed and recommendations were prepared.

4. Research Constraints

Our research, like any other research, has its own constraints. In the first place, the information existing on peach sector (e.g. number of plantations) is scarce. The time was also limited during the research, as the field work was carried out during the peach harvest period. Consequently, the farmers and the other participants of the value chain had very limited time for the interviews (on the other hand, this period helped us to better understand the important details of the sector).

Despite all these, this research is one of the first attempts to describe and document peach sector in Georgia. It is recommended to carry out a more detailed research in order to study the particular issues more thoroughly.

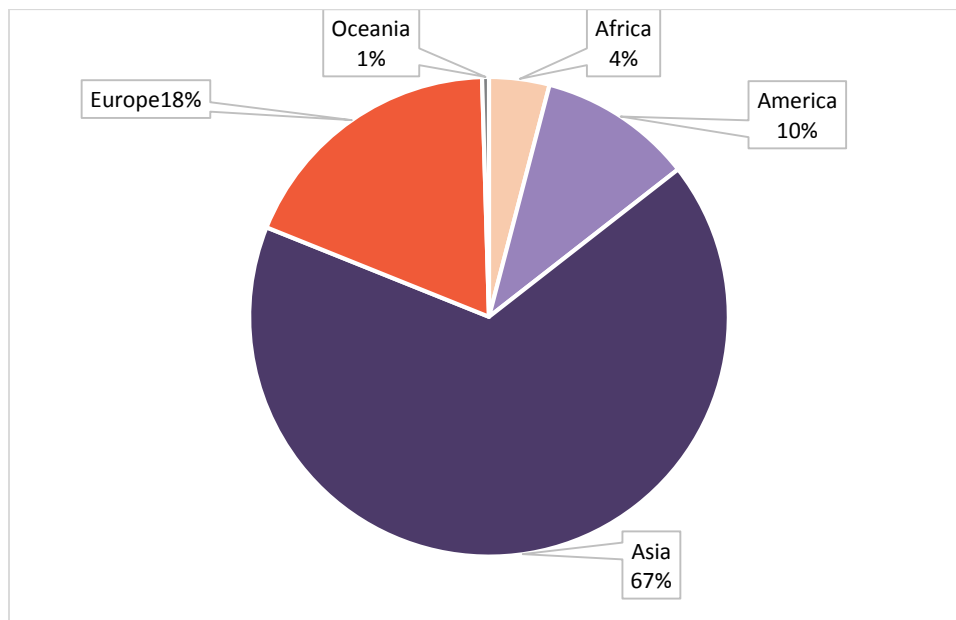
5. Brief Overview of the Sector

5.1 World Peach Production

According to the 2013 data of United Nations Food and Agriculture Organization (FAO), 81 countries produce peach in the world. The top 10 peach producers are: China (12 million tons), Italy (1.4 million tons), Spain (1.3 million tons), US (1 million tons), Greece (0.7 million tons), Turkey (0.6 million tons), Iran (0.5 million tons), Chile (0.4 million tons), Argentina (0.3 million tons), and Egypt (0.3 million tons). The same year the total volume of the world's peach production was 22 million tons.

As for the peach producing regions of the world, their shares in 2013 is described below (chart 1).

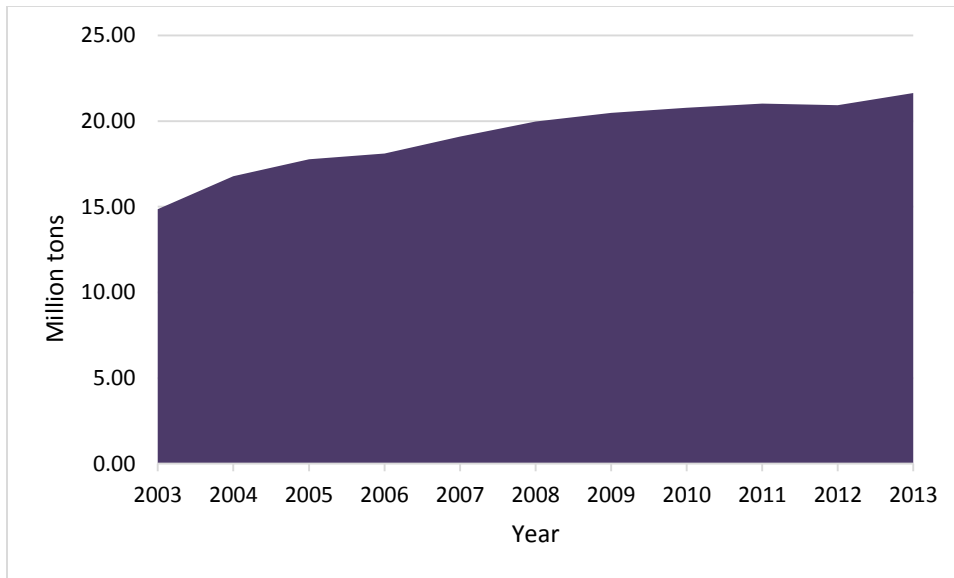
Chart 1: Peach producing regions of the world (2013 data)



Source: FAOSTAT (data are as of August 15)

The world peach production has a growing trend which is evident from the chart below (chart 2).

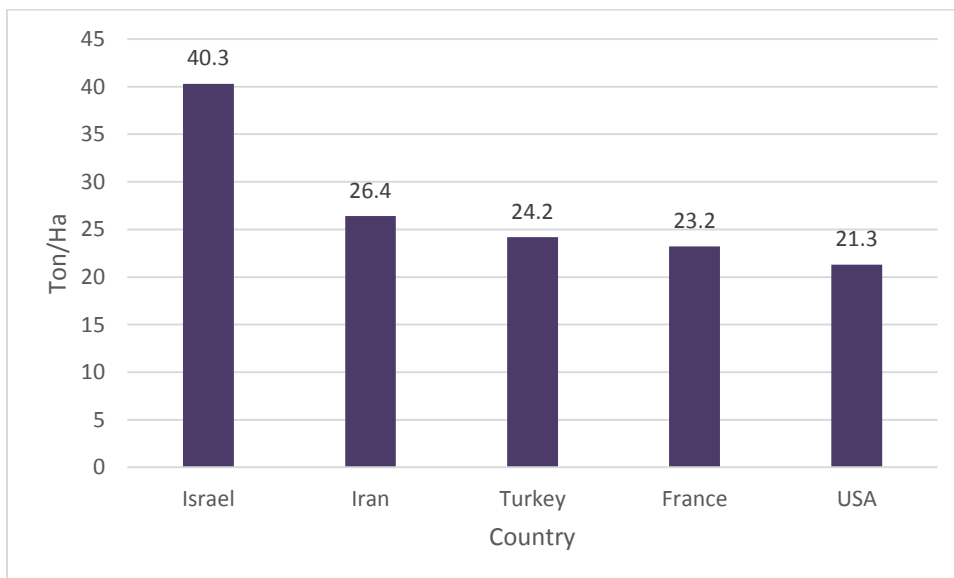
Chart 2: World peach production volume (2003-2013 yrs.)



Source: FAOSTAT (data are as of August 15)

The growth of peach production in the world is caused by the increase of peach plantations as well as the increase in yield per hectare. Below is the list of the countries that gave highest average yield per hectare.

Chart 3: Countries with the highest yield per hectare (2013)



Source: FAOSTAT (data are as of August 15)

As for the average yield in the world, in 2003-2013 it increased from 11.5 tons to 15.5 tons per one hectare of peach plantation.

5.2 World Peach Trade

Trade with fresh peach is very common in the world. In 2015 the trade with fresh peach was 2.2 billion USD (2.8 million tons of peach).

Table 1: The major exporter and importer countries in 2015 (according to the value)

Exporter countries	Importer countries
Spain	Germany
Italy	Belarus
US	France
China	United Kingdom
Jordan	Russia

Source: ITC – Trade Map

In 2015 major exporter countries accounted for 70% of the total peach trade. As for the top importers of the fresh peach, their share was 43% in 2015.

6. The Scope of the Research

6.1 Kakheti Region

6.1.1 General Overview

Kakheti is Georgia's border region, with total space of 11,310 m², which is 17.5% of country's territory. It is the largest region of Georgia. According to the 2014 census, the population of Kakheti is 318,583 people, 9% of Georgia's total population. As for the ethnic groups, 85% of Kakheti population are Georgians, 10% are Azerbaijani Georgians, 5% - other ethnic groups. The urbanization level of the region is low, as 78% of the population live in the rural areas.

Map 1: Georgia and its regions



Source: Wikipedia

The region heavily depends on agriculture, as its share in total output was 31% in 2014. The other significant fields of the economy are service (19%) and industry (13%).

40% of Georgia's agricultural lands and 35% of its arable lands are located in Kakheti. One enterprise owns 3.6 ha of land on average, this is the largest size among Georgia's regions. Kakheti is the number one region according to the grain production and goat and sheep cultivation. It is notable that Kakheti is famous for its viticulture. It is not surprising as 70% of Georgia's vineyards are located in Kakheti.

Map 2: Kakheti and its municipalities



Source: Wikipedia

6.1.2 Agriculture of Kakheti Region

As for the major agricultural products produced in Kakheti, the information is provided in the tables below.

Table 2: Production of annual plants in Kakheti compared to other regions (based on 2014 data)

Product	Wheat	Melons	Barley	Corn	Vegetables
Production volume (thousand tons)	25.9	66.3	6.4	75.0	46.0
Percentage share in total production in Georgia	52%	77%	20%	22%	24%
Position among regions	(#1)	(#1)	(#3)	(#3)	(#2)

Source: National Statistics Office of Georgia (2014 data)

Table 3: Population of domestic animals in Kakheti compared to the other regions (based on 2014 data)

Animal husbandry	Sheep	Goat	Pig	Poultry	Bee family	Cow
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Number	494.1	16.9	29.7	1263.3	55.1	119.5
<i>% share in Georgia's total population</i>	57%	31%	15%	17%	14%	9%
<i>Position among the regions</i>	(#1)	(#1)	(#3)	(#2)	(#3)	(#5)

Source: National Statistics Office of Georgia (2014 data)

Table 4: Production of perennial plants in Kakheti compared to the other regions of Georgia (based on 2014 data)

Product	<i>Peach</i>	<i>Grape</i>	<i>Nuts (walnut)</i>	<i>Prune</i>	<i>Cherry</i>
Production volume (thousand tons)	18.4	171.3	1.2	0.9	0.3
<i>Percentage share in total production in Georgia</i>	74%	76%	21%	8%	5%
<i>Position among regions</i>	(#1)	(#1)	(#2)	(#4)	(#4)

Source: National Statistics Office of Georgia (2014 data)

7. Analysis of Georgia's Peach Sector

7.1 Peach Producing Regions of Georgia

It is notable that 81 countries produce peach in the world and in 2016 Georgia held 47th place according to the production volume (FAOSTAT, 2016).

In Georgia peach is mainly produced in small gardens. The majority of peach gardens are located in Kakheti and Shida Kartli. In 2015 these regions produced approximately 90% of the total peach output (table 2).

Table 5: Peach production according to the regions of Georgia (2011-2015 yrs)

Region/Year	2011	2012	2013	2014	2015
Imereti	300	300	400	200	300
Samegrelo and Zemo Svaneti	200	400	500	400	500
Shida Kartli	4400	1100	4900	4800	4200
Kakheti	13700	4200	16700	18400	9900
Kvemo Kartli	200	400	100	100	0
The rest	300	600	1100	900	300

7.2 Peach Varieties and Species

In Georgian agriculture fruit growing has an important role. As for the peach, it is one of the major plants in fruit growing sector. Georgia's soil and climate are very favorable for commercial production of peach. It develops well on alluvial, carbonaceous, and light, loose gravel soils and well drained clays. It cannot survive on highly saline soils, or heavy clays due to bad water drainage. Peach grafted on peach cannot survive excess humidity, peach grafted on wild plum cultivates well on the soils of west Georgia. Peach grafted on almond tolerates highly carbonaceous, rocky soils (Aleksidze G., et al, 2016).

In Georgian fruit-growing, peach was always an important plant, which is demonstrated by the wide variety of selective Georgian peach cultivars. Unfortunately, lately peach does not get much attention.

The peach cultivars common in Georgia can be divided in three main groups: (1) real peaches (clingstone) – fuzzy skin; (2) freestones– fuzzy skin; (3) nectarines (apple-peaches) – fuzz less skin¹. The following cultivars are cultivated in Georgia:

- Georgian peach
- Gavazuri
- Kakhuri Tetra
- Skris Saadreo
- Khirsuli
- Kakhuri Kviteli
- Khidistauri Vardisperi
- Konela
- Lobzhanidze
- And etc.

¹ <http://agrokavkaz.ge/dargebi/mebageoba/atami-atmis-baghis-gasheneba-da-ramodenime-jishi.html>

As for the varieties of nectarines, they started to be widely cultivated in Georgia in 1990-ties and since then the farmers call it Italian nectarines (the exact name could not be found).

7.3 Export and Import of Peach

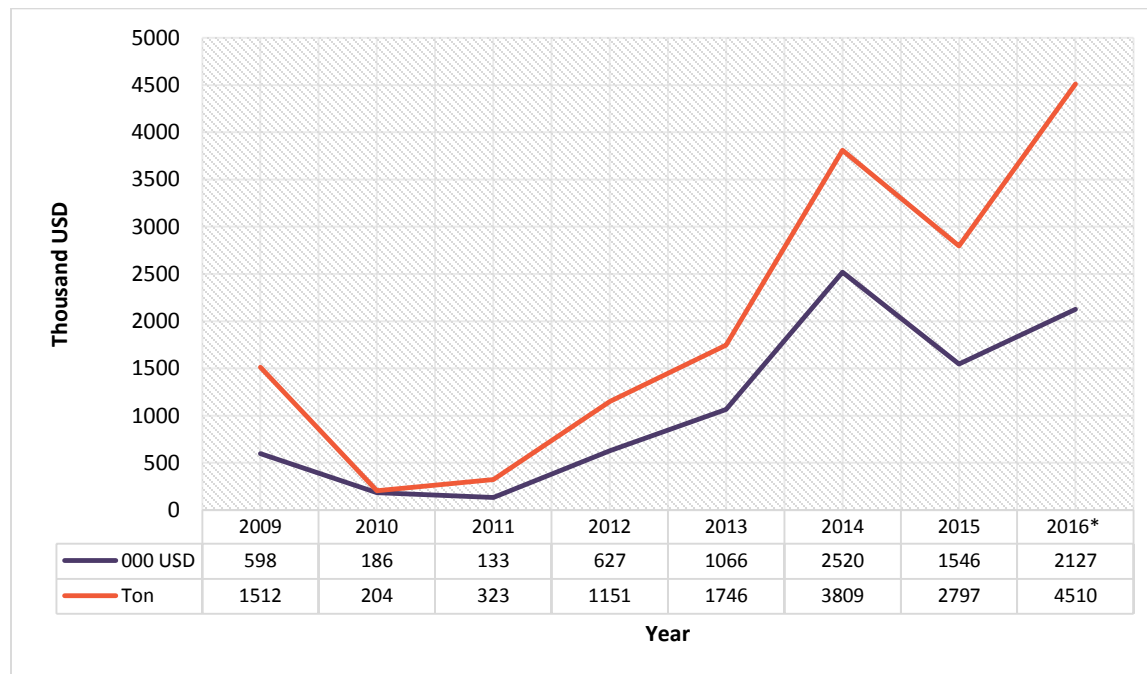
Lately the total area of peach gardens and peach production level increased significantly. Its export potential has also grown. This is mentioned in the list of the 21 priority products with export potential that was prepared and published by the Ministry of Agriculture in 2015.

7.3.1 Peach Export from Georgia

At this stage, due to the lack of the peach processing enterprises, there is an excess of produce during the harvest. For this reason, peach export is necessary.

The chart below 4 shows the export data of fresh peach (including nectarines) in 2009-2016 yrs. It is clear from the chart that peach export has significantly increased since 2013, which is mainly caused by lifting the embargo from Georgian production by Russia.

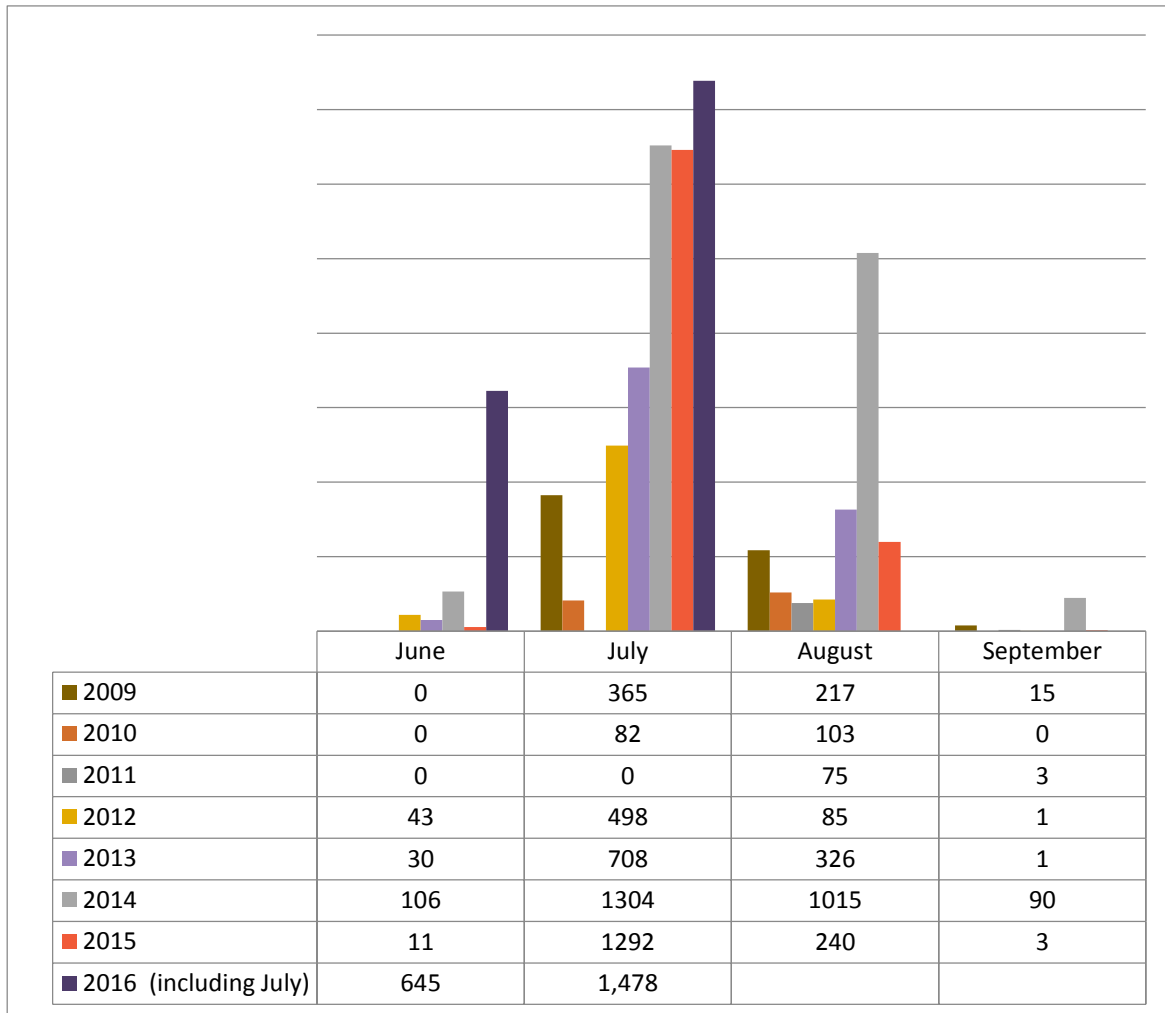
Chart 4: Peach export (including nectarines) from Georgian in 2009-2016* yrs. (thousand USD)



Source: Geostat. *Including July 2016

Chart 5 shows export data of peach (including nectarines) according to months. It is evident that peach export period is June-September (when the harvest is taken), the export peaks in July and August. This is explained by the lack of fridge-warehouses. The farmers cannot store peach harvest taken during the active season and sell it during less active season.

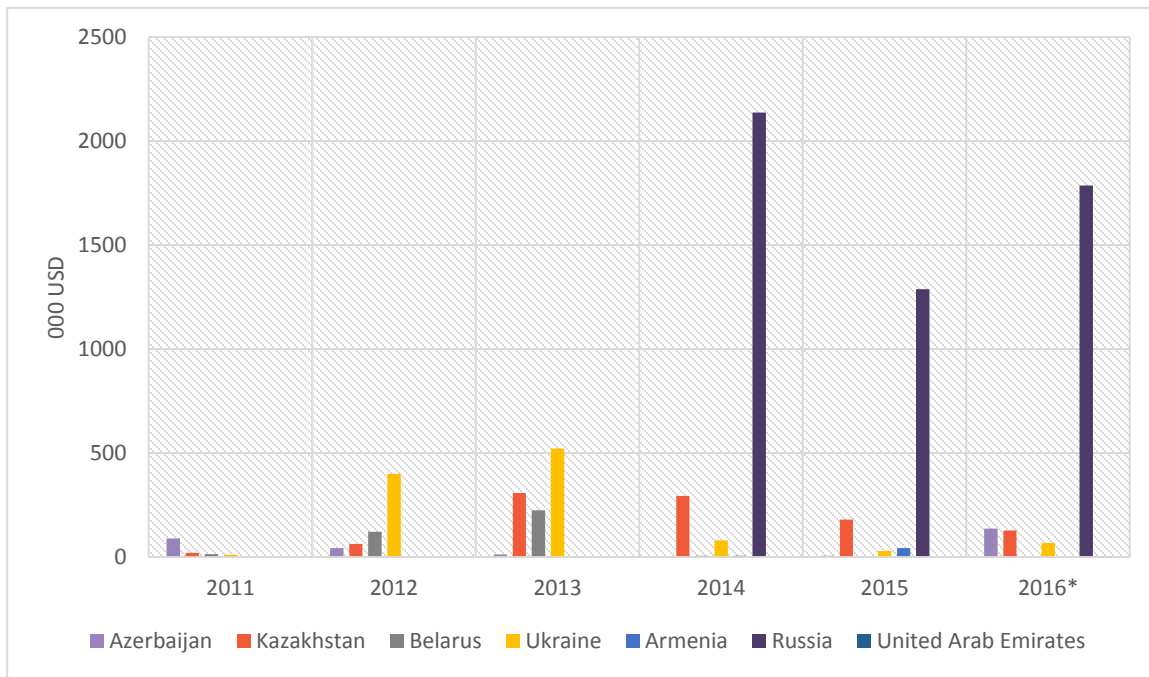
Chart 5: Peach (including nectarines) export from Georgia in 2009-2016* yrs. by months (thousand USD)



Source: Geostat. *Including July 2016

Chart 6 shows export of fresh peach (including nectarines) in 2011-2016 yrs. by countries. It is visible from the chart that peach is mainly exported to the post-soviet countries. From the information given, we see that in 2011-2013 the export increases in Kazakhstan, Belarus and Ukraine. In 2014-2016, after lifting of an embargo, majority of peach harvest is exported to Russia.

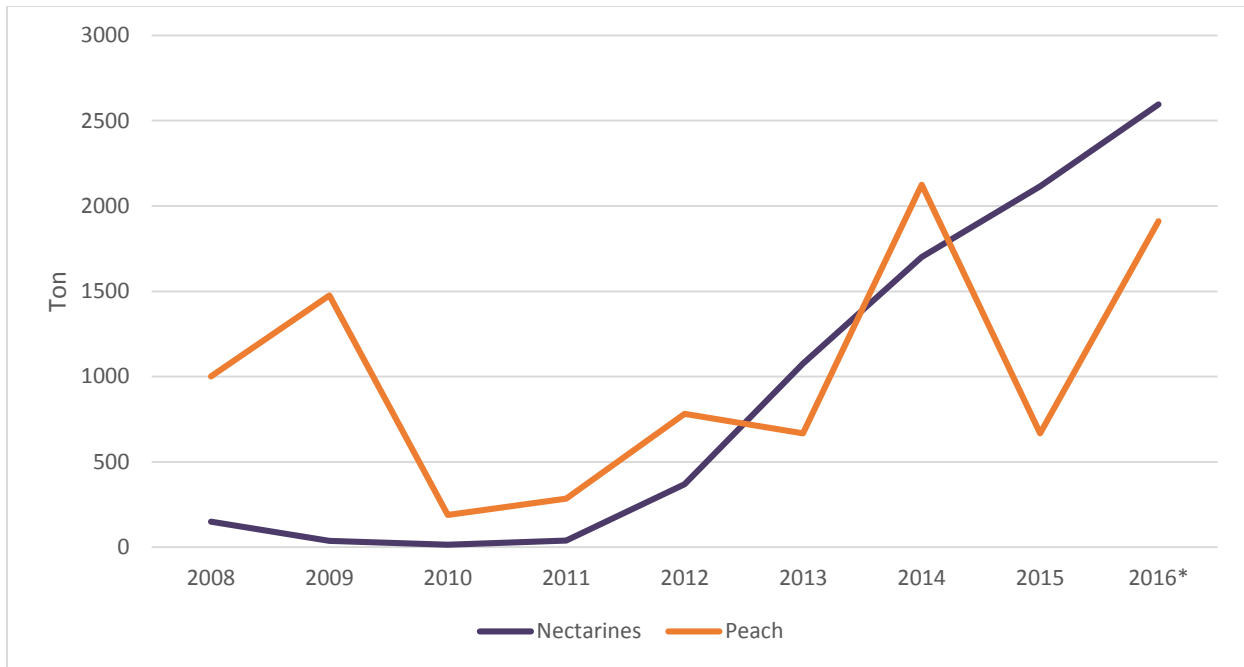
Chart 6: Peach (including nectarines) export from Georgia in 2009-2016* by countries (thousand USD)



Source: Geostat. *Including July 2016

As for the peach and nectarines export ratio, since 2011 nectarines export has been increasing, while the peach export volume varies. Based on 2015 export data, Georgia exported 2100 tons of nectarines and 667 tons of peaches (chart 7).

Chart 7: Peach (including nectarines) export from Georgia in 2009-2016* by cultivars (tons)



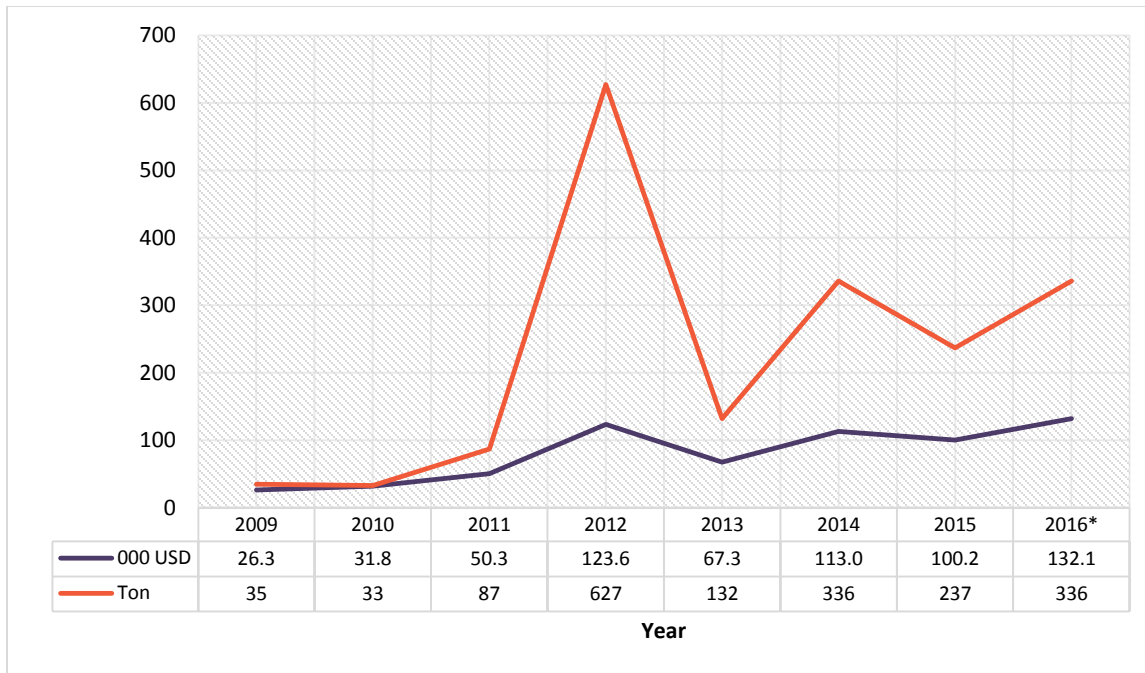
Source: ITC (2016). *Including July 2016

7.3.2 Peach Import in Georgia

Despite the fact that Georgia produces large amount of peach and it is an export product of the country, the production cannot satisfy local demand throughout the year and a small amount of peach is imported in the period when the market price on the peach is high.

Chart 8 shows peach import (including nectarines) data in 2009-2011. As we see, the peach import has increased lately. The largest amount of peach was imported in 2012, which might have been caused by climate conditions, as in 2012 the natural event destroyed a large part of the harvest in Kakheti.

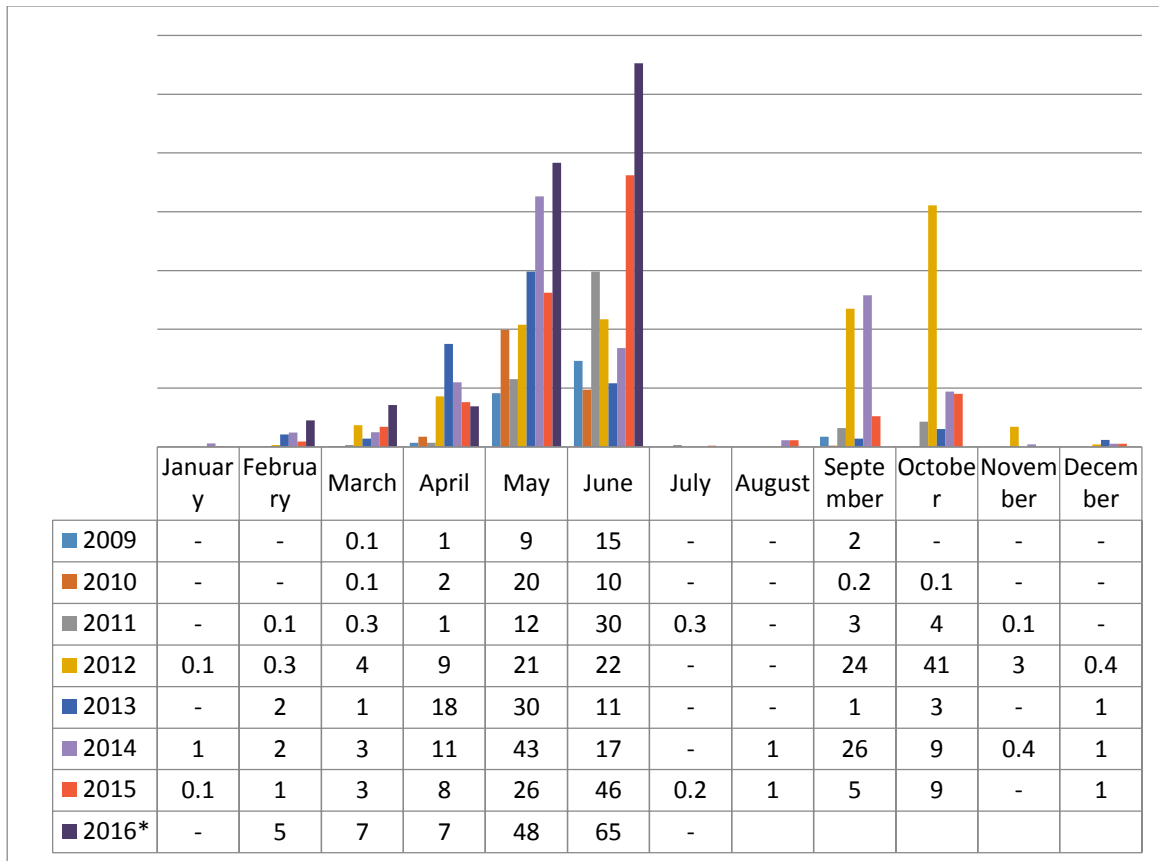
Chart 8: Import of peach (including nectarines) to Georgia in 2009-2016* (thousand USD)



Source: Geostat. *Including July 2016

Chart 9 shows import of fresh peach (including nectarines) in 2009-2016. The chart demonstrates that the peach is imported in the country around the year and import reaches the peak in May, June and September.

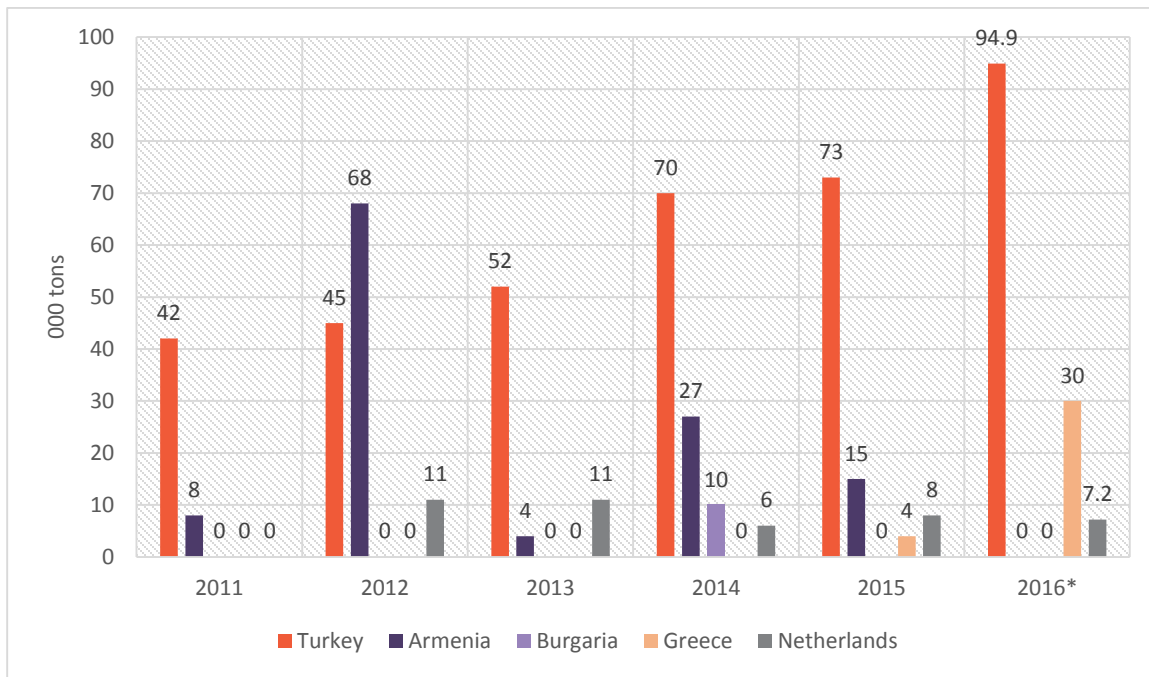
Chart 9: Import of peach (including nectarines) to Georgia in 2009-2016* by months (thousand USD)



Source: Geostat. *Including July 2016

Chart 10 shows import of peach (including nectarines) in 2011-2015 by countries. Major import countries are Turkey and Armenia, this year the peach was also imported from Greece.

Chart 10: Import of peach (including nectarines) to Georgia in 2009-2016* by countries (thousand USD)



Source: Geostat. *Including July 2016

8. Research Results

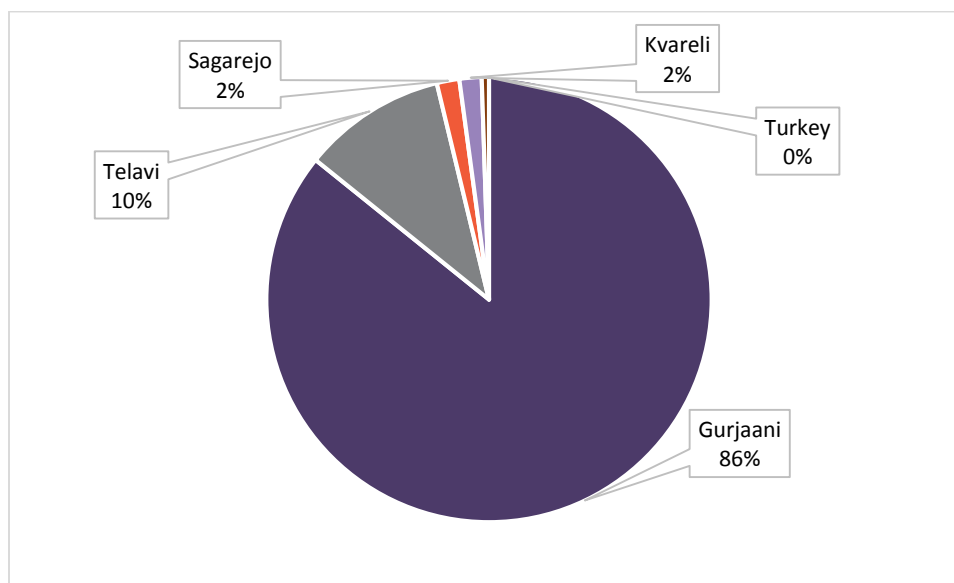
8.1 Peach Production in Kakheti

8.1.1 Peach Producing Farmers

According to the data provided by the Kakheti Information and Consultation Centre of the Ministry of Agriculture of Georgia, there are up to 1000 peach producing farmers in Kakheti region, they have planted peach on 0.5 ha and larger area of land. In total such farmers own 1800 ha peach gardens, which gives 1.8 ha peach garden per farmer on average. The size of one farm varies from 0.5 ha to 35 ha.

In Kakheti region, leading peach producing municipalities are Gurjaani and Telavi, with 85% and 12% shares in total peach areas respectively. The share of other municipalities is insignificant.

Chart 11: Allocation of peach plantations between Kakheti municipalities (2016)



Source: Kakheti Information and Consultation Centre of the Ministry of Agriculture of Georgia

8.1.1.1 Gurjaani Municipality

Gurjaani municipality is the major peach producer of the region, as it holds 86% of Kakheti's total peach area. In Gurjaani municipality, village Chumlaki is the leader; based on the same data, this village has 55% of the Gurjaani municipality's total peach area (almost half of the Kakheti peach plantations). The majority of the families living in Chumlaki are peach producers.

In this municipality the following villages are also notable: Vazisubani (9%), village and city Gurjaani (9%), and Akhasheni (8%). The rest of the Gurjaani villages hold 11% of the peach areas. It is notable that according to the average area per farmer, village and city Gurjaani is a leader with 3.8 ha.

8.1.1.2 Telavi Municipality

Telavi municipality holds 10% of the Kakheti peach lands and it holds the second place after Gurjaani. The leading peach producing villages in Telavi municipality are Vanta and Akura with 45% and 24% of total peach areas, respectively.

Unfortunately, the study revealed that in the region there is no fruit processing company that would make juices, comfitures, dry fruit and other products from peach. In Kakheti the peach processing finishes at the fridge storage stage, when fruit is stored in the fridge for short period of time to prepare it for export. No added value is created in the region. Households process small amount of peach and make compote, comfiture, dry fruit and etc.

8.2 Description of Peach Value Chain in Kakheti

All cultivars (peach as well as nectarines) produced in Kakheti fall within two categories of quality, standard and nonstandard. The peach is sorted according to this category in a special place, where women work on sorting the peaches. The process is the following: the harvested peach goes to such places, where it is sorted in the two above-mentioned categories.

Nonstandard peach

The share of the nonstandard peach in total harvest varies from year to year and depends on the weather conditions and how the plantation is take care of. In 2015 the share of such nonstandard peach was approximately 20%. In 2016 the excess precipitation (including hail) increased the share of nonstandard peach up to 30%. The price of such peach was 20-30 tetris this year. However, as the research showed, large part of the nonstandard peach is discarded, a certain part is taken by the only juice producer that has a factory in other region (it only takes peach, not the nectarines), the other part is used to distill vodka and spirits, and a small amount is used as a food for pigs. Unfortunately, the scare data did not allow to calculate their shares.

Standard peach

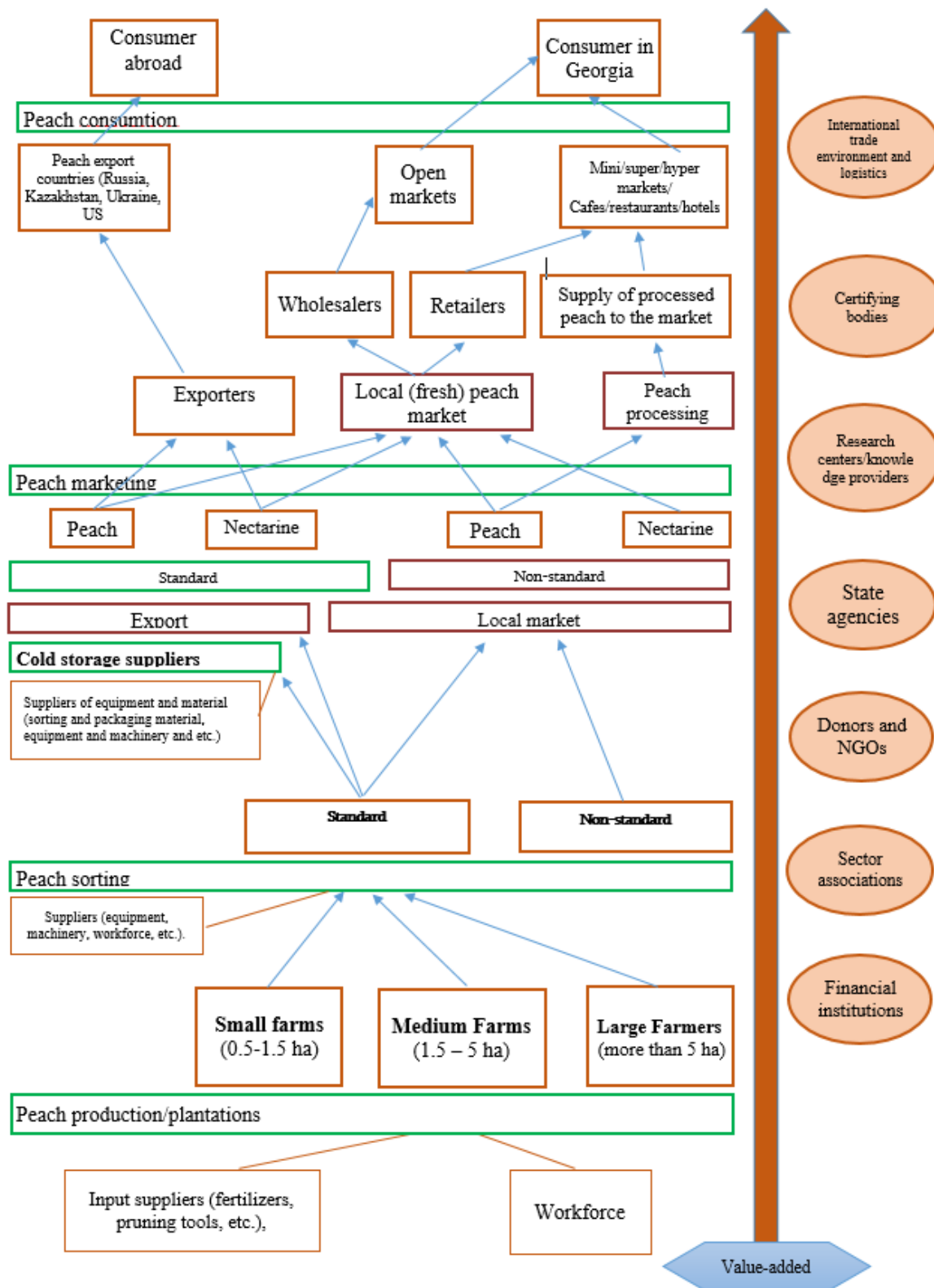
Standard peach is sold locally as well on export markets. If the fruit should be exported, it is chilled in the fridge storages, after loaded in the special container vehicles (20 tons on average) and exported.

In general, the largest part of the peach is sold on local market where it is consumed as a fruit, it is also processed, mainly in home conditions, to prepare juices, comfiture, dry fruit or compote.

8.3 Grid Map of Peach Value Chain in Kakheti

A grid map of peach value chain is given below. It consists of internal and external factors. Both factors, as well as the complete value chain, is discussed in detail below.

Diagram 1: Grid map of peach value chain



8.3.1 Peach Value Chain Participants in Kakheti

Major participants of peach value chain can be divided into the following groups:

Suppliers of agricultural products

In order to cultivate peach seedlings, pesticides, irrigation channels, water, and proper land is required.

Seedlings. Unfortunately the production of seedlings is a problem in the region as there is no certified nursery and seedlings are produced in primitive conditions. The price of one seedling varies from 1.5 GEL to 3 GEL. The majority of the farmers say that it is better to use seedlings imported from abroad for intensive gardens.

Pesticides. Currently there are many suppliers of pesticides in the region. However often the price does not match the quality of the pesticides. On one hand, the farmers try to use cheap pesticides. This approach is not economically rational, as the yield is low and the share of low quality (nonstandard) peach is quite high in the total harvest.

Irrigation System. In part of Kakheti where the majority of the peach gardens are situated (in Gurjaani and Telavi regions), on the right bank of river Alazani, the irrigation system is more or less available. However, some farmers, especially those who own intensive gardens, have their own irrigation wells.

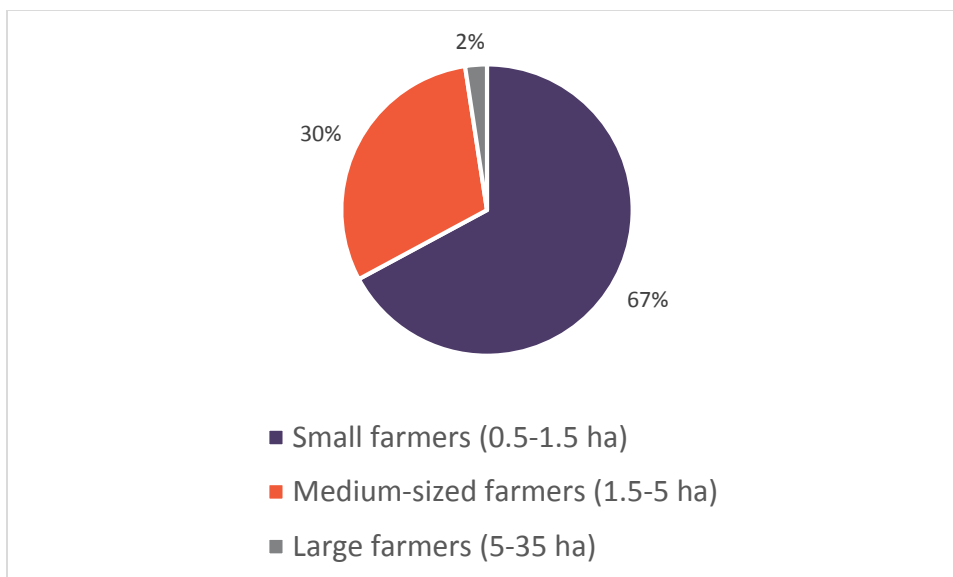
Land. As we have already mentioned, Kakheti is the leader region of Georgia in terms of land area. Kakheti also has the biggest land per household. This positively affects peach growing, as it requires quite large land. However, highly fragmented lands and small-sized lands still remain a problem, especially in the peach producing municipalities. Unregistered lands and lack of development of land market is also a problem.

Farmers

As we have mentioned above, according to the data provided by the Kakheti Regional Representative Office of Ministry of Agriculture, there are up to 1000 peach producing farmers in the region, they have peach gardens on 0.5 ha of land or more. The total area of plantation is 1800 ha, that is 1.8 ha of plantation on average per farmer. It is notable that the farmers often have plantations on 2 or 3 different pieces of land, which makes it more difficult to take care of them and increases the costs.

If we divide the farmers into three categories according to the plant size – small (0.5-1.5 ha), medium (1.5-5 ha) and large (5 ha and more), we will see that the majority of the farms are small (Graph 12):

Graph 12: Peach plantation in Kakheti by areas of land



Source: Kakheti Information and Consultation Centre of Ministry of Agriculture (2016)

It is notable that the small farmers (67%) hold 44% of the total plantations, the medium-sized farmers (31%) – 41%, and the large farmers (2%) – 15%.

Workforce

In Kakheti, as well as in whole Georgia, the peach is harvested manually. The sorting of the peach is a very labor intensive process and requires high involvement of labor during the harvest period. In addition, peach trees require a lot of agricultural work (e.g. pruning), which also highly depends on the labor force. The research showed that even though the demand on labor force is high during the harvest season, there is no deficit of workforce as the groups of workers come from distant villages that do not produce peach. Average daily salary of one worker is 20-30 GEL.

As for the highly qualified workers that are necessary during pruning, pesticide treatment and other agricultural works, it is still a problem to find them in the region.

Fridge storages

There are three modern fridge storages in the region. They were built in the last several years and were partially financed by the state's preferential credit (Produce in Georgia) or co-financed by the donor organizations (USAID/REAP).

All three fridge storages are located in Gurjaani municipality, in the following villages: Chumlaki, Akhasheni and Velistsikhe (the latter opened several months ago). They are used for peach export during the peach harvest period, during other seasons they are used for storing other fruits (for example, table grape, and persimmon). The total capacity of the three fridge-storages is approximately 1000 tons per one storage. As the study revealed, it is difficult for the fridge storages to work at full capacity, which is on one hand due to the improperly planned supply chain and on the other hand, due to low level of automatization. In order to export the peach, it should be chilled up to its core to a certain temperature and this requires about 1.5 days.

In addition to modern fridge warehouses, there are primitive fridges in the region with the capacity below 10-15 tons per one storage, the chilling quality does not meet the standards either; however, they are still used for the peach intended for export to short-distance markets.

The lack of fridge warehouses is considered one of the factors impeding the development of the sector.

Exporters

As revealed by the research, there are two types of exporters: the first type export the peach to a shorter distance markets and usually do not use the fridge warehouses. They load the peach in the fridge container vehicles straight after the sorting and packing stage and transport it abroad. The second type of exporters transport the peach to a longer distance markets (or to a short-distance markets but prefer to be insured from spoiling the produce) and they use fridge-warehouses (modern as well as primitive).

It has been a second year already that during the peach harvest season a special office operates under “one window” principle in Gurjaani. In this office the exporter can get necessary export documentation (see table A3 in appendix) in approximately one hour, the price of this service is just GEL 25 per one container (the exporter only pays phytosanitary fee, the rest of the service is free). According to the data of this office, there were up 20 exporters in Kakheti in 2015.

It was interesting to find out that the majority of the fridge-warehouse owners use mediator, i.e. exporter to export the peach. Several of the fridge-warehouses terminated the contract saying that they prefer to sell the peach via exporter than carry the responsibility of its transportation and sale.

Transportation

Transport companies transport the peach with fridge-vehicles during the harvest period. The capacity of one vehicle is approximately 20 tons - 26 pallet, each 700-800 kg. The majority of the export is transported via trailers; the peach is exported to Ukraine from Poti or Batumi via Black Sea ferry.

Processing/Canning

Unfortunately, in Kakheti region there is no processing factory, which would make juices, comfitures and jams from peach.

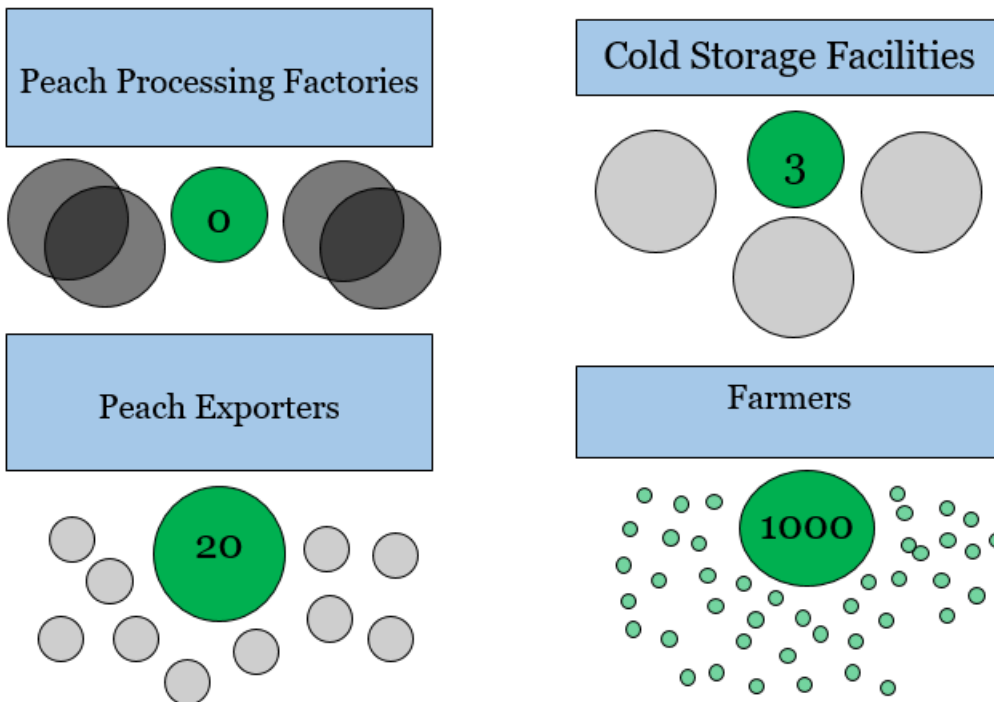
In Kakheti the peach is purchased by the only processing company Kula which has the factory in Shida Kartli and transports the peach from Kakheti during the harvest season (this year the price was 15-20 tetris per kg). Due to high competition on juice market, Kula cannot purchase peach in large quantities.

It should be noted that Kula does not purchase nectarines as the sugar content in nectarines is low and it is not suitable for making juices. At the same time, according to Kakheti Information and Consultation center, majority of the peach plantations in Kakheti region produce nectarines.

Considering the fact that the large part of the peach produced in the region is discarded, the existence of the processing factory would partially solve this problem.

In addition to the canning factory, it is common to make peach compotes and jams at home in Kakheti as well as in other regions. Home-made peach compotes and jams have a significant share in the local peach consumption.

Diagram 2: Major players of peach sector in Kakheti



8.4 External Factors Affecting Peach Value Chain

The processes in the peach value chain highly depend on external factors. Below are the factors that influence or will influence the peach value chain.

State agencies

Information and Consultation Centers of the Ministry of Agriculture are one of the main sources of information in the region. The centers have team of 4-5 people and they are established in each municipality. They spread information about any project initiated by the Ministry of Agriculture. In addition, they collect information about peach plantations, expected yields, and etc. The programs initiated by the Ministry of Agriculture that directly affect the peach sector are “Plant the Future”, “Preferential Agro Credit”, “Produce in Georgia”, and “Agro Insurance”, which is implemented by the Agricultural Projects Management Agency in collaboration with the private sector.

Joint work of National Food Agency and Revenue Service to support peach export is also notable. In Gurjaani office of National Food Agency the export documents are prepared under “one window” principle and it is highly appreciated by the exporters.

International donor organizations

In Kakheti region many international organizations have worked for years. Several organizations still continue their activities in the field of agriculture currently. These organizations, usually, help farmers to purchase equipment and agricultural machinery. In peach sector a program supporting the development of

fridge-warehouses implemented by USAID within the REAP project is worth noting. The three fridge warehouses were developed with the support of this project.

Financial institutions (banks, microfinance organizations and insurance companies)

Despite many financial institutions present in the region, limited access to finance is often considered one of the factors impeding farmers' activities, however, the subsidized agro credit program launched by the Agricultural Projects' Management Agency is considered one of the most successful projects of the agency. This program is especially effective for the large farmers. As for the small farmers, it is more difficult for them to get the loan, as they are required to present collateral to guarantee the loan in most of the cases. For this reason, access to finance remains a very pungent topic for the small and medium farmers.

As for the agricultural insurance, it has been several years that the government together with the private sector has started a harvest insurance program and subsidizes the insurance premium. This program is implemented in order to help farmers reduce their risks. It is important to continue and develop agricultural insurance in the region.

Sector association

There are many farmer associations in Georgia, however, none of them is active in peach sector. Also, the peach producers themselves show no interest in joining farmers' associations or establishing the peach producers' association.

Educational and research centers

There are university and colleges in the region. The Iakob Gogebashvili University has a long history and was once considered a leading regional university in the field of agriculture. However, peach and fruit growing directions need to be strengthened. The research center based in the university also needs to be strengthened.

The college Aisi which is located in the village Kachreti of Gurjaani municipality has branches in the region. College Aisi is considered one of the best colleges of the country in agriculture sector. Despite this, the peach sector (peach cultivation, storage, processing) is underrepresented and this hampers further development of the field in the region and introduction of modern knowledge in the field.

International trade environment

Georgia is a member of World Trade Organization. It has preferential trade regime with Europe, CIS countries, Turkey, US, Norway, Switzerland, Canada and Japan. This year Georgia strengthened its trade relations with China as well.

If Georgia produces high quality peach that meets required standards, Georgia can export peach to these countries under low tariffs or free of tariffs. However, it will be better if the peach is processed locally and is exported to foreign markets in the processed form. There is also a possibility of increased competition on the local market as the trade agreements imply bilateral preferences.

Certifying bodies

The custom clearance of the goods to be exported outside of Georgia is done by the customs agencies. The exporter can prepare all necessary documents in the Gurjaani office that operates under "one window"

principle. As for giving out the certificate that proves high standards in the factories of the various participants of the value chain and the farmer, much needs to be done in this regard.

9. Cost and Mark-up Analysis

9.1 Costs and Revenues of the Producers

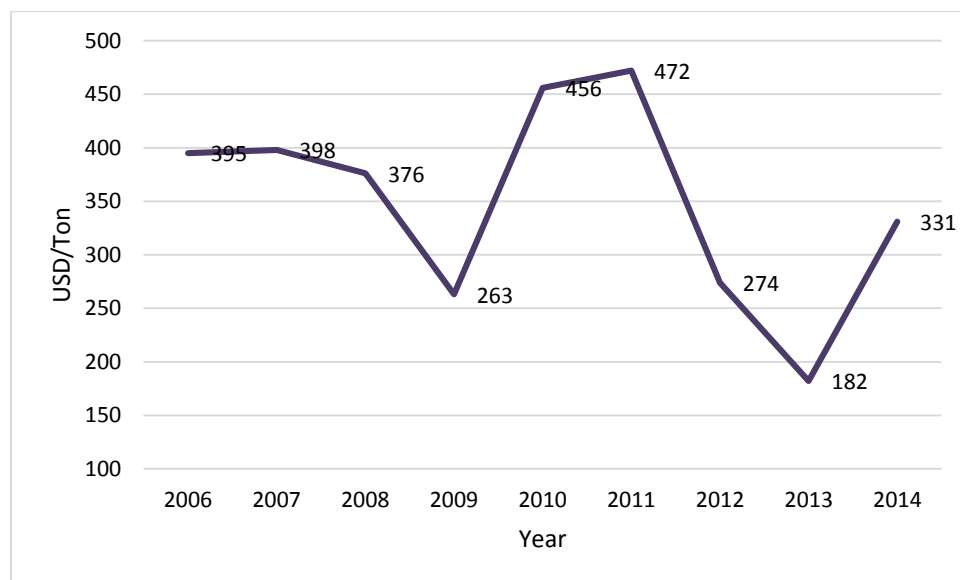
Costs and revenues of peach producers depend on the method of peach production. The final profit is largely determined by the method used by the farmer, whether it is extensive or intensive;

The major costs of the farmer are associated with taking care of the plantation (pruning, treatment with pesticides), also with labor force, especially during the harvest period.

The income is determined by the yield (including the quality yield) and the price. The yield of extensive gardens is 20 t/ha, the yield of intensive gardens – 40 t/ha. The latter can even produce 50 t/ha and more.

As for the prices, the firm gate prices of the producers are given below (chart13).

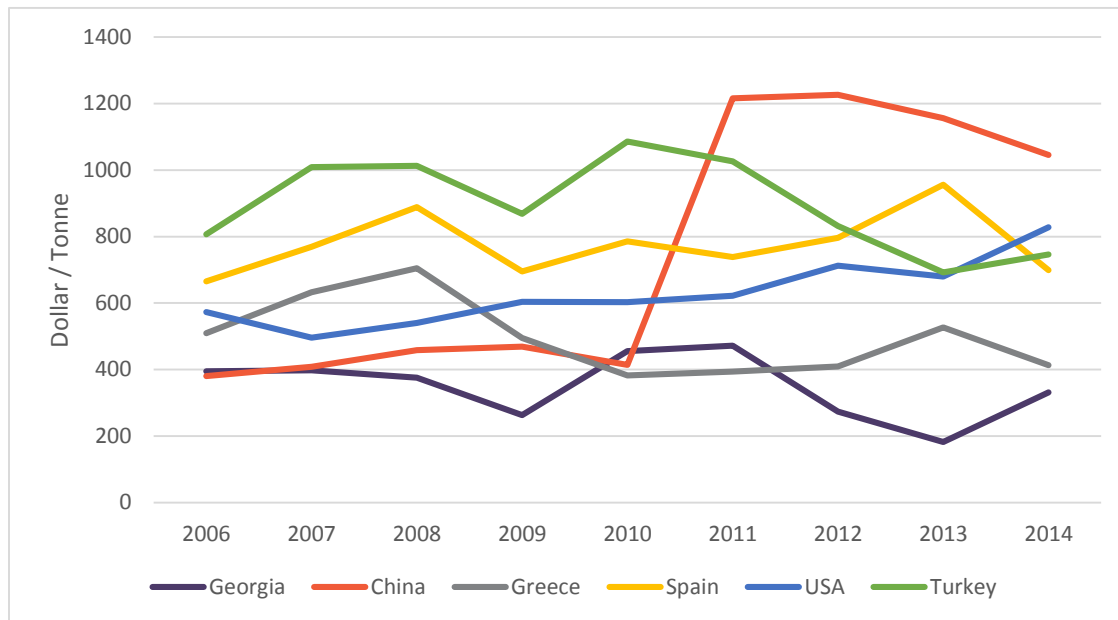
Chart 13: Prices of peach producers in Georgia in 2006-2014 (USD/ton)



Source: FAOSTAT

It is interesting to find that prices of Georgian producers are much lower than the prices of the leading producer countries (chart 14).

Chart 14: Prices of peach producers in Georgia and in leading peach producing countries in 2006-2014 (USD/ton)



Source: Author's calculations based on the data from Food and Agriculture Organization (FAOSTAT)

According to the information gained from the interviews, the average annual income received from peach production in case of extensive gardens is 10'000 GEL/ha, average cost is 5'000-6'000 GEL/ha, and average profit 4'000-5'000 GEL/ha. As for the intensive gardens, their average revenues and average costs are the following: average annual income is 24'000 GEL, average annual cost is 11'000 – 12'000 GEL and average profit is 12'000 – 13'000 GEL.

Below the table 6 provides one of the scenarios of financial results under certain assumptions for extensive and intensive farming. Detailed calculations based on sensitive analysis is given in annex (tables A1 and A2).

Table 6: Comparison of marginal profit in cases of extensive and intensive gardens

#	Indicators	Extensive (regular method)	Intensive (modern method)
1	Total cost (GEL)	5'255	11'282
2	Yield (kg/ha)	20'000	40'000
3	Average sale price (GEL/kg)	0.50	0.60
4	Revenues (GEL)	10'000	24'000
5	Profit (GEL)	4'745	12'718
6	COGS (GEL/kg)	0.26	0.28
7	Profit margin (GEL/kg)	0.24	0.32
8	Profit margin (%)	47%	53%

9	Break-even point (kg/ha)	7'700	14'100
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Source: author's calculations based on the interview results; Economic calculations of S. Gongladze were also used.

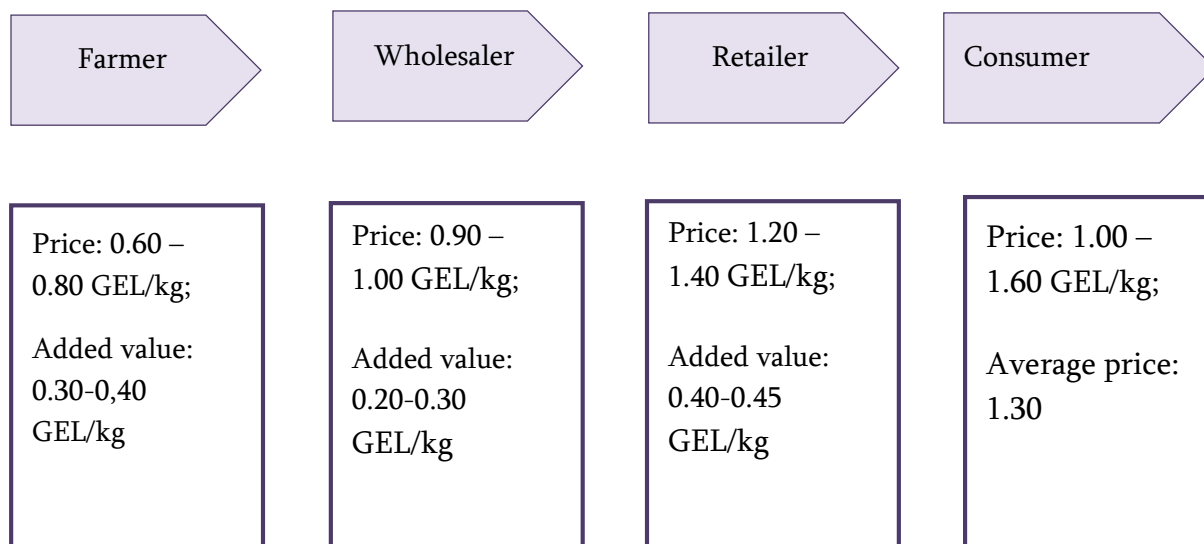
Note: Detailed economic calculations of S. Gongladze is given in appendix in Table A4.

It is notable that intensive gardens require more investment at the start than extensive gardens. However, as the above calculations show, the intensive method is more profitable for the farmer, as it yields more and better quality harvest leading to higher revenues eventually.

9.2 Analysis of Value-Added

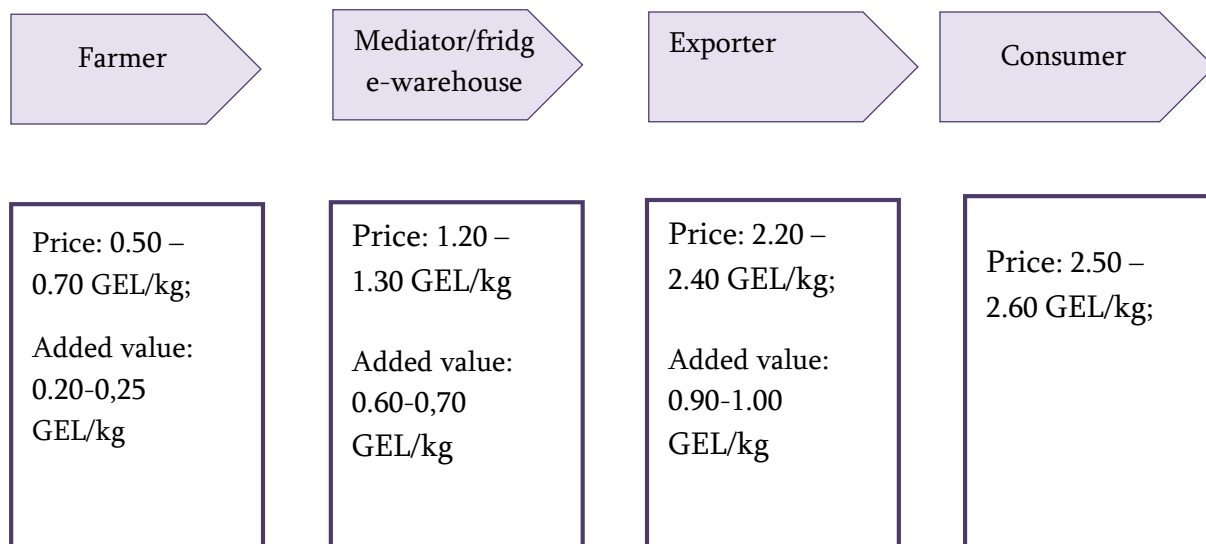
Value-added at each stage of the value chain is the price difference between the stages. The diagrams below (diagram 3 and 4) show how the value-added is distributed between the various components of the value chain. The diagrams demonstrate two cases: (1) when the peach is supplied to the local market, and (2) when the peach is exported.

Diagram 3: Value-added in the chain when the peach is sold on local market



Source: Author's calculations.

Diagram 4: Value-added in the chain when the peach is exported



Source: Author's calculations.

As we have already mentioned, 15% of the total harvest is exported annually. It should be noted that a relatively high quality peach, the so-called standard peach (including nectarines) is exported. Such peach is 70-80% of the total harvest. Both diagrams given above use the prices of this standard peach. (diagram 3 and 4).

10 Major Participants and Their Relationship

10.1 Horizontal relations in the value chain

Following horizontal relations were revealed in the chain as a result of the interviews (Table 7).

Table 7: Horizontal relations between the value chain participants

Relation	Description
Between suppliers of agricultural products/shops	In Georgia lately the supply of agricultural services has increased. The same is true for Kakheti region. This causes a high competition in terms of price and quality.
Between the farmers	It is notable that in Kakheti the majority of the peach is produced on one territory (Gurjaani and Telavi municipalities), this encourages cooperation between the farmers. However, the farmers are not united in the cooperatives and post-harvest care and storage is underdeveloped. In fact, the farmers do not work in this direction (while the value added is created exactly at these stages).
Between the mediators (wholesalers)	There are many mediators/wholesalers in the region during the harvest period, however sale of the peach remains a challenge (often due to the low price). There is competition between the wholesalers, as the price and quality they offer the farmers do not differ much from each other. As for the nonstandard, low quality peach, it is purchased only by several buyers and they can influence the prices.
Fridge-warehouses	There are three professional fridge-warehouses in the region and several primitive fridges (operated in home conditions). The cooperation between them is not very close, however, there are certain cases of cooperation.
Between the exporters	The major export of peach is done from the end of June to the middle of August. In this period approximately 20 exporters work in Kakheti region and there is more or less competition between them. There is almost no cooperation between them.
Between the retailers	The number of retailers is quite high, starting from open markets to super and hypermarkets of the cities. Usually, the latter offers higher prices.

Between the consumers	In Georgia peach is a popular fruit in terms of consumption. The consumers mainly buy the fruit on the season (in the harvest period) and consume it fresh or make jams and compotes for winter consumptions.
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10.2 Vertical Relations in the Value Chain

The study revealed following vertical relations in the peach value chain (table 8).

Table 8: Vertical relations between the participants of the peach value chain

Relation	Description
Between suppliers of agricultural products/shops and farmers	According to the farmers, agricultural products and services are more available. However, they frequently note that the price and the quality of purchased product or service do not coincide. Qualified consultation on peach cultivation remains a challenge in the region. As for the workforce, the competition for them is strong, especially during the harvest period. However, there are certain groups that mobilize the workforce and supply it to the farmers.
Between the farmers and the mediators/wholesalers	Majority of the relations between the farmers and the mediators/wholesalers is informal and is not based on any kind of agreement (contract). Majority of the farmers have stable relations with the mediators/wholesalers and sell their product to various mediators/wholesalers.
Between the mediators/wholesalers and and fridge-warehouses	The relations between the mediators/wholesalers and the fridge-warehouses is mostly informal and is not based on any kind of agreement. However, these relations are stable. Majority of the fridge-warehouses purchase peach from the same mediator/wholesaler based on the verbal agreement.
Between the fridge-warehouses and the exporters	Fridge-warehouses and exporters work based on agreements and try to follow the provisions of the agreement. Fridge-warehouses work with several exporters usually.
Between the mediators (exporters, wholesalers) and the retailers	Formalizing this relation depends on the type of retailer, if the trade is on open market, the relationship is usually informal, in case of mini, super or hyper markets the agreements are formal and the parties try to follow the agreement provisions.
	Markets have many customers, in the cities as well as in the villages. Compared to the other retail sales points, the prices in the markets are

<p>Between the retailers in market and the consumer</p>	<p>usually lower, which is crucial for certain segment of the consumers. In addition, there is certain group of consumers who believe that the product purchased in the market is healthier and more natural.</p>
<p>Between supermarkets and the consumers</p>	<p>The supermarkets offer customers a comfortable environment during the shopping for the products and respectively, they charge higher prices than the retailers in the market. Usually, the supermarkets have different target audience, who is ready to pay a higher price for the comfort.</p>

11. SWOT Analysis of Peach Sector in Kakheti

The analysis of the peach sector in Kakheti region revealed its strengths and weaknesses, as well as opportunities and threats (Table 9).

Table 9: SWOT analysis of Kakheti peach sector

Strengths	Weaknesses
<ul style="list-style-type: none"> • Favorable climate and fertile soil; • Potential to sell on local market (substitute import with fresh peach as well as with processed products); • Export product; • Institutional experience in peach production. 	<ul style="list-style-type: none"> • Low-yield plantations; • High share of nonstandard peach in total harvest; • Diversity of the cultivars, which excludes the possibility to receive homogenous product; • Underdeveloped nurseries; • No processing factories in the region; • Lack of fridge-warehouses • High dependence on export markets (undiversified markets); • Lack of modern knowledge and experience.
Opportunities	Threats
<ul style="list-style-type: none"> • Planting productive peach gardens (intensive gardens); • Development of peach processing lines; • Program Plant the Future; • Sale on (development of) export markets <ul style="list-style-type: none"> ○ European markets ○ Post-Soviet countries; • Increase employment and revenues 	<ul style="list-style-type: none"> • Spread of diseases; • Negative impact of natural events (hail, storm, rain, drought); • Losing export markets (embargo and competition from Azerbaijan, which intensively cultivates peach plantations).

12. Peach Sector Potential

12.1 Employment Potential

As we have already seen above, there are about 1000 farmer families that own gardens of more than 0.5 ha. For the majority of them the peach cultivation is their main employment. In addition to these families, there are numerous people employed in the peach value chain during the season, especially during the harvest and storage period, when the daily salary of the worker is GEL 20-30. During this period the so-called worker groups are created and they work for various farmers to help them take the harvest. This work employs thousands of people in the region during the season.

12.2 Revenue Generation

Majority of Georgian farmers receive revenues from different sources, as the activities of the small and medium farmers are much diversified, they get revenues from plant growing as well as from animal husbandry. However, the revenues received from the peach plantations represent a large share of the total annual revenues for the families who own peach plantations. In addition to the families who own peach plantations, there are many people employed in the peach value chain during the season, especially during the harvest and storage period, when the demand for the workforce is high. This is also an important source of income for many families.

Hence the development of the field would bring additional revenues to all participants of the value chain.

12.3 Impact on Environment

In terms of environmental impact, peach is a plant that requires much pesticides and this adversely affects the environment.

13. Discussions and Recommendations

13.1 Major Factors Impeding Peach Sector

The peach value chain study revealed several significant factors that impede the sector. These factors can be divided into three major groups: factors impeding production, storage and processing, and sale.

13.1.1 Factors Impeding Production

The most important factor that impedes peach production is the instable quality of the harvest. This is a result of insufficient insurance of production risks. Low quality of the harvest is caused by the natural events (hail, frost, excessive precipitation), as well as lack of knowledge in how to fight diseases and how to treat the diseased plants.

One more factor that is a barrier to the development of the peach production is qualified workforce. The knowledge in modern peach cultivation approaches is scarce in the region. A very small number of farmers does intensive farming, while the extensive gardens yield very low harvest. In addition, there are diverse cultivars in the plantation which leaves no possibility to receive homogenous product. The usage of modern technologies, including drop irrigation systems is also low at this stage.

In addition to the challenges mentioned above, lack of insurance practice remains a barrier. Despite the state support, agricultural insurance is still not widespread among the farmers in Georgia.

13.1.2 Factors Impeding Storage and Processing

After harvest of peach, one of the most significant steps is to store it timely in proper conditions (it needs to be chilled up to 0 degree Celsius), as it is a perishable food. There are few fridge warehouses in the region and the peach cannot be chilled timely and properly. This adversely affects the life time of the peach. The situation is worse in the primitive fridges, as they cannot maintain conditions necessary for fast chilling. The absolute majority of the fruit chilled in the fridge warehouse are exported. Soon after the harvest Georgian peach disappears from Georgian market and only imported fruit can be found.

Peach processing is a second and more pungent issue in peach sector. Industrial peach processing does not exist in the region. In Kakheti there is no canning factory that would process peach and make various products from it. In the region peach is only processed in the households to prepare compotes, jams and comfitures. Mainly peach, less nectarines is used for this reason.

As the respondents mentioned, they prefer to sell their produce right away even at a low price as the storage and processing of the harvest is related to difficulties.

13.1.3 Factors Impeding Sale

As mentioned above, the sale period of peach is short as its storage is difficult and there are no peach processors in the region. Hence, the farmers have to sell peach through mediators/wholesalers for exporting or selling it locally.

In case of export one of the major impeding factors is the closure of the Russia-Georgia road in Dariali Valley as it halts the peach export. If the bypass road is used, the transportation cost increases significantly and the farmers receive less price for their product. The Russian market poses other threats in addition to the road closure, as the embargo has become a political tool and the country's government can use it anytime.

As there is no processing of the fruit, the peach products are not diversified and the market only receives fresh peach as a fruit.

13.2 Recommendations

In order for the sector to overcome the challenges and develop further, a holistic approach is necessary to strengthen each component of the value chain.

It is necessary to increase the productivity of the existing plantations by improving cultivation practices. In addition, the cultivation of intensive gardens should be encouraged accompanied with the transfer of relevant knowledge. It is desirable to organize demonstration farms; this will enable farmers learn modern approaches. In addition, it is necessary to focus on certain cultivars, in order to receive homogenous produce.

It is also necessary to learn cultivation of high value peach and further cultivate them (bio, from places of origin). It is also important to develop agro touristic infrastructure and offerings in the peach gardens (including during the peach blossom period). This will be a response to the increase of tourist inflow in Georgia of the last years.

The markets should be diversified so that the country does not only depend on Russian market as it is a less predictable market and has high marketing risks. Countries where Georgian peach can be exported should be studied (free trade agreements with various countries or unions of countries should also be take into account). Despite this, the focus should be made on peach processing and supplying the market with processed products. This will on one hand reduce above mentioned export risks and on the other hand will create more value added in the local economy. In certain cases, it will also substitute imported products that contain peach. The focus can also be placed on the export of products made from processed peach.

In order to develop fridge warehouses and peach processing, it is recommended that farmers create cooperatives that focus on storage of peach and working with the exported without the mediator. The processing enterprise can also be established by the cooperative, which will create value added for the farmers. Public-private partnership can be used for this purpose.

In order for the peach sector and its value chain to work effectively, it is necessary to enhance knowledge in modern methods and approaches. In the universities and colleges of the region the courses in peach cultivation should be improved and they should be based on theoretical, as well as practical teaching.

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Appendix

Chart A 1: Peach production in Georgia in 2006-2015 (thousand tons)

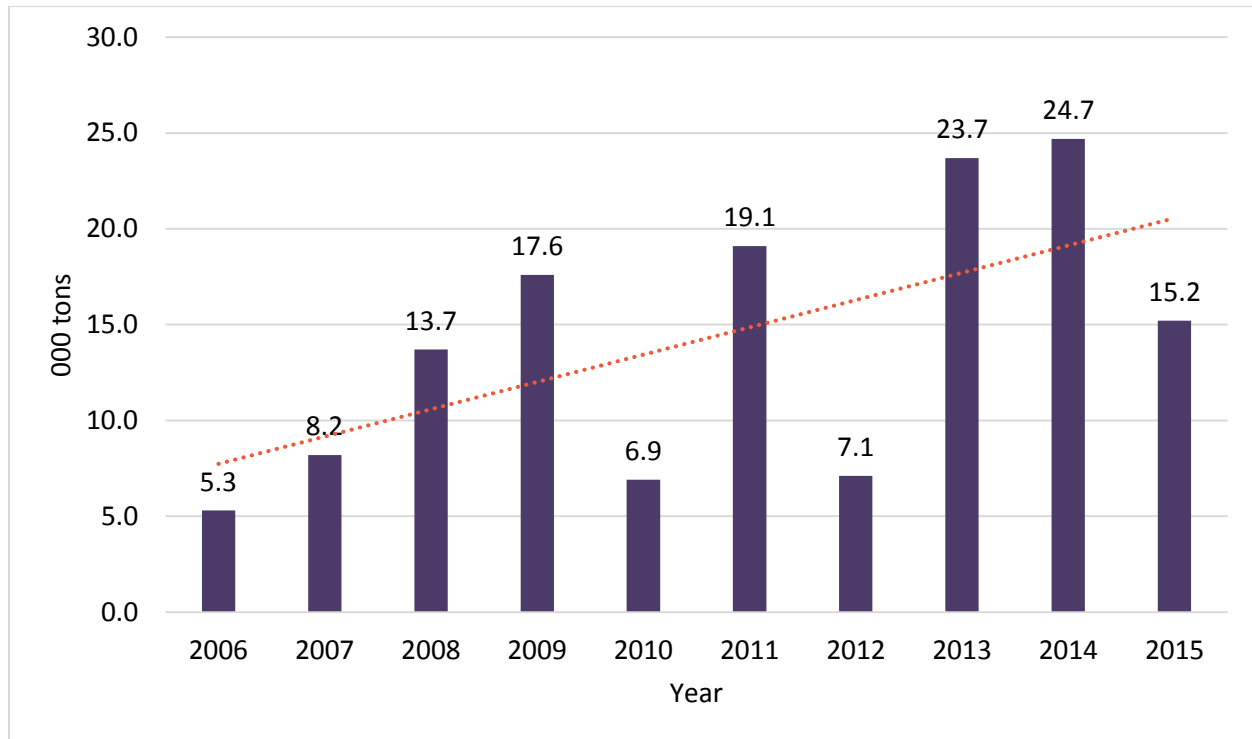


Table A 1: Calculation of economic indicators using sensitive analysis (for extensive gardens that are majority in Kakheti)

#	Indicators	Low Yield (15 t/ha)	Medium Yield (20 t/ha)	High Yield (25 t/ha)
1	Fixed cost (GEL)	3'000	3'000	3'000
2	Variable cost (GEL)	1'740	2'255	2'770
3	Total cost (GEL)	4'740	5'255	5'770
4	Revenues (GEL)	7'500	10'000	12'500
5	Profit (GEL)	2'760	4'745	6'730
6	Profit margin per unit (GEL)	0.18	0.24	0.27
7	Profit margin (%)	37%	47%	54%
8	Break-even point (ton)	7.8	7.7	7.7

9	Sale price per 1 kg	0.50	0.50	0.50
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Table A 2: Calculation of economic indicators using sensitive analysis (for intensive gardens)

#	Indicators	Low Yield (30 t/ha)	Medium Yield (40 t/ha)	High Yield (50 t/ha)
1	Fixed cost (GEL)	6'967	6'967	6'967
2	Variable cost (GEL)	3'285	4'315	5'345
3	Total cost (GEL)	10'252	11'282	12'312
4	Revenues (GEL)	18'000	24'000	30'000
5	Profit (GEL)	7'748	12'718	17'688
6	Profit margin per unit (GEL)	0,26	0,32	0,35
7	Profit margin (%)	43%	53%	59%
8	Break-even point (ton)	14,2	14,1	14,1
9	Sale price per 1 kg	0,60	0,60	0,60

Chart A 2: Wholesale price of peach (Kakhuri Kviteli) in Gurjaani municipality (July-August, 2016)

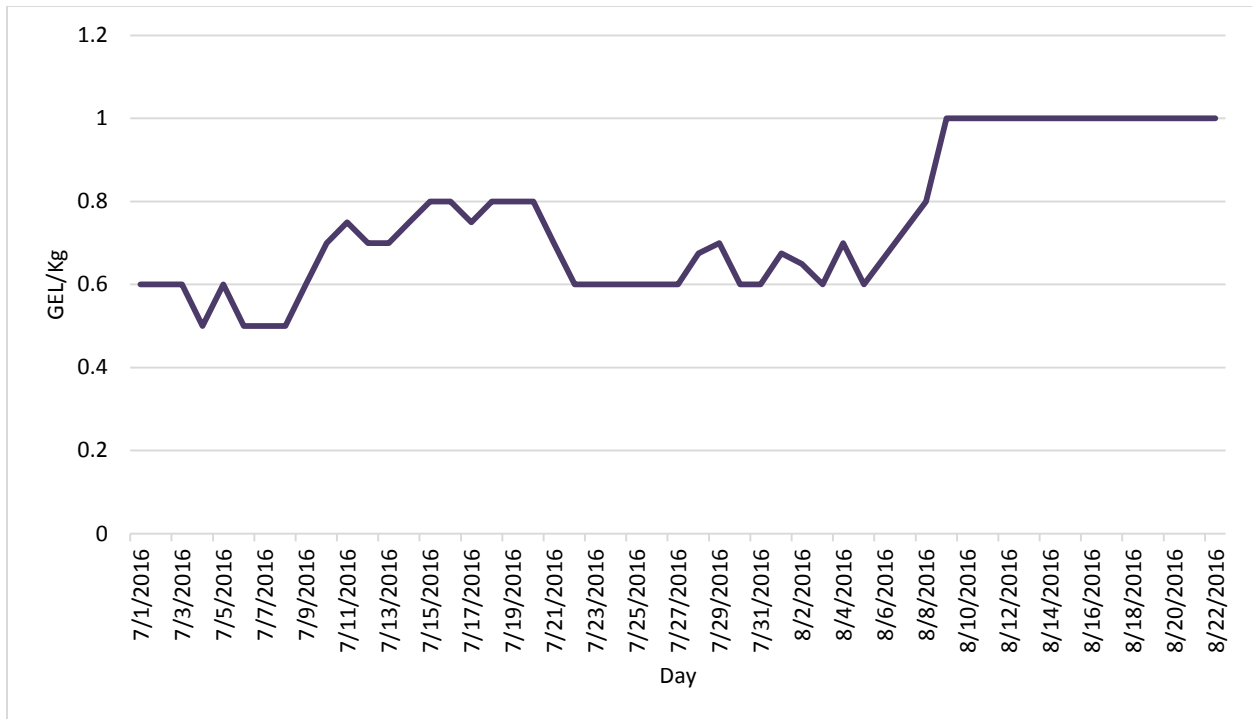


Chart A 3: Average retail price of peach (Kakhuri Kviteli) by regions (July, 2016)

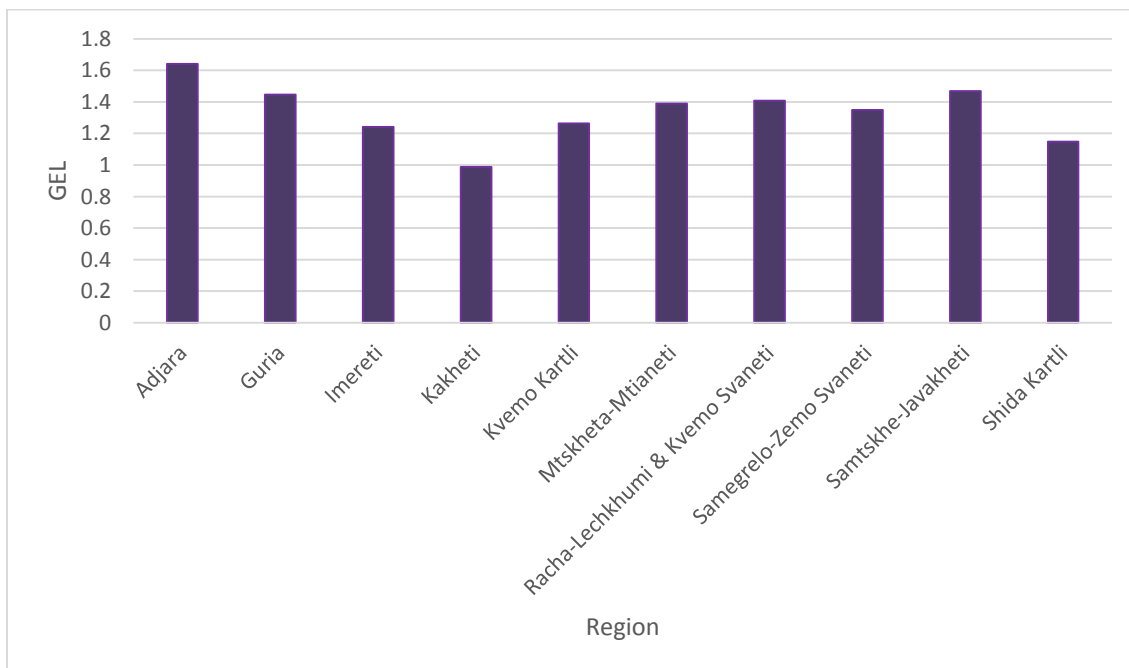


Table A 3: Documents necessary for peach export

The documents necessary to determine the export operation:

1. Invoice or purchase certificate;
2. Transport document: for car transportation – CMR document or TIR (or presents the CMR form, technical passport of the car, and the passport of the driver or the form is filled in at place, the same applies to TIR);
3. The certificate or representation (to be presented voluntarily) – issued by the Revenue Service;
4. Certificate of origin (to be presented voluntarily);
5. Permit for international cargo transportation (not required for Georgia, Armenian and Kazakh cars);
6. Phytosanitary certificate (to be presented voluntarily).

The following documents should be presented for issuing the certificate of place of origin:

- a) An application (should contain the name of the product including its 11 digit product code, amount of the product, names of the exporter and importer, address and the country);
- b) Declaration on the ownership and criteria of the product in compliance with the #4 annex of #420 regulation dated 29 December, 2010 issued by the Government of Georgia;
- c) Contract (agreement);
- d) Invoice;
- e) Certificate of representation (in case of trustee);
- f) The act on purchase of product (to be presented voluntarily).

Source: Gurjaani peach export support office. July 2016.

Table A 4: Calculation of investment for peach garden in Kakheti region²

Cultivation of peach gardens is recommended in the areas that are provided with irrigation water. It is important to process the land between the rows in the first and second years of the garden cultivation, hence, it is useful to install drop irrigation system later, so that the land between the bottoms of the seedlings can be processed by machine easily.

Assumptions of the table 5:

- Number of peach seedlings: - 400 plants/ha (with distance of 5X5).
- Harvest period – third year after planting;
- Full harvest period: - 6th and 7th year;
- Average yield per hectare on full harvest – 20 tons/ha.

Cost of cultivating peach gardens and the harvest (by production years)

Revenues		Year III	Year IV	Year V	Year VI	Year VII
Number of peach plants	plant/ha	800	800	800	800	800
Peach harvest	kg/plant	6.0	15.0	35.0	45.0	50.0
Peach harvest	kg/ha	5,000	12,000	28,000	36,000	40,000
Peach sale price (average)	GEL/kg	0.40	0.40	0.40	0.40	0.40
Total revenues	GEL/kg	960	2,400	5,600	7,200	8,000
Costs						
Costs	GEL/ha	1,800	2,300	3,100	3,600	4,000
Share of costs in the revenues	%	188%	96%	55%	50%	50%

The table below shows the costs of the peach garden cultivation and caring of the plants during one years.

² Source: S. Gongladze Economic Calculations, Cultivation of Bulb Onion, Peach and Walnut, 2016.

Peach garden cultivation costs

Expenses							GEL/ha	
Preparation of the soil								
Cleaning the land (with machine)	1.0	- time	x	100.00	GEL	=	100	
Cleaning the land (by workers)	8.0	worker/day	x	25.00	GEL	=	200	
Ploughing the soil (საპლანტაჟე გუთნით)	1.0	- time	x	550.00	GEL	=	550	
Processing the soil (მძ. დისკ. ფარცხით)	1.0	- time	x	85.00	GEL	=	85	
Purchase of the mineral fertilizers (NPK)	300.0	kg/ha	x	0.90	GEL/kg	=	270	
Apply the fertilizers with a spray (NPK)	1.0	- time	x	13.00	GEL	=	13	
ხნულის ფრეზირება (ჰორიზ. ფრეზით)	1.0	- time	x	130.00	GEL	=	130	
Planting the seedling								
Planning	6.0	worker/day	x	20.00	GEL	=	120	
Purchase of the seedlings	400.0	units	x	5.00	GEL/unit	=	2,000	
Preparation of the pits	8.0	worker/day	x	25.00	GEL	=	200	
Planting the seedlings	6.0	worker/day	x	25.00	GEL	=	150	
Individual supports for the seedlings	400.0	units	x	0.20	GEL/unit	=	80	
Putting individual supports for the seedlings	4.0	worker/day	x	20.00	GEL	=	80	
Rubber rope (100m)	2.0	units	x	20.00	GEL/unit	=	40	
Irrigation (with pump)	12.0	liters	x	1.80	GEL/L	=	22	
Irrigation (manually)	1.0	worker/day	x	20.00	GEL	=	20	
Taking care of the seedling								
Purchase of ammonia nitre	300.0	KG/ha	x	0.90	GEL/kg	=	270	
Apply the ammonia nitre	2.0	worker/day		20.00	GEL	=	40	
Ploughing the seedlings	6.0	worker/day		25.00	GEL	=	150	
Processing the soil between the rows (plough)	3.0	- times		110.00	GEL	=	330	
Apply the herbicides	1.0	worker/day		20.00	GEL	=	20	
Cost of herbicides	2.0	liters		20.00	GEL/l	=	40	
Apply the fungicides	2.0	- times		20.00	GEL	=	40	
Cost of fungicides	4.0	KG/ha		35.00	GEL/kg	=	140	
Irrigation (with pump)	60.0	liters	x	1.80	GEL/l	=	108	
Irrigation (manually)	5.0	worker/day		25.00	GEL	=	125	
Pruning the plants	2.0	worker/day		25.00	GEL	=	50	
Irrigation system								
Drop irrigation system	1.0	units	x	4,500.00	GEL	=	4,500	
Installation (workers)	12.0	worker/day	x	25.00	GEL	=	300	
Unforeseeable expenses								
of garden cultivation cost	3%							305
Other expenses								
Irrigation water fee							70	
Land tax							87	
Total costs							10,635	