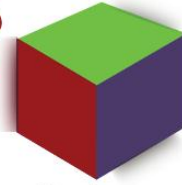




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# The Onion Value Chain Analysis in Samtskhe-Javakheti Region of Georgia

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 Samtskhe-Javakheti 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.

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## 1. Introduction

Agriculture plays an important role in the economy of Georgia. Development of agriculture is especially significant for the development of the regions, where the majority of the population is employed in the sector.

The goal of this research is to analyze the value chain of onion in the Samtskhe-Javakheti region. This implies a detailed study of the sector and determining of its future perspectives.

Georgia has a favorable soil and climate for onion production. Clearly, it is impossible to produce onion in large amounts in every region, however, in the majority of the regions, onion production, including for self-consumption purposes, is becoming increasingly popular. Onions produced in Georgia are quite resistant to various diseases and has good taste characteristics.

In Samtskhe-Javakheti region, main plants cultivated are potatoes, grain and vegetables. Potato has a special significance for the region, as Samtskhe-Javakheti is the largest producer of potato. Currently, onion production is not widespread in the region, however, the size of the land used for onion cultivation increases every year.

## 2. Brief Overview of the Sector

Onion is an ancient plant that was already known as far back as 4 thousand years ago. Near east and Middle East are considered the homeland of onion, from where it gradually spread in the rest of the world. Onion is biennial or perennial plant and is used in raw as well as processed form.

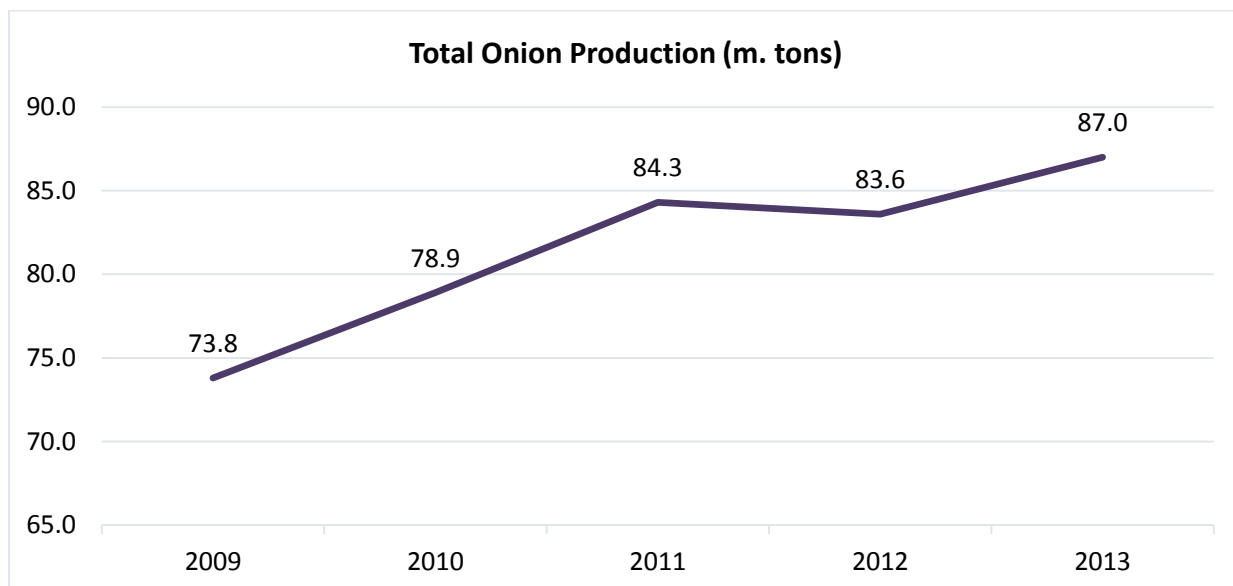
Due to its composition, onion has many health properties. It is rich in iron, potassium, calcium, magnesium, fluorine, and other minerals and vitamins. It also belongs to the group of antioxidants. (Research and Development Centre of Georgia's Agriculture, 2015).

Onion can be in fact cultivated on any type of soil. It is frost resistant and does not require much irrigation. (Research and Development Centre of Georgia's Agriculture, 2015).

### 2.1 Onion Sector in the World

According to the Food and Agriculture Organization (FAO), in 2013 total world production of onion reached 87m tons, exceeding the production volume of the previous years.

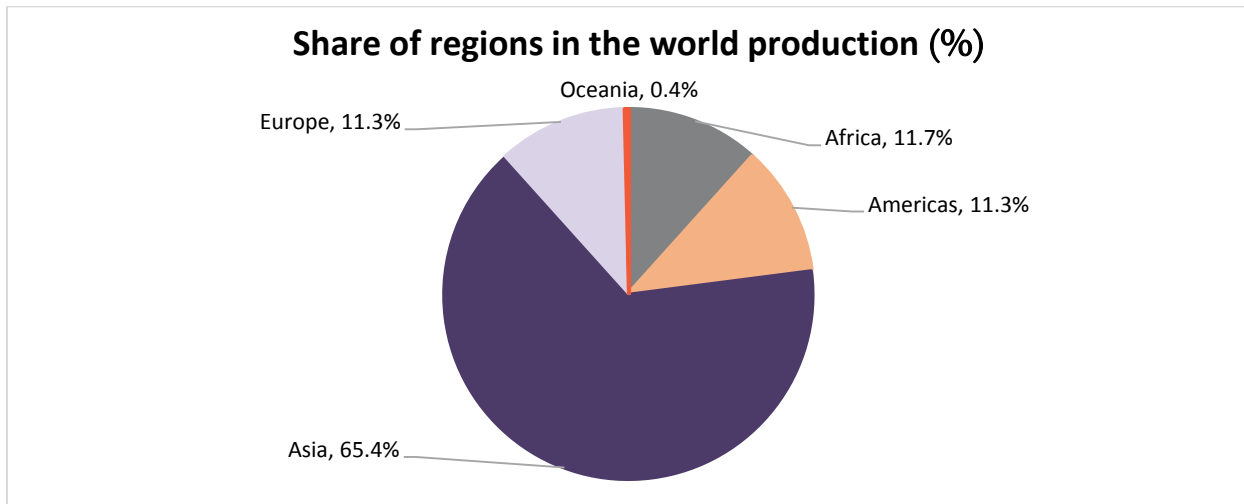
**Chart 1. Total onion production in the world, 2009-2013 years**



Source: Food and Agriculture Organization, 2016.

According to the average data of 2010 – 2014 yrs., major producers of onion are: China (22m tons), India (17m tons), US (3m tons), Iran (2 m tons) and Egypt (2 m tons). Production breakdown according to the regions is presented below:

**Chart 2. Onion production breakdown according to the regions of the world, average of 2010-2014 yrs.**



Source: Food and Agriculture Organization, 2016

In terms of productivity, the following countries received the highest yields:

**Table 1. Average yields in 2010-2014 (ton/ha)**

Country	Tons/Ha
Ireland	71.0
South Korea	69.3
US	60.8
Australia	60.8
Austria	57.6

Source: Food and Agriculture Organization, 2016

The largest producer of onion seeds is Sri Lanka.

**Table 2. Main onion importer and exporter countries in 2015 (by volume).**

Importer Countries	Exporter Countries
Malaysia	Holland
US	India
Great Britain	China
Saudi Arabia	Egypt
Japan	Mexico

Source: ITC – Trade Map

## 2.2 Onion Sector in Georgia

Onion is produced in almost every region in Georgia.

**Table 3. Onion production in Georgia (thousand tons)**

	2010	2011	2012	2013	2014	2015
Production (thousand tons)	19.0	14.6	17.8	17.0	18.1	12.7

Source: Geostat, 2016

The major onion producer regions are: Kvemo Kartli (70%), Shida Kartli (15%), and Kakheti (10%).

Every year more and more farmers grow onion in Samtskhe-Javakheti. In 2014 onion was planted on 230 ha of land, while in 2015 the land occupied by onion in the whole region reached 252 ha.



### 3. The Aim of the Research

The major goal of the research is to analyze onion value chain in Samtskhe-Javakheti by involving the students and professors in the study.

The objective of the analysis is to:

- Study the onion production process
- Identify participants of the onion value chain
- Reveal links between the participants
- Analyze costs and margins
- Determine employment opportunities
- Evaluate total revenues (including revenues from other activities) of the value chain participants.

The major goal of the analysis is to explore potential of the onion production in order to eventually maximize the value-added created along the chain.

## 4. Methodology

Major methods used in the research are:

- Desk research: analysis of the articles, reports, statistical data and etc.
- Field work: face-to-face interviews and focus groups with the suppliers of raw material, onion producers (individual farmers and representatives of cooperatives), mediators, consumers, representatives of public and nongovernmental organizations, and independent professionals.

18 face-to-face interviews and 4 focus groups were carried out in total.

Following qualitative tools for analyzing the value chain were used in the research:

- Defining priorities for selecting the value chain;
- Reflecting value chain;
- Analysis of management, coordination and control, which implies analyzing those formal and informal institutions, regulations and standards that are related to the onion sector;
- Analysis of links and trusts, implies analysis of formal and informal agreements between the value chain participants;
- Analysis of the chain modernization possibilities.

In addition, the following quantitative tools were used:

- Analysis of costs and value-added – determining the amount of value added created by each participant at every stage of the value chain;
- Analysis of revenue allocation along the value chain, implies determining of the total revenues received by the participants from various activities;
- Determining employment opportunities along the value chain.

Three professors and three students from Samtskhe-Javakheti State University were actively involved in the research. The professors carried out desk research, while the students carried out face-to-face interviews and focus groups.

### **Desk Research**

Desk research mainly involved analysis of the existing literature (reports, articles, and statistical data) and was carried out by the professors from Samtskhe-Javakheti State University.

### **Field work**

In February 2016 at the working meeting held in Samtskhe-Javakheti State University a decision was made to analyze value chain in onion case. 35 people attended the meeting, including representatives of the University, farmers, representatives of cooperatives, members of local government, and private sector representatives.

The participants used following criteria to select the plant for research:

- Export potential of the plant;
- Import substitution potential;
- Innovative approaches;
- Necessity for diversification;
- Relevancy of the plant for Samtskhe, as well as for Javakheti;

- Climate conditions of the region;
- Agricultural traditions of the region;
- Conditions of storage, warehousing, and etc.

After the research topic was selected, face-to-face interviews were carried out with the onion producer farmers, and representatives of Ministry of Agriculture, international organizations and educational institutions. 12 interviews were carried out at the initial stage.

Focus groups with farmers were carried out in June 2016. Four interviews were carried out in total, three - in Samtskhe, and one – in Javakheti. In terms of gender, two focus groups were mixed, third consisted only of women and fourth – of men.

At the last stage of the research, 6 additional face-to-face interviews were carried out.

## 5. Research Constraints

The research has several constraints:

- The small number of interviews and focus groups carried out the cause of the constraint is that in the region onion is mainly used for self-consumption and is cultivated on small areas of land;
- The results of the research is more relevant to Samtskhe due to the product selected and at this stage it might not fully include Javakheti, as onion is not actively cultivated in Javakheti due to climate conditions.

## 6. Scope of the Research

### 6.1 Brief Description of Onion Producing Regions

Georgia's soil and climate are favorable for onion production. Onion produced in Georgia is quite resistant to diseases and has good taste characteristics. In addition, different varieties of onion can easily adapt to Georgia's soil and climate.

In Georgia, onion is mainly produced in Kvemo Kartli (70%), Shida Kartli (15%), and Kakheti (10%).

#### **Kvemo Kartli**

Agriculture plays important role in the development of the Kvemo Kartli Region. The climate conditions of the region allows to take harvest 2-3 times a year, giving a region a strong competitive advantage compared to other regions. (Development Strategy of Kvemo Kartli Region for 2014-2021 years.)

In the region mainly small farmers, who sell their produce on local market, are engaged in planting. In the lower and middle zone mainly vegetables, potato, grain, fruit, grapes and garden plants are produced. As for the upper zone, the major share comes on potato and grain production. (Development Strategy of Kvemo Kartli Region for 2014-2021 years.)

#### **Shida Kartli**

Shida Kartli is especially famous for fruit production. It is number 1 in the country in terms of production of different fruit varieties. For years Shida Kartli has been steadily holding the leading position in the production of such fruits as apple, plum and cherries. (Development Strategy of Shida Kartli Region for 2014-2021 years.)

In addition to fruit, vegetables are actively produced in the region. Shida Kartli is number three after Kvemo Kartli and Kakheti in terms of vegetable production. The vegetables produced in the region are potatoes, beetroot, cabbage, carrot, onion, eggplant and etc.

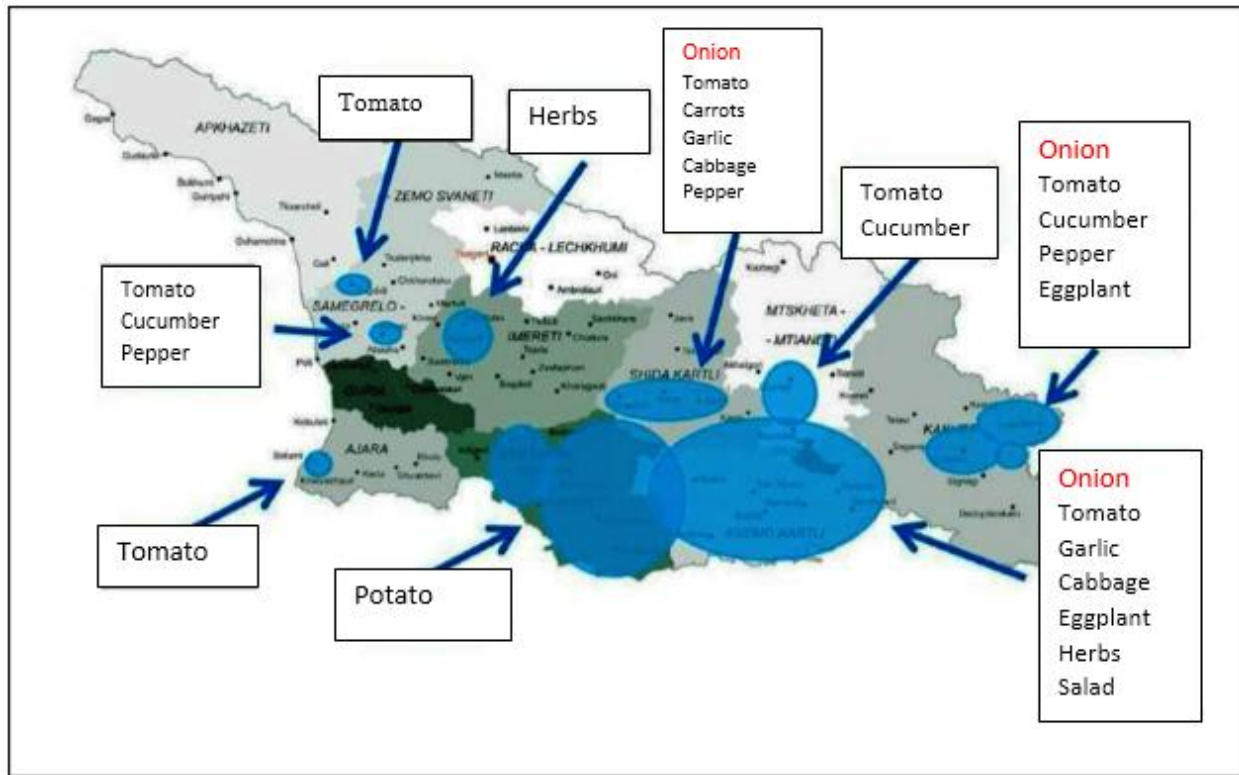
Climate conditions and fertile soil of the region create a strong potential for agricultural development of the region. In addition, Kvemo Kartli has big arable lands, which also contributes to the development of the agriculture in the region. (Development Strategy of Shida Kartli Region for 2014-2021 years.).

#### **Kakheti**

Kakheti is the oldest wine making and vine growing region, where almost 70% of the country's vineyards are concentrated. Grain production is also a significant part of agriculture in Kakheti. The region is the number one wheat producer in the country.

Kakheti is also a leader in production of garden plants (strawberries, watermelon, melon and pumpkin). These are high-income yielding plants, which indicates regions potential. (Development Strategy of Kakheti Region for 2014-2021 years.)

Picture 1. Onion production zones and regions in Georgia



It should be noted that at this stage, onion is not a major plant for production in any of the above discussed regions.

## 6.2 Samtskhe-Javakheti

Samtskhe-Javakheti region, which is a research area of this study, consists of six municipalities and borders Turkey and Armenia; such location contributes to the development of trade relationships between the countries.

Picture 2. Map of Georgia



Source: Wikipedia

According to the 2014 Census, the region is mainly populated by ethnic Armenians (49.5%), the rest of the population consists of Georgians (48.5%), Russians (1.1%), and other ethnic groups (0.9%).

Picture 3. Map of Samtskhe-Javakheti region



Source: Wikipedia

The region strongly depends on agriculture; 32% of the value-added created in the region in 2006-2011 years comes on agriculture. The majority of the producers are small households, who produce 90% of the total agricultural output. 73% of these households produce for self-consumption, the remaining 27% are commercial households whose main source of income is agriculture. The region has a high level of commercialization compared to other regions. Productivity in animal husbandry and planting is also higher than the country average. (Development Strategy of Samtskhe-Javakheti Region for 2014-2024 years.)

Planting mainly includes potatoes, grain and vegetables. The region is the largest potato producer in Georgia.

**Table 4. Samtskhe-Javakheti's share in total production of perennial plants in Georgia.**

	<i>Potato</i>	<i>Vegetables</i>	<i>Barley</i>
<i>Production volume (thousand ton)</i>	115.3	16.9	14.4
<i>% share in country's total production</i>	53.3	8.9	45.7

Source: National Statistics Office of Georgia, 2014

Animal husbandry is also important for the region. Live-stock of Samtskhe-Javakheti represent 9-14% of total livestock in Georgia. Apiculture and sheep-breeding is also developed in the region.

**Table 5. Animal husbandry in Samtskhe-Javakheti.**

	<i>Cattle</i>	<i>Sheep</i>	<i>Bee</i>
<i>Livestock (thousand heads)</i>	156.7	80.5	38.4
<i>% share in country's total livestock</i>	12.3	9.3	9.5

Source: National Statistics Office of Georgia, 2014

One of the factors that hamper development of agriculture is the short vegetative season due to the climate conditions. In addition, the region lacks modern infrastructure, agriculture is mainly extensive, production technologies - outdated. There is also a lack of qualified workforce and limited access to finances. (Development Strategy of Samtskhe-Javakheti Region for 2014-2024 years.)

At the same time, the region has advantages, which could transform the agriculture in one of the promising fields. These advantages are: geographic location of the region, richness in natural resources, ancient tradition of agriculture and existence of educational institutions in the region. One of such educational institutions is Samtskhe-Javakheti State University, founded in 1990, which offers students bachelor, master and doctoral programs. (Development Strategy of Samtskhe-Javakheti Region for 2014-2024 years.)

Similar to the other regions, modern research methods are not widely used in Samtskhe-Javakheti either. The number of students in the educational institutions is decreasing due to various social and economic problems (e.g. migration). According to the results of the Unified National Exams the students from Samtskhe-Javakheti get lower results compared to the students from other regions. The teaching programs are outdated and do not meet the demands of modern labor market. Involvement of professors and students from the local university will support the introduction and usage of modern research methods in the learning process.



## 7. Analysis of Georgia's Onion Sector

### 7.1 Onion Production in Georgia

In Georgia onion is cultivated using two methods: sowing the onion seeds directly in the soil, and planting onion bulbs. Cultivating the onion by sowing the seeds is an intensive method, whereas bulb planting is an extensive method. The first method is more widespread all over Georgia, however, in western Georgia, the second, bulb planting method is more traditional.

The usage of this method in western Georgia was caused by climate conditions. As the start of the autumn is characterized with heavy precipitation, the onion cannot reach maturity and get mildew disease if the seed planting method is used. The bulbs are more resistant to bad weather conditions and eventually, harvest starts earlier. Hence, bulb planting is more popular in western Georgia (newspaper Agromani).

Bulb-planting (rush-planting) of onion is a two-stage process. The first year onion seed is sown and rush is received. The rush is further kept during the winter and is planted in early spring to receive the final product (edible onion) (source: newspaper Agromani). The bulbs (rush) can be directly purchased and after planted. However, it is very difficult to find homogeneous, high quality rush.

As for the eastern Georgia, in this part the onion is planted in late autumn, winter or early spring, directly in the open soil. The soil is processed before sowing, it is tilled, cultivated and harrowed. Newspaper Agromani). Because of heavy precipitation, the onion does not need irrigation in the west, while in the east irrigation is necessary. The frequency of irrigation depends on the region. For example, in Shida Kartli, onion needs to be irrigated 3-4 times. In Kvemo Kartli, Kakheti and Tbilisi peripheral zone, onion lands need to be irrigated more frequently, 6-10 times. Irrigation is finished 3-4 weeks before the harvest, so that bulb maturing is not hampered and its storage ability is not adversely impacted. Irrigation methods used can be surface irrigation or drip irrigation. (Newspaper Agromani).

Harvest is taken in dry weather. Onions collected are placed on the land for several days, cleaned of roots. After this step the harvest is taken to the warehouse and stored. Depending on the varieties and the regions, the harvest period is from July 15 to September 15. (Newspaper Agromani).

#### **Favorable conditions for onion cultivation**

The optimal conditions for onion cultivation are the following:

- Air temperature 15-25 degrees Celsius
- Low relative humidity of air (60-70%)
- High humidity of soil
- High intensity of light
- Land free of weeds
- Use of mineral fertilizers
- Best predecessors: cabbage-like plants, cucumber, tomato, potato, legumes.

As it was mentioned above, the optimal temperature for onion cultivation is 15-25 degrees Celsius. One of the strengths of onion is that a grown plant can survive in up to -7 degree frost. At the early stage of growth, the plant is not damaged up to -2-3 degrees of frost, however -4-5 degrees damage the leaves. Onion is also resistant to heat and can survive in more than 35 degree Celsius. (Newspaper Agromani.)

Low air humidity (60-70%) and high soil humidity are favorable for onion. When the soil humidity is low, the seed sprouts slowly, the plant itself is weak and the harvest is relatively small. It is important that the

land is rich in humus, acidic soil cannot be used for onion. Onions do not require putting big amount of fertilizers in the soil, however, fertilizers are still necessary. For example, per each ha of the land 30-40 tons of animal manure and mineral fertilizers. In the first period of growth the onion especially requires nitrogen and potassium, when the bulbs are formed, it needs potassium and phosphorus, which speed up the maturing of the bulbs and improve their storage ability. The fertilizers should not be put deeply in the soil as the roots of the onion are located in the upper layers of the soil. (Newspaper Agromani).

Onion needs high intensity of light, especially in the beginning, during sowing. It is also important that the land is free of weeds. Onion is weak in fight with weeds, hence it should be planted in the light, non-shady land free of weeds. In the unfavorable conditions (drought, lack of nutrients in the soil, land covered with weeds) the growth of the plant is impeded and the bulbs are prematurely formed. (Newspaper Agromani). If the leaves are not formed on the plant and the bulbs start forming, the process cannot be terminated. For this reason it is very important to strictly follow the onion cultivation conditions, especially during the initial development stage in the first 70-80 days. (Newspaper Agromani).

As for the seed rotation, the best predecessors for onion are: cabbage like plants, cucumber, tomato, potato, legumes. Onion should not be planted on the same soil consecutively as this will damage the onion. The onion can return to the same soil 2-3 years after.

Onion itself is the best predecessor for other plants except garlic as they have the same pests and diseases.

## 7.2 Onion varieties and species

There are following onion varieties based on its color:

- Red
- White
- Dark yellow
- Light yellow

There are following varieties according to the bulbs of the onion:

- One -bulb onion (one, rarely two bulbs)
- Average onion (two to four bulbs)
- Aggregatum onion (more than five bulbs)

The production conditions as well as the size of the rush influence the bulb of the onion. The bigger the rush, the more bulbs the onion will have. It is negatively affected by the low fertility and low humidity of soil.

There are following varieties of onion according to its taste:

- Pungent
- Semi-pungent
- Sweet

Pungent varieties contain high amount of ethers and sugar, and are stored well.

The information about the onion varieties is given in the table below. The more detailed data is given in the table of Annex A1.

**Table 6. Onion Species**

Name	Origin	Characteristics
<b>Kartli Onion – Allium cepa 'Kartlis'</b>	Shida Kartli Region. Assigned to the region since 1962.	Average late harvest species. Vegetative period 110-120 days. High yield under irrigation (20 t/ha). Semi-pungent, quite resistant to pests and diseases.
<b>Skhvilisi Onion – Allium cepa 'Skhvilisis Khakvi'</b>	Samtskhe-Javakheti region, Akhaltsikhe. Assigned to the region since 1947.	Vegetative period - 80 days. Is cultivated in mountainous, cool region. Can be stored for a long period. Is semi-pungent. Quite resistant to pests and disease  Skhvilisis Khakhvi is widespread aboriginal species of Akhaltsikhe region. It is cultivated in other regions of Georgia too. This onion is also known under the names "Suphლისისა" and "Akhaltsikhის".
<b>Marneuli multi- bulb onion – Allium cepa 'Marneulis Mravalbolkvian i'</b>	Kvemo Kartli region, Marneuli. Is cultivated in the irrigated zone of Kvemo Kartli, mainly in Marneuli and Gardabani.	Late harvest species, requires long and warm days for maturing the bulb. Very pungent. Can be stored for long periods, is quite resistant to fungal diseases.
<b>Lizi – Allium cepa 'Lizi'</b>	Mtskheta-Mtianeti region, Tserovani. Registered in 2012.	Average-late harvest species. Vegetative period - 100-105 days. Semi pungent. Resistant to pests and diseases. The yield of bulb on high agrophone in the irrigation zone is 30-40 tons per ha.
<b>Kakhuri Flat - Allium cepa ' Kakhuri Brtkeli'</b>	Kakheti region. Assigned to the region since 1962.	Early harvest species. Vegetative period 80-85 days. Yields 19-20 tons per ha. Quite resistant to pests and diseases. The sweetest onion among the species cultivated in Georgia.

<b>Pink 32- Allium cepa ‘ Vardisperi 32’</b>	Kvemo Kartli region, Gardabani. Registered in 2012 for cultivation in Kvemo Kartli and Mtskheta regions.	Late harvest species. Vegetative period 130-135 days. Is stored well. Semi-pungent. In irrigation conditions, on high agrophone, the yield of the bulb is 27-29 tons per ha. Quite resistant to pests and diseases.
<b>Vani onion – Allium cepa ‘ Vanis Khakvi’</b>	Imereti region. Vani. Cultivated in Vani and the rest of the Imereti regions. Also, in warm regions of Kakheti.	Average early species. Delivers high yield and has highest quality bulb. Belongs to semi-sweet onion group. Has average storage capacity, and is resistant to fungal diseases and pests.

It should be noted that at this stage Geostat does not have information on how much onion is produced in Samtskhe-Javakheti region. For this reason, the data used in this study are the newest fresh data from Samtskhe-Javakheti information and consultation centre.

**Table 7. Onion harvest, lands and yield per 1 ha, Samtskhe-Javakheti region, 2015**

#	Municipality	Onion harvest, lands and yield per ha in 2016 in Samtskhe-Javakheti		
		Land (ha)	Harvest (tons)	Average yield per ha (tons)
1	Akhaltzikhe	117.00	1872.00	16.00
2	Aspindza	46.00	915.00	19.89
3	Akhalkalaki	1.20	46.50	38.75
4	Adigeni	60.00	1392.50	23.21
5	Borjomi	12.20	157.00	12.87
6	Administrative unit of Eliatsminda	16.10	43.30	2.69
<b>Total</b>		<b>252.50</b>	<b>4426.30</b>	<b>17.53</b>

Source: Samtskhe-Javakheti information and consultation center.

It can be seen from the table above that in 2015 the leader of region in onion production was Akhaltzikhe municipality and Adigeni followed it with minor difference. However, Akhalkalaki municipality had the highest yield per ha.

As for the 2016 data, Akhaltzikhe is still the leader in terms of lands with onions (119 ha), however, the share of onion lands in the total cultivated lands is quite low, 0.71%.

**Table 8. Cultivated lands, Samtskhe-Javakheti region, as of July 1, 2016**

Lands cultivated in spring 2016 (ha), as of July 1 (ha)	

#	Municipality	Total (ha)	Onion (ha)	Share in total cultivated land (ha)
1	Akhaltzikhe	5539.0	119.0	2.15%
2	Akhalkalaki	17683.0	2.0	0.01%
3	Aspindza	2084.0	43.0	2.06%
4	Borjomi	1166.1	13.2	1.13%
5	Adigeni	3300.0	65.0	1.97%
6	Ninotsminda	9182.0	34.0	0.37%
	<b>Total</b>	<b>38954.1</b>	<b>276.2</b>	<b>0.71%</b>

Source: Samtskhe-Javakheti information and consultation center

The table below presents forecasted onion harvest.

**Table 9. Forecasted onion harvest (tons) Samtskhe-Javakheti region, as of July 1, 2016.**

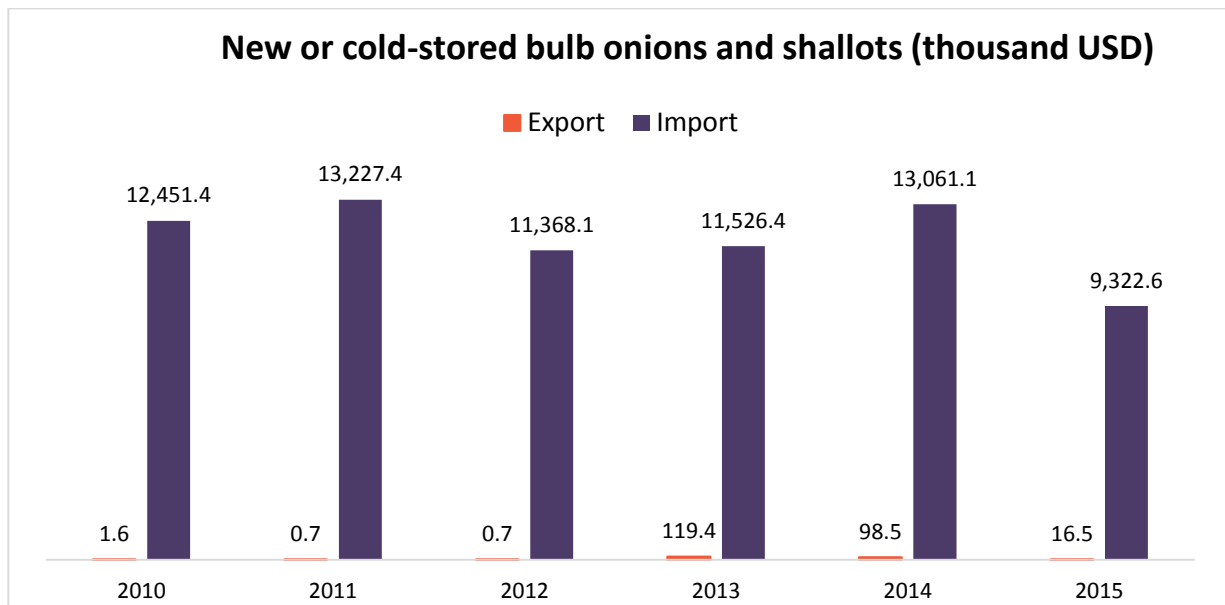
#	Municipality	Forecasted onion harvest (tons)
1	Akhaltzikhe	2023.0
2	Akhalkalaki	40.0
3	Aspindza	1075.0
4	Borjomi	144.1
5	Adigeni	1950.0
6	Ninotsminda	678.0
	<b>Total</b>	<b>5910.1</b>

Source: Samtskhe-Javakheti information and consultation centre

### 7.3 Export and Import of Onion

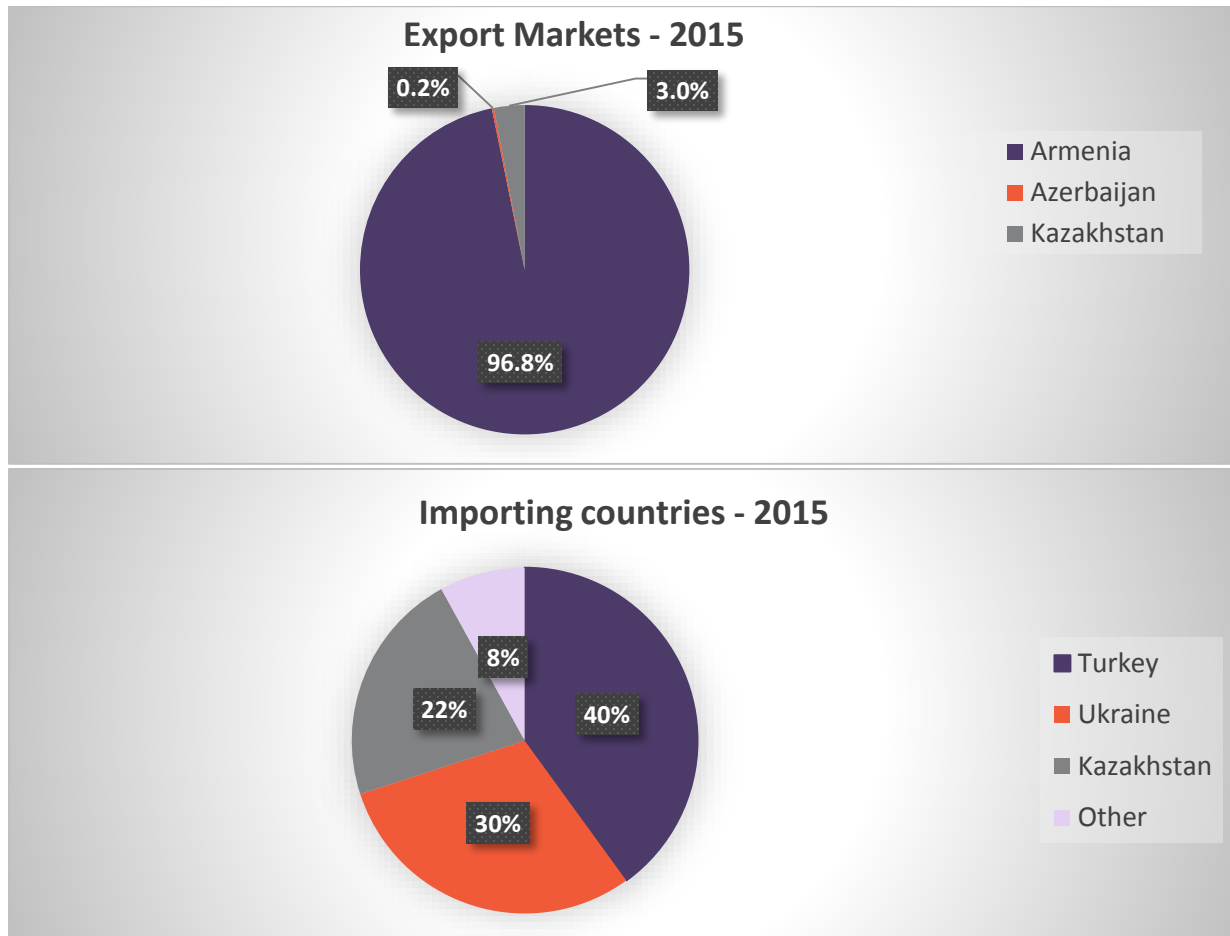
Georgia is an import-dependent country, which is confirmed by its low self-sustainability coefficient and high volume of import. Similar to other food products, onion import exceeds by far its export.

**Chart 3. Import and Export of new or cold-stored bulb onions and shallots, thousand dollars, 2010-2016 yrs.**



Source: Geostat

**Chart 4. Export markets for onions and import countries, 2015**



Source: Geostat

Georgia’s export market is not well-diversified and mainly includes post-soviet countries. The same is not true of the import markets, which are quite diverse. However, despite this diversity, the onion is mainly imported from turkey.

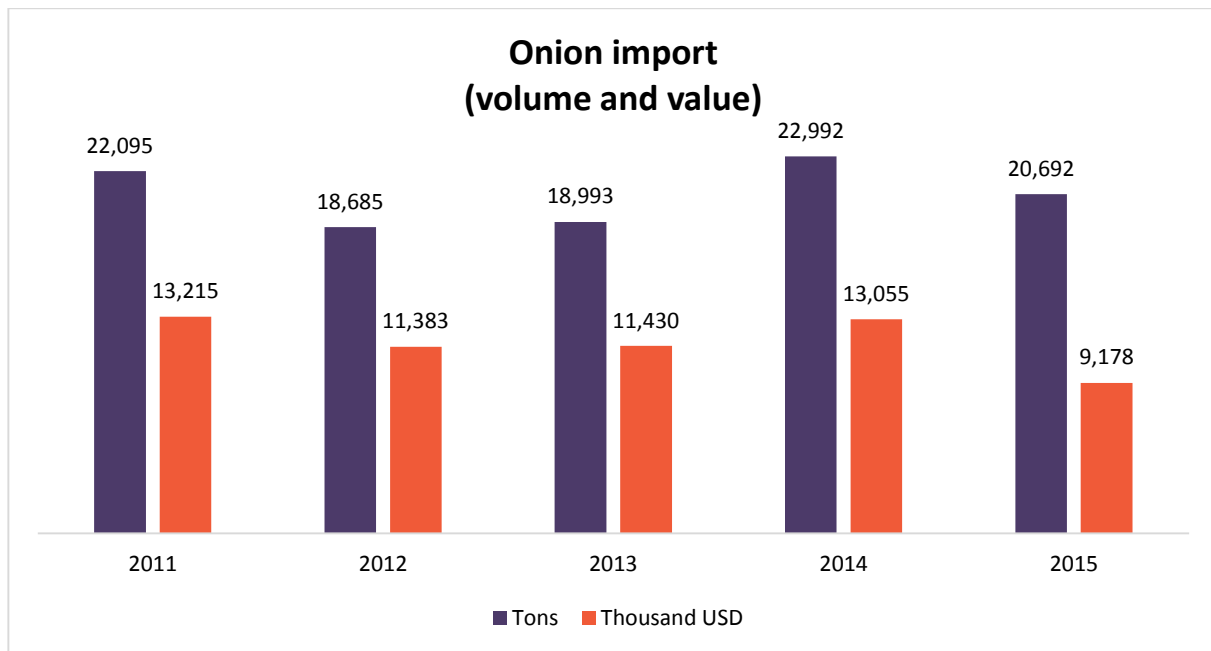
**Table 1. Export markets for Georgian onion and import countries, 2014-2015 yrs.**

Export Markets, 2014-2015 yrs.	Import Countries, 2014-2015 yrs.
<ul style="list-style-type: none"> <li>● Azerbaijan</li> <li>● Armenia</li> <li>● Belarus</li> <li>● Kazakhstan</li> <li>● Malta</li> </ul>	<ul style="list-style-type: none"> <li>● Iran</li> <li>● Italy</li> <li>● Kazakhstan</li> <li>● Kenia</li> <li>● Luxemburg</li> <li>● Moldova</li> <li>● Netherlands</li> <li>● Russia</li> <li>● Turkey</li> <li>● Ukraine</li> <li>● Egypt</li> </ul>

Source: Geostat

As import of onion highly exceeds its export, it is interesting to see import dynamics year by year.

**Chart 5. Volume and value of imported onion, 2011-2015 yrs.**



Source: ITC – Trade Map

It is notable that in 2015 both, volume and value of the imported onion decreased compared to 2014. However, the given data show no trend of growth or decline.



## 8. The results of the Research

### 8.1 Participants of the Onion Sector Value Chain in Samtskhe-Javakheti

The main participants of onion value chain can be divided into the following main groups:

- **Suppliers of seeds, plant protection means, fertilizers, and etc.**

This group includes Agro Shops that are available in every municipality. In these shops, in addition to the necessary products, the farmers receive free consultations about onion cultivation.

One of the most distinguished player in the region is Information Consultation Service RAS, which is also one of the largest onion producers in the region.

Agro shops are mainly local and of a small scale.

- **Small farmers, who produce onion for self-consumption.**

The majority of the region's onion producers belong to this group. Almost each household has planted onion for self-consumption. The majority of the interviewed said that they do not cultivate onion for commercial purposes. The majority of the families cultivate onion on 0.1 ha and have to buy onion in the market in winter. For self-consumption, onion is frequently cultivated on 0.1 ha, and on 0.2-0.3 ha on average. For example, according to the Information Consultation Centre, onion was cultivated on the total of 1 ha in village Tkemlana, the same happened in village Skhvilisi.

- **Medium and large commercial farmers.**

Despite that majority of farmers are small-scale households, there are several large producers in the region, who cultivate onion for further sale. This category cultivates onion on 0.5-1.5 ha of land. The respondents also included such producers who cultivate onion on 2.5-3.5 ha and sell it locally.

- **Middlemen**

Middlemen are the main distribution channel for onion. The majority of the producers sell onion through middlemen. One middlemen can purchase 5 tons of onion from one producer a day on average. However, there are farmers who sell their produce in the market themselves, without any mediator.

- **Retailers in the markets**

Retailers sell onion in the markets of various cities. They usually deal with middlemen. Sometimes producers themselves act as retailers when they sell onions at the market.

- **Supermarkets**

One other distribution channel of onion are Supermarkets. None of the respondents had relation with the supermarket at this stage. As they say, the supermarkets do not offer them acceptable terms and for this reason the farmers prefer to sell their product to middlemen.

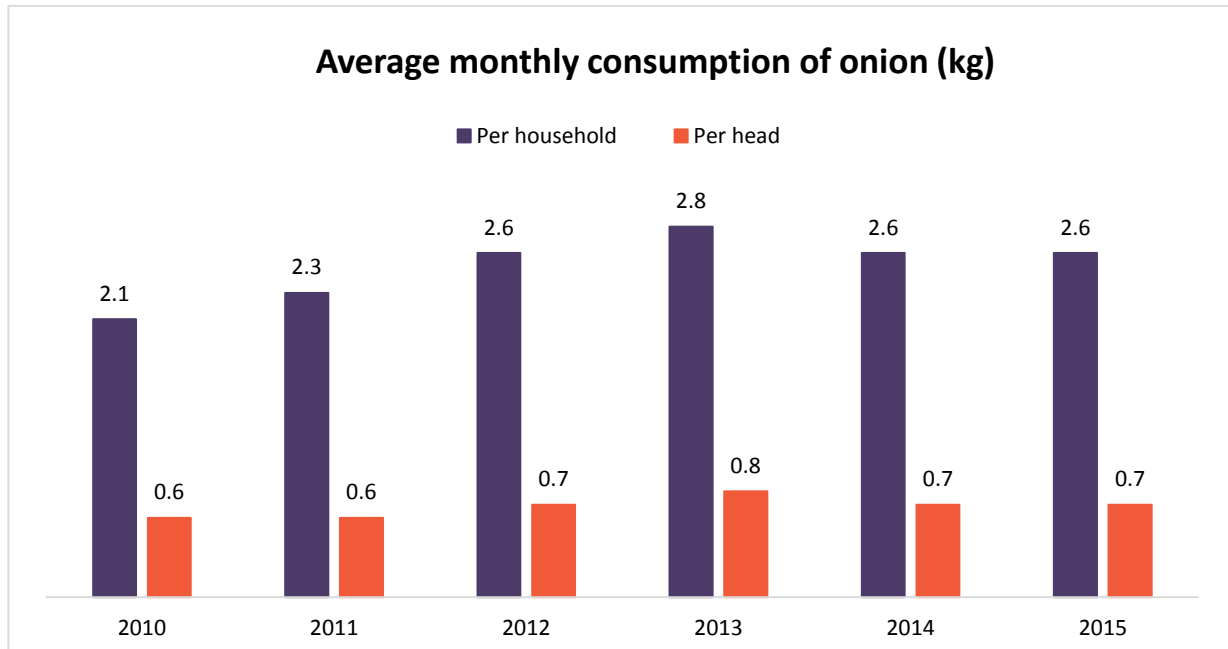
However, in the supermarket the consumer can purchase imported as well as local onion.

- **Local and foreign consumer**

As noted above, a small amount of Georgian onion is exported. The export onion is mainly produced in Kvemo Kartli, as this region is the leader in onion production. Onion from Samtskhe-Javakheti is mainly consumed locally and a relatively small amount is sold in the other regions through mediators. It is also notable, that the onion produced in the region cannot fully meet the regional demand, the deficit is especially apparent in winter. The deficit is filled with onion from Kvemo Kartli or Turkey. Kvemo Kartli onion is a major competitor of onion cultivated in Samtskhe, if imported onion is not considered.

The graph below shows onion consumption data.

**Chart 6. Average monthly consumption of onion in Georgia’s households, per one household and one person (kg).**



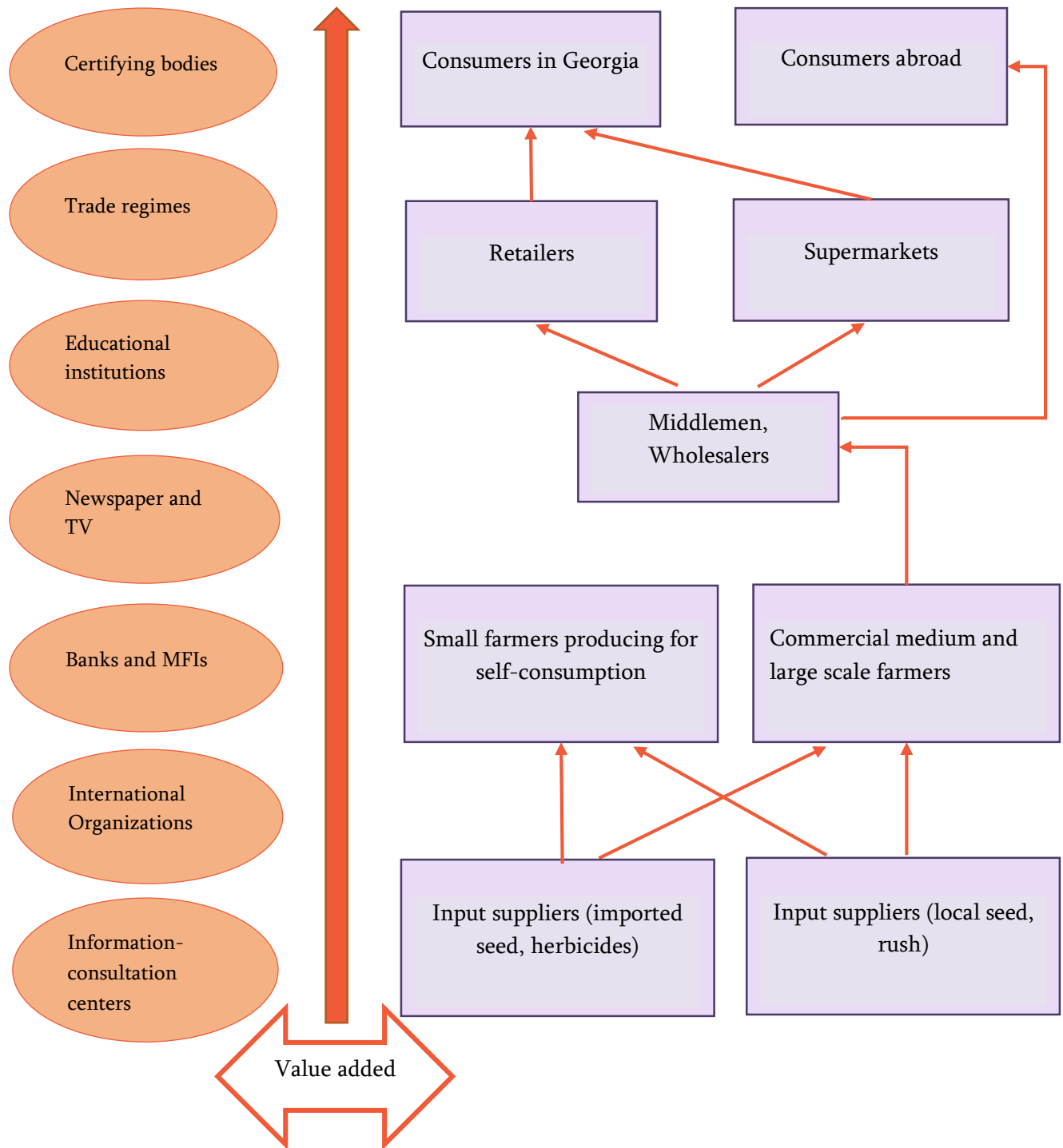
Source: Integrated survey of households, Geostat

Hence the major participants of the onion value chain are Suppliers of seeds, fertilizers, chemicals; farmers (commercial and noncommercial), middlemen, retailers, supermarkets, and final consumers (local and foreign).

## 9. Description of Onion Value Chain

### 9.1 Grid Map of Onion Value Chain

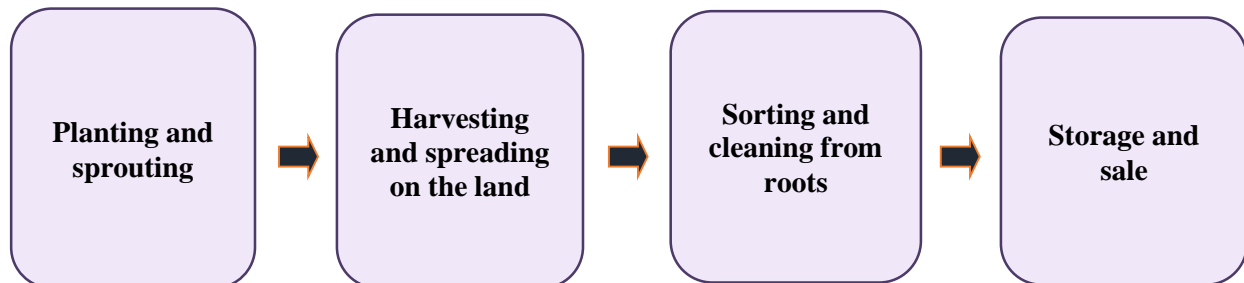
Chart 7. Onion Value Chain



## 9.2 Description of the Main Steps

The processes in the onion value chain can be grouped into the following steps:

**Chart 8. Main steps in the onion value chain**



### Onion planting and sprouting

Onion is planted in the rows of different width. Onion can be planted manually or with the sowing machine. The number of rows and the distance between them depends on the sowing machine. The optimal period for sowing is 5-20 March. The soil is processed in the period after the sowing and before sprouting.

In the optimal conditions, in spring the onion will start sprouting in 14-20 days after sowing. In case of rush, sprouting needs less time than in case of seed. One week after planting, before the onion starts sprouting, herbicides need to be applied. In the phase of three-four leaves, the herbicides (Goal, Galax, Galigan) should be applied for the second time. Total cost norm - 0.6-1 liter per 1 ha, three sprays.

### Harvesting and spreading on the land

In case of rush, onion is harvested in August 1-20, in case of seeds harvest starts from September 15. Onion should be harvested when its neck is at least 80% dry. After harvesting, the onion are spread on the land to dry them under the sun.

### Sorting and cleaning from roots

After harvesting, the onion is sorted and cleaned from the roots. Onions are sorted when they enter the warehouse. This process is one of the most labor-intensive and the cost of labor is significantly high at this stage.

### Storage and sale

After sorting and cleaning, the onions are placed in the net-sacks or boxes and kept in the warehouse that is well-ventilated and where the temperature is high (at least 30 degrees). It is very important to dry the onions well. If the warehouse does not provide proper conditions, 20-25% of the harvest can be lost. The temperature should decrease in the warehouse gradually. The optimal temperature for winter storage is from -1 to +1.

As for the sale of onion, the main distribution channels are:

- Selling in the markets

- Selling on the roads
- Middlemen/Wholesalers

Onion cultivated with rush is sold in September-October, onion cultivated with seed - in September-May. Onion cultivated with the seed can be stored for a long time, however, the farmers prefer to sell the onion in autumn, as the lack of the storage increased the risk of onion decay.

Commercial farmers prefer to sell onion to the middlemen/wholesalers, as for the small farmers, they sell the onion in the market themselves.

Majority of the farmers sell part of the produced onion during the harvest period, the other part is kept for sale at a higher price in the non-season period. Local onion is supplied to the market from June and reaches its peak in July-August.

### 9.3 External Factors Affecting the Onion Value Chain

The processes along the onion value chain largely significantly depend on the external factors. Below are the factors that influence the onion production or will influence it in the future.

- **Information and Consultation Centers**

Information and Consultation Centers of the Ministry of Agriculture are one of the most important sources of information for onion producers. Information about any project initiated by the Ministry of Agriculture is spread among population by these centers. In addition, they gather information about onion cultivated lands and onion harvest.

It is also notable that Ministry of Agriculture has issued a brochure on cultivation of onion and these brochures were distributed among the farmers via these consultation centers.

In addition, the Information and Consultation Centers play an important role in setting up demonstration farms. These farms are useful as they help spread best practices among the farmers.

Besides state Information Consultation Centers, there is a private consulting company GDCI, which helps food product producers introduce to their farms quality management (ISO 9001), food safety, and integrated management systems (ISO 22000) and best production practices (in compliance with the requirements of GLOBALGAP).

- **International organizations**

In Samtskhe-Javakheti region many international organizations have worked. Several organizations still continue their activities in the field of agriculture currently. These organizations, usually, help farmers to purchase equipment and agricultural machinery.

International organizations are also involved in setting up the demonstration farms. Support provided by donors to the local college is also an important contribution.

- **Banks and micro finance organization**

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 consider 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 the finance remains a very pungent topic for the small and medium farmers.

As onion is produced on a small scale in the region, none of the respondents have taken the loan for this purpose.

- **Newspaper and TV**

Newspaper and TV are the main sources of information for the farmers. The respondents have emphasized the importance of the newspaper Samkhretis Karibche. The newspaper provides the farmers with the information about the prices of agricultural products, TV programs, on the other hand, inform them about the practices of cultivating different plants.

- **Educational institutions**

There is a university and several colleges in the region. One of the colleges is Opizari, where students can learn such professions as farmer, veterinary, mechanic of agricultural machines, food product manufacturing specialist, processing of fruits and vegetables, and etc. Demand on these professions depends on the state regulations. When the food safety standards get stricter, the demand on the theoretical knowledge in this field increases.

- **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 onion and meets the sanitary and phytosanitary requirement, Georgia can export onion to these countries. However, 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. To export the produce, the enterprise should present at the customs a list of documents determined by the law. Among these documents is a certificate of origin, which is given by the Georgian Chamber of Commerce and Industry. Another document is a phytosanitary document which is given by the plant protection unit of the Ministry of Agriculture of Georgia.

## 9.4 Analysis of Cost and Mark-up/Value-added

### 9.4.1 Costs and revenues of the producers

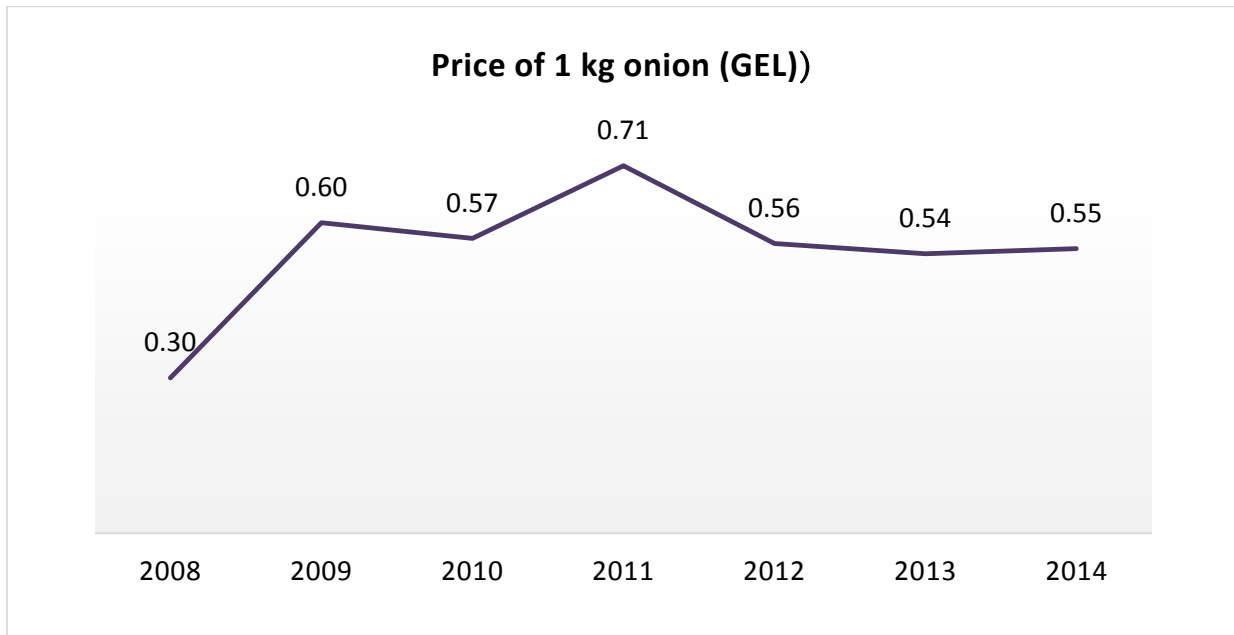
The costs and income of onion producer depend on the onion cultivation method. The final profit is largely determined by the method use by onion producer, whether it was extensive (cultivation with rush) or intensive (cultivation with seed); local seed was used or imported and etc.

The major costs of the farmers are related to the seeds (price of Dutch seed - GEL 400-500/kg, local seed - GEL 80/kg, price of rush - GEL 5-6/kg), labor force (women - GEL 20/day, men - GEL 25/day), and herbicides and fungicides (on average GEL 2000/ha).

The income is determined by the onion harvest and its price. In case of rush cultivation, average yield is 20-25 tons/ha, if cultivated with seed, 40-45 tons/ha. Seed cultivation can sometimes yield 60-70 tons/ha.

As for the prices, the „firm gate” price dynamics of the producers is given below:

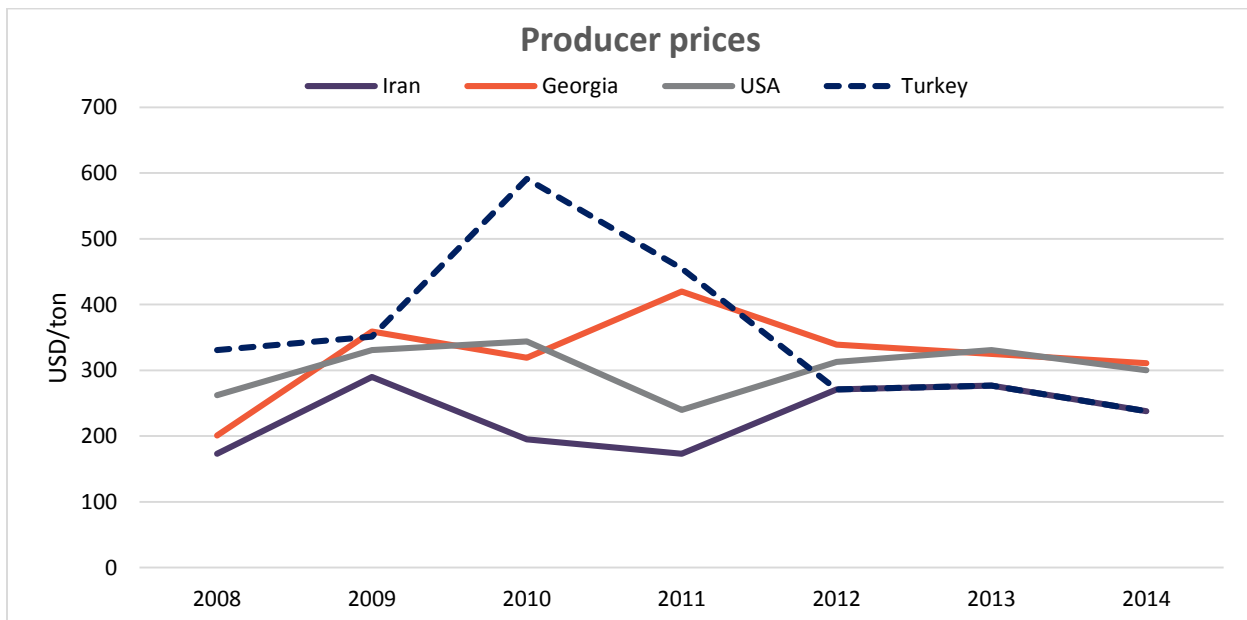
**Chart 9. Onion producer prices in Georgia**



Source: Geostat

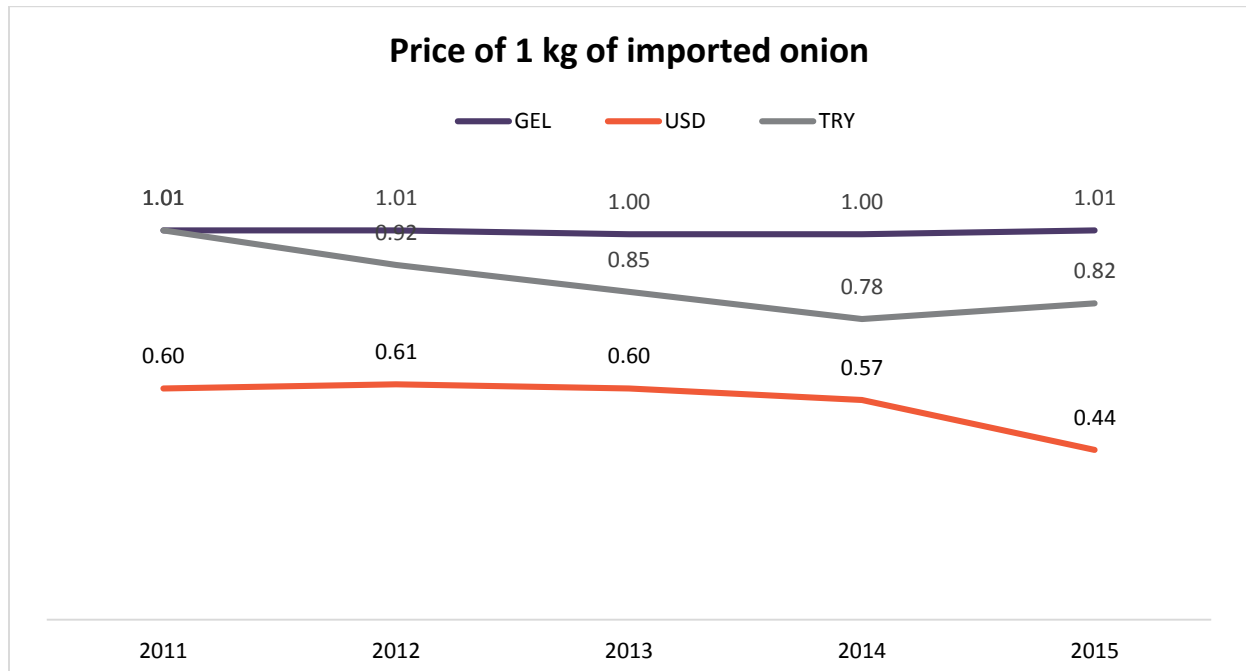
It is interesting that in 2014 the prices of Georgian producers were quite high compared to the prices of the producers from leading countries.

**Chart 10. Comparison of onion producer prices**



Source: Calculations by author, based on the data from Food and Agriculture Organization.

**Chart 11. Comparison of onion prices in US dollar, Georgian lari and Turkish lira**



Source: Calculations by the author.

The chart above shows how the purchasing power of USD increases as national currency depreciates. In case of Turkish lira, the price was decreasing until 2014 and in 2015 it increased a little.

Based on the interviews, the average annual income from onion cultivation is GEL 10'000 – 20'000 GEL/ha, average cost GEL 7'000-8'000 GEL/ha, which leads to average income of GEL 3'000-12'000 GEL/ha.

The table below provides one of the scenarios for the extensive and intensive methods of onion cultivation, with the assumptions of certain yield and prices.

**Table 12: Comparison of marginal incomes in case of extensive and intensive methods**

		Extensive	Intensive
#	Indicator	Headed onion, rush (bulb) cultivation	Headed onion, seed cultivation
1	Total cost (GEL)	6'200	9'600
2	Yield (kg/ha)	25'000	60'000
3	Average sale price (GEL/kg)	0.37	0.36
4	Income (GEL)	9'250	21'600
5	Profit (GEL)	3'050	12'000
6	COGS (GEL)	0.25	0.16
7	Profit margin (GEL/kg)	0.12	0.20
8	Profit margin (%)	32%	55%



Source: calculations by the author based on the economic calculations of Sh. Gongladze. Note: detailed economic calculations by Sh. Gongladze is Given in annex, tables A2 and A3.

Hence, intensive method of onion cultivation is more profitable for the farmer.

### 9.4.2 Analysis of Value Added

Value added at each step of the chain is the difference between prices at the various chain steps.

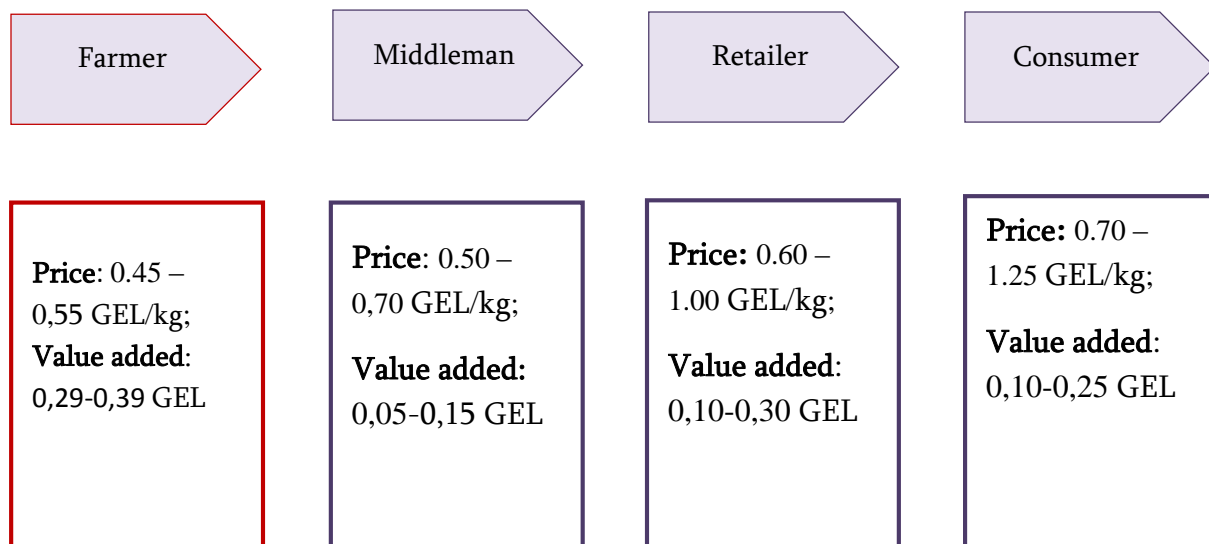
**Chart 12. Value-added in cultivation with rush**



Source: calculation by the author.

Note: it is assumed that the cost of the onion for the farmer is 0.25 GEL/kg.

**Chart 13. Value added in cultivation with seed.**



Source: calculation by the author.

Note: it is assumed that the cost of the onion for the farmer is 0.16 GEL/kg.

As the cost of the onion production varies by the method of cultivation, the value added changes only for the farmer.

## 9.5 Major Participants and Their Relations

### 9.5.1 Horizontal Links in the Value Chain

The interviews revealed the following horizontal links in the onion value chain.

**Table 13. Horizontal Links**

Link	Description of the link
Between Agro Shops	As the number of the agro shops increased in the last period, the competition between them also became more intense. The agro shop chain of the agricultural consulting unit RAS holds a very important position in the region. The name of the chain is Fermeri. It has a dominant position in the region.
Between the farmers	The majority of onion producing farmers are small households, who mainly produce onion for self-consumption. It is notable that significant number of the farmers are united under the cooperatives. In terms of production, the cooperatives have diversified portfolio, however, the majority of them focus on the potato production.
Between the middlemen	There are many middlemen in the region and distribution of onion is not a difficult task. Competition between the middlemen is not very strong, as they offer the same price to the farmer.
Between the retailers in the market	There are many retailers in the market and consequently, the environment is competitive. However, in this case, similar to the previous one, the prices are almost the same. In many cases, the farmers themselves act as retailers when they take their produce to the market.
Between the supermarkets	The number of the supermarkets increased lately and the competition is tough among them in the big cities. However, in the region there are only several supermarket chains and consequently, the level of the competition is not so high.

Between the consumers	<p>In Georgia, onion is a very popular product in terms of consumption. Consumers buy local, as well as imported onion. However, they prefer more and more Georgian produce. Various activities support this trend. However, despite these activities, at this stage the consumer has to buy imported onion in winter any way, as Georgia production does not fully cover the local demand.</p>
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### 9.5.2 Vertical Links in the Value Chain

**Table 14. Vertical Links**

<b>Link</b>	<b>Description of Link</b>
Between Agri shops and farmers	<p>In the interviews the respondents frequently mentioned that fertilizers, chemicals, and seeds are easily available for them. The farmer does not have to come to Tbilisi to purchase these products. The prices are also affordable for most of the farmers.</p>
Between the farmers and middlemen	<p>The links between the farmers and the middlemen is informal and is not based on any agreement, written or even verbal. The majority of the respondents have stable relation with middlemen and sell their produce to different middlemen.</p>
Between the middlemen and retailers in the market	<p>This relation is also informal and is not based on any agreement. However, the relation is stable. The majority of the retailers purchase the produce from the same middlemen based on the oral agreements.</p>
Between the middlemen and the supermarkets	<p>This relation is formal and is backed with the agreement between middlemen and the supermarket.</p>
Between the retailers in the market and consumers	<p>The markets have many customers in the cities as well as in the villages. Compared to other points of retail sale, the prices in the market are relatively lower, which is crucial for a certain segment of the consumers. In addition, there is a segment of consumers who believe that the products purchased in the market are healthier and more natural.</p>
Between the supermarkets and the consumers	<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>

## 10. SWOT Analysis of Samtskhe-Javakheti Onion Sector

**Table 15. SWOT analysis of onion sector in Samtskhe-Javakheti**

<b>Strengths (S)</b>	<b>Weaknesses (W)</b>
<ul style="list-style-type: none"> <li>● Onion is resistant to frost;</li> <li>● Does not need frequent irrigation;</li> <li>● Is good to cultivate successively with potato and other plants;</li> <li>● Has long storage time;</li> <li>● The region has favorable climate;</li> <li>● The soil of the region is fertile;</li> <li>● Seeds and plant protection means are available;</li> <li>● Existence of Information and Consultation Centers;</li> <li>● Projects by the Agricultural Projects' Management Agency.</li> </ul>	<ul style="list-style-type: none"> <li>● Lack of warehouses (driers);</li> <li>● Lack of agricultural machinery (sowing, harvesting and other);</li> <li>● High labor costs during harvest;</li> <li>● Lack of modern irrigation systems;</li> <li>● Lack of insurance practice;</li> <li>● Low yield;</li> <li>● Low level of cooperation between farmers;</li> <li>● Low level of commercialization;</li> <li>● Low usage of modern technologies in production;</li> <li>● Low vegetative period for agriculture.</li> </ul>
<b>Opportunities (O)</b>	<b>Threats (T)</b>
<ul style="list-style-type: none"> <li>● Diversification of regional production;</li> <li>● Import substitution;</li> <li>● Upgrade of agricultural machinery;</li> <li>● Introduction of modern production technologies;</li> <li>● Development of post-harvest technologies;</li> <li>● Setting up demonstration farms;</li> <li>● Establishment and support of seed and seedling production;</li> <li>● Development of irrigation systems;</li> <li>● Packaging, sorting and branding of onion;</li> <li>● Improve cooperation between the farmers.</li> </ul>	<ul style="list-style-type: none"> <li>● Focus on potato as a mono culture;</li> <li>● Drought, hail and other natural events;</li> <li>● Uncontrollable spread of diseases and epidemics;</li> <li>● Worsening of relations with trade partners;</li> <li>● Deterioration of macroeconomic environment (depreciation of national currency, which makes import more expensive).</li> </ul>

## 11. Potential of Onion Sector

### 11.1 Employment Potential

The employment in the onion value chain is mostly seasonal and hired workforce is mainly needed during harvesting of onion, cleaning onion from roots, sorting, and placing onion in the net-sacks.

Expenses on workforce are major expense for the onion producer farmer. During the season mainly women are hired for 10-15 days. Usually, the compensation of women work is 20 GEL, GEL 25 - for men. The respondents explained that men receive higher compensation as they have to work more hours a day. As respondents say, harvesting one ha - which implies taking the onion from the land, cleaning it and transporting it - requires 50-70 people. The number of the workforce hired significantly depends on the agricultural machinery the farmer has. The more machinery is available, the less is the expense on labor force.

As onion cultivation is a very labor intensive process, the majority of the farmers noted that they try to reduce the expenses of the labor force. For this reason, the employment potential in the onion production stage is not very high.

### 11.2 Income Generation

The majority of Georgian farmers get their income from various sources. As the studies reveal, the activities of small and medium farmers are quite diversified and they get income from planting as well as animal husbandry.

In Samtskhe-Javakheti, the major income is received from the potato production and animal husbandry. The study revealed that the income received from the potato production largely exceeds the income generated from onion production. In Javakheti, even in case the climate conditions are favorable, many farmers think that it is much more profitable for them to cultivate potatoes and then exchange them for onion than spend resources on growing onions.

Hence, the revenues generated from onion production have an insignificant share in the total revenues of the farmers.

### 11.3 Impact on the Environment

In terms of an impact on the environment, onion is especially good for seed turnover, and is a good predecessor for other plants. The seed turnover helps maintain the nutrient balance in the soil.

A rich harvest requires a fertile soil, which contains microelements. It is notable, that different plants need different microelements. For example leafy plants need nitrogen, root plants need phosphorus. If the same plant is grown on the land for consecutive years, the soil is depleted from nutrients.

Besides, growing of the plants from the same family on the same soil increases the number of bugs and spreads diseases.

For this reason the use of onion in the seed turnover helps maintain the microelements in the soil.

## 12. Discussions and the Recommendations

### 12.1 Major Limitations of the Onion Sector

The research of the onion value chain revealed several significant barriers that can be divided into three groups: production limitations, storage limitations and distribution limitations.

#### **Production limitations**

The biggest impeding factor in the process of onion cultivation is related to the availability of the agricultural machinery. The respondents say that in the region there is lack of machinery needed to cultivate the onion. Many farmers do not have sowing equipment and for this reason they sow the onion manually. The lack of the necessary machinery complicates the process of harvest and sorting.

One more impeding factor is related to the labor force. As the respondents say, many unemployed people living in the village do not want to work in the agriculture sector. This problem is especially evident in case of men.

At this stage the level of using modern technologies, including drop irrigation system, is also low. In general, irrigation is a pungent problem in the region. Onion needs far less irrigation compared to other plants, however, irrigation is necessary for seed cultivation of onion.

#### **Storage limitations**

One of the most important issues after harvest of onion is its storage in proper conditions.

Small farmers, who produce onion for self-consumption, store the onion in cool basement at home. As for the medium and large producers, they need warehouses with ventilation as high amount of onion. When drying, produces high humidity. For this reason, well equipped drier is necessary.

As the respondents noted, they prefer to quickly sell their produce due to the difficulties with the storage.

#### **Distribution limitations**

The majority of the producers has no difficulty in selling their produce. However, it should be noted that the relation with the middlemen is informal and respectively, not stable. At this stage, none of the producer has relation with the supermarkets. Like many other farmers from the region, onion producers have low level of commercialization. Neither is the onion branded.

Besides the difficulties mentioned above, such impeding factors should also be mentioned as lack of insurance practice. Despite the state support, insurance of agriculture is still not popular among the farmers in Georgia.

### 12.2 Recommendations

In order to develop onion production in Samtskhe-Javakheti, onion production should be promoted in the region in the first place. At this stage, the farmers cultivate potato mainly and their majority does not seed turnover, which reduced yield and damages the soil. For this reason, it is important to produce other plants as well. Growing other plants also reduces the risks of being dependent on monoculture. Hence, it is necessary to promote onion production in the region.

Production diversification will also contribute to the growth of overall production level and creates a potential of import substitution in the future.

It is necessary to improve availability of the agricultural machinery for the development of onion cultivation. The state has already helped the farmers by opening the mechanization centers, however the lack of machines, in terms of quantity and quality as well, is still evident.

Onion yield is quite low in the region. For this reason it is necessary to introduce the best production practices. For this purpose, we recommend to set up demonstration farms and also share the experience of foreign farmers via visits abroad.

As Majority of the farmers produce the onion for self-consumption, the level of commercialization is low. To improve commercialization, it is recommended to encourage marketing cooperatives.

The above recommendations will contribute to the development of the onion sector in Samtskhe-Javakheti region.

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## Annex

Table A1. Onion species and their description

Species	Origin	Description
Kartli's – Allium cepa 'Kartlis'	Shida Kartli Region, assigned to the region since 1962 for IX, XII, XIX, XX and XXII zones. .	Average late species. Vegetative period 110-120 days. The bulb is flat and round, slightly convex at the neck. Mainly with one bulb, rarely with two bulbs. The outside tunic is pink. It strongly resembles Skhvilisi Onion with morphological features, as well as social and biological characters. It is likely that Skhvilisi Onion is related to Kartli Onion by origin and development. Kartli Onion is a high-yield onion when irrigated - 20 tons/ha. Under no irrigation, its yield is very low. Semi pungent, resistant to pests and diseases.
Skhvilisi Onion – Allium cepa 'Skhvilisis Khakvi'	Samtskhe-Javakheti Region, Akhaltsikhe, assigned to the region since 1947 for VI, IX, XII, XIII, XIX, XX and XXII zones.	The species has a relatively short vegetative period as it was derived in the mountainous, cool region. It takes 80 days to receive a bulb after planting the onion. It has a long storage time. Develops a large, flat, round and dense bulbs. Average weight - 120 g The inside skin of the bulb is white, the outside dry thin tunic is golden-brown. Semi-pungent species. Resistant to pests and diseases. Skhvilisi Onion is an aboriginal species widespread in Akhaltsikhe region. It is also spreading in other regions of Georgia. This onion is also know under the name Suplisi and Akhaltsikhis.
Marneuli Multibulb – Allium cepa 'Marneulis Mravalbol kviani'	Kvemo Kartli region, cultivated in the irrigated zones of Kvemo Kartli region, mainly in Marneuli and Gardabani.	Multipibulb late species from Marneuli. Requires long and warm days for maturing the bulb. For this reason, it delivers better results in the war region and when planted in autumn-winter. Develops large, multiple bulbs, mostly 3-4, sometimes 4-5 bulbs. Each bulb has long, oval form, outside tunic is pale yellow and pink, inside skin is white. Very pungent. Can be stored for a long time. Resistant to fungal diseases. The Science and Research Institute of Farming worked on the improvement of this species and on elite seed growing.

<p>Lizi – Allium cepa ‘Lizi’</p>	<p>Mtskheta-Mtianeti region, Tserovani. Registered in 2012 to be cultivated in the irrigation zones of this region’s municipalities.</p>	<p>The species Lizi has average-late vegetative period. It needs 100-105 days from sprouting to full biological maturity. Semi-pungent. The soft part of the bulb is white, tunic is white, the form is round, weight - 120-160 grams, sitting above the surface of the soil, the height of the plant - 30-40 cm, number of leaves - 6-8, dark green, arranged in a fan order, resistant to pests and diseases, the yield on irrigated zone on high agrophone - 30-40 tons/ha, the yield of seed - 2.6-2.9 centner/ha. Weight of 1000 seeds - 3.4-3.7 g.</p> <p>The species Lizi is derived from the species Stardust Beyio, with mass selection method, in I. Lomouri Farming Institute.</p>
<p>Kakhetian flat - Allium cepa ‘ Kakhuri Brtkeli’</p>	<p>Kakheti region. Assigned to the region since 1962 for IX and XVI zones.</p>	<p>The species is Kakhetian early harvest onion. The vegetative period from sprouting to bulb maturity is 80-85 days. Develops flat bulb, with one or multi bulbs, average density. Tunic is pink, inside skin is juicy and violet. The dry substabce in the bulb is up to 10,78%, sugar - 8.4%. The yield of Kakhuri Brtkeli is 19-20 tons/ha. The seed yielded is 3.8 centners/ha. Weight of 1000 seeds - 3,6g. Multiple bulbs influence the storage capacity of the species. Quite resistant to pests and diseases. The sweetest among the species cultivated in Georgia, has a superior taste.</p>
<p>Pink 32- Allium cepa ‘ Vardisperi 32’</p>	<p>Kvemo Kartli region, Gardabani. Registered in 2012 for cultivation in municipalities of Kvemo Kartli and Mtskheta.</p>	<p>The species Pink 32 is late harvest species according to the vegetative period, it requires 13-135 from sprouting to full biological maturity. Has good storage capacity. Semi-pungent. The flower is white. The number of the leaves on false stem is 11-12. The height of the plant - 40-50cm. Dark green. One bulb. Flat. Outside dry tunic is pink, inside skin is juicy and pink. The size of the bulb is average, weight - 115-120g. In irrigated zones on high agrophone the bulb yields 27-29 t/ha. the seed is black, with three corners, surface - wrinkled. The seed yield - 3.5-3.8 centners/ha. Weight of 1000 seeds 3.8-4 grams. Dry substance - 11.03%, bulb is very dense. Average resistance to pests and diseases. The Pink 32 is derived in the Gardabani Experiment Station of Farming Institute, with mass selection method from species Kakhuri Brtkeli.</p>
<p>Vani Onion – Allium cepa ‘ Vanis Khakvi’</p>	<p>Imereti region. Cultivated in Vani and the rest of Imereti municipalities, Kakheti and Tbilisi.</p>	<p>According to the vegetative period this species is an average early harvest. Delivers high yield and has a highest quality bulb. For this reason it is very much appreciated by local consumers. Develops round, multiple bulbs, narrowed at the neck, the outside dry tunic is pink0-red, inside skin is juicy and light violet. Belongs to semi-sweet onion group. Average storage capacity. Resistant to fungal diseases and pests.</p>

Table A1: Marginal Profit Calculation (cultivation with bulb - extensive method)

Income (from sale of harvest)							GEL/ha
Harvest (according to product form)	100%	25,000					
Average (standard)	70%	17,500	kg/ha	x	0.40	GEL/kg	= 7,000
Thick	30%	7,500	kg/ha	x	0.30	GEL/kg	= 2,250
Thin	0%	-	kg/ha	x		GEL/kg	= -
<b>Total Income</b>							<b>9,250</b>
Expenses (production costs)							GEL/ha
<b>Seeds</b>							
Own			kg/ha	x		GEL/kg	= -
Purchased		880.0	kg/ha	x	2.80	GEL/kg	= 2,464
<b>Fertilizers</b>							
Fertilizer (NPK 8:24:24)		250.0	kg/ha	x	1.45	GEL/kg	= 363
Fertilizer (NPK 13:0:45)			kg/ha	x	5.50	GEL/kg	= -
Ammonia nitre (34.4 %)		200.0	kg/ha	x	0.90	GEL/kg	= 180
<b>Pesticides</b>							
Herbicides		1.5	l/ha	x	30.00	GEL/l	= 45
Fungicides		4.0	kg/ha	x	35.00	GEL/kg	= 140
Insecticides		2.0	l/ha	x	40.00	GEL/l	= 80
<b>Equipment and Machinery</b>							
Ploughing the soil to 28 mm		1.0	times	x	150.00	GEL/ha	= 150
Processing the land with disco harrow		1.0	times	x	70.00	GEL/ha	= 70
Spraying the fertilizer		3.0	times	x	15.00	GEL/ha	= 45
ფრეზირება of the ploughed soil (vertical ფრეზიით)		1.0	times	x	190.00	GEL/ha	= 190
Forming ბაზონ on the ploughed land		1.0	times	x	150.00	GEL/ha	= 150
Application of pesticides		15.0	times	x	16.00	GEL/ha	= 240
Transportation of the harvest		4.0	times	x	30.00	GEL/ha	= 120
<b>Expenses on own machinery</b>							
Transport means		8.0	times	x	8.00	GEL	= 64
Water pump		5.0	times	x	12.00	GEL	= 60
<b>Labor</b>							
Employed		40.0	man per day	x	25.00	GEL	1,000
Own		5.0	man per day	x	25.00	GEL	125
<b>Other Expenses</b>							
Net sacks		833.0	item	x	0.40	GEL/item	= 333
Unforeseen expenses		0.1					291
Irrigation fee	100%		times	x	70.00	GEL	= 70
Insurance							-
<b>Expenses</b>							<b>6,180</b>
<b>Marginal profit</b>							<b>3,070</b>
<b>COGS (GEL/kg)</b>							<b>0.25</b>

Source: Sh. Gongladze Economic Calculations, Cultivation of Bulb Onion, Peach and Walnuts, 2016

Table A2: Marginal Profit Calculation (Bulb onion cultivation with seed - intensive method)

Income (from sale of harvest)							GEL/ha
Harvest (according to product form)	100%	60,000					
Average (standard)	60%	36,000	kg/ha	x	0.40	GEL/kg =	14,400
Thick	20%	12,000	kg/ha	x	0.30	GEL/kg =	3,600
Thin	20%	12,000	kg/ha	x	0.30	GEL/kg =	3,600
<b>Total Income</b>							<b>21,600</b>
Expenses (production costs)							GEL/ha
<b>Seeds</b>							
Own			kg/ha	x		GEL/kg =	-
Purchased		5.0	kg/ha	x	400.00	GEL/kg =	2,000
<b>Fertilizers</b>							
Fertilizer (NPK 8:24:24)		200.0	kg/ha	x	1.45	GEL/kg =	290
Fertilizer (NPK 13:0:45)		220.0	kg/ha	x	5.50	GEL/kg =	1,210
Ammonia nitre (34.4 %)		350.0	kg/ha	x	0.90	GEL/kg =	315
<b>Pesticides</b>							
Herbicides		2.5	l/ha	x	30.00	GEL/l =	75
Fungicides		4.0	kg/ha	x	35.00	GEL/kg =	140
Insecticides		2.0	l/ha	x	40.00	GEL/l =	80
<b>Equipment and Machinery</b>							
Ploughing the soil to 28 mm		1.0	times	x	150.00	GEL/ha =	150
Processing the land with disco harrow		1.0	times	x	70.00	GEL/ha =	70
Spraying the fertilizer		1.0	times	x	15.00	GEL/ha =	15
ფრეზირება of the ploughed soil (vertical ფრეზირება)		1.0	times	x	190.00	GEL/ha =	190
Forming ზაზო on the ploughed land		1.0	times	x	150.00	GEL/ha =	150
Onion sowing		1.0	times	x	170.00	GEL/ha =	170
Application of pesticides		16.0	times	x	16.00	GEL/ha =	256
Transportation of the harvest		10.0	times	x	30.00	GEL/ha =	300
<b>Expenses on own machinery</b>							
Transport means		8.0	times	x	8.00	GEL =	64
Water pump		10.0	times	x	12.00	GEL =	120
<b>Labor</b>							
Employed		55.0	man per day	x	25.00	GEL	1,375
Own		5.0	man per day	x	25.00	GEL	125
<b>Thin Drip irrigation pipes</b>		12,000.0	m		0.10	GEL/m	1,200
<b>Other Expenses</b>							
Net sacks		2,000.0	item	x	0.40	GEL/item =	800
Unforeseen expenses		0.1					455
Irrigation fee		100%	times	x	70.00	GEL =	70
Insurance							-
<b>Expenses</b>							<b>9,620</b>
<b>Marginal profit</b>							<b>11,980</b>
<b>COGS (GEL/kg)</b>							<b>0.16</b>

Source: Sh. Gongladze Economic Calculations, Cultivation of Bulb Onion, Peach and Walnuts, 2016