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AGREEN
Community for climate-smart agriculture

Black Sea CROSS BORDER COOPERATION

AGREEN
CROSS-BORDER ALLIANCE FOR CLIMATE-SMART AND GREEN AGRICULTURE IN THE BLACK SEA BASIN

Subsidy Contract No. BSB 1135

FEASIBILITY STUDY

CLIMATE-SMART AGRICULTURE IN THE BLACK SEA BASIN REGION OF

GEORGIA

Common borders. Common solutions.

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The project **Cross-Border Alliance for Climate-Smart and Green Agriculture in The Black Sea Basin (AGREEN),** Ref. No. BSB 1135 is funded by the Joint Operational Program for Cross-Border Cooperation under the European Neighbourhood Instrument "Black Sea Basin 2014-2020", under Priority 1.2 "Increasing cross-border opportunities for trade and modernization of agriculture and related sectors".

Contents

List of abbreviations

ADC	Austrian Development Cooperatio
AGREEN	Cross-Border Alliance for Climate-Smart and Green Agriculture in the Black Sea Basin
CSA	Climate-Smart Agriculture
EU	European Union
MEPA	Ministry of Environment Protection and Agriculture of Georgia
RDA	Rural Development Agency
UNDP	United Nations Development Programme
USAID	United Stated Agency for International Development

1. General description

Authors: Irakli Javakhishvili
Funding Instrument: Programme funded by the European Union/ European Neighbourhood (ENI)
Date of publication: May, 2021
Copyright:
Language: English
Theme: Climate Smart and Green Agriculture
Keywords: Climate-smart Agriculture, Black Sea Basin, Europe
Target audience:

- Development Partners
- International Policy Research Organisations
- International Research Institutions
- National Agricultural Extension Representatives
- NGOs Operating at Farmer Level

Category: Report

Definitions and Acronyms

Introducing Climate-Smart Agriculture (FAO, http://www.fao.org/climate-smart-agriculture-sourcebook/concept/module-a1-introducing-csa/a1-overview/en/?type=111)

Reviewing the above reference of FAO on Climate Smart Agriculture (CSA), the following information or data are suggested to collect in a feasibility study to guide how to implement CSA for crop production in a specific region.

The agriculture sectors need to overcome three intertwined challenges:

- sustainably increase agricultural productivity to meet global demand;
- adapt to the impacts of climate change; and
- contribute to reducing the accumulation of greenhouse gases in the atmosphere.

FAO has developed and promoted the concept of climate-smart agriculture. Climate-smart agriculture has three objectives:

- sustainably increase agricultural productivity and the incomes of agricultural producers;
- strengthen the capacities of agricultural communities to adapt to the impacts of climate change; and,
- where possible, reduce and/or remove greenhouse gas emissions.

Climate-smart agriculture is an approach for transforming and reorienting agricultural production systems and food value chains so that they support sustainable development and can **ensure food security under the climate change**.

Abstract

The study of the state of climate-smart agriculture in Georgia was carried out in the frame of the project "Cross-border Alliance of Climate Smart and Green Agriculture in the Black Sea Basin (AGREEN)".

The project goal is the establishment of a cross-border network of entrepreneurs and experts and exchange of knowledge that will contribute to the development of climate-smart agriculture in the countries of the Black Sea basin;

Project period: June 2020 - November 2022;

The project is funded by the Joint Operational Programme "Black Sea Basin 2014-2020" of European Cross-border Cooperation under its European Neighborhood Instrument.

The purpose of the study is to learn about the problems and the development opportunities of climate-smart agriculture in the Black Sea Basin countries.

In Georgia, the study was carried out by the Elkana Biological Farming Association, during which the following issues were discussed:

- General situation in agricultural sector;
- General overview of the issues related to climate change;
- Attitude of the population of Georgia to climate-smart agriculture;
- Attitude of the members of organizations and agencies working in the field of rural development and agriculture to current activities and trends in climate-smart agriculture in the country.

In the study process, the following methods were applied:

- Desk research - analysis of literature and legislation;
- Population survey - telephone survey of 105 persons throughout Georgia;
- Detailed interviews with 50 representatives from the academic, nongovernmental, private and public sectors.

Study results:

In Georgia, scientific research related to climate change began in the middle of the 20th century. This process was temporarily suspended due to the political and economic crisis in the country in the early 1990s, which arose as a result of the collapse of the USSR and the independence of Georgia. The study of climate change in the country started again only after 1994, when Georgia, as an independent country, joined international conventions.

According to the studies carried out, climate change in Georgia had the following negative impacts:

- Increase of average annual temperature;
- Changes in precipitation regime;

- Less access to water resources;
- Increase the number of force majeure circumstances: increased frequency and intensity of floods, landslides and avalanches;
- Rise of the Black Sea level.

The negative impact of agricultural activities on climate change in Georgia is mainly caused by greenhouse gas emissions, which accounts for 18% of the total greenhouse gas emissions in the country. Total annual increase in greenhouse gas emission intensity in 2010-2015 was 6.3% that led to an increase of the average temperature by 0.7°C in the regions of Western Georgia and by 0.6°C in Eastern Georgia. In the conditions of such trend of climate change, the temperature is expected to rise by maximum 2.1°C.

If the current trend of climate change continues, it will cause significant damage of agriculture induced by the following factors:

- Change of agricultural zones;
- Decrease in agricultural productivity;
- Shortening of agricultural lands and irrigated areas.

Based on the analysis of the negative impacts of climate change, the main challenges for agriculture of Georgia are identified as:

- Reduction of greenhouse gas emissions;
- Climate change mitigation;
- Sustainable development of agricultural production.

On the background of these challenges, the level of awareness and attitudes of the Georgian population - identified in the course of the study - should be taken into account. This can be expressed as follows:

- The concept of climate-smart agriculture is not known to the population;
- The population associates climate-smart agriculture with global environmental processes and the development of the agricultural sector;
- Respondents believe that climate-smart agriculture will contribute the improvement of the economic situation of farmers and provide healthy products for the population;
- Despite the lack of knowledge of the concept of climate-smart agriculture, after adequate explanation the population expresses a positive attitude towards its development.

In addition, rural and agricultural development organizations working in the country noted that:

- The climate-smart agriculture policy of the country is weak and formal;
- Information on documentation related to climate-smart agriculture is limited and consists of information provided by donor-funded studies or presentations of strategic documents;
- In some cases, the inclusion of paragraphs on climate-smart agriculture in strategic documents is considered sufficient;

- It is considered that the development of climate-smart agriculture is inescapable and that the country has adequate resources and capacity.

It should also be noted that the main acknowledged document in agriculture, implementation of which should influence the reduction of negative impacts of climate change, is:

- Agricultural Development Strategy and Agricultural Development Action Plan.

While improving the effectiveness of mitigation of the negative effects of climate change, the agricultural sector in Georgia faces the following major challenges:

- Raising public awareness on climate-smart agriculture;
- Investing in climate-smart technologies;
- Introduction of climate-smart agriculture practices;
- Involvement of the population and key stakeholders in the development of climate-smart agriculture;
- Critical shortage of qualified personnel.

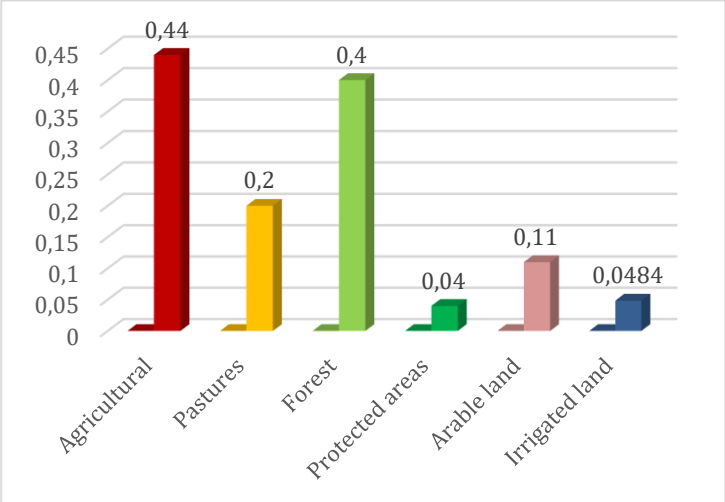
It is worth to mention that despite the lack of information on climate-smart agriculture among the population, some climate-smart technologies and methods have been already applied for years and have successful results (drip irrigation systems, indigenous crops, etc.).

2. Introduction

The agricultural sector in the BSB partner country

Indicators of the agricultural sector in Georgia

Chart 2.1.1 Land areas



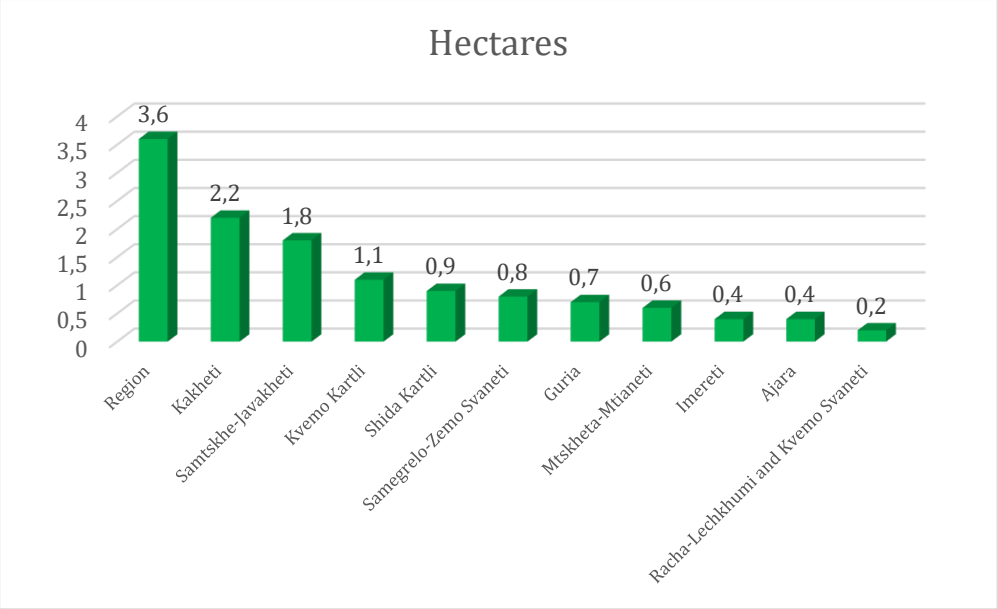
The territory of Georgia is 69,000 km^2, of which 44% are agricultural land, 20% are pastures, 40% are forests and 4% are protected areas. 25% of agricultural land is arable, which is 11% of the total area. 44% of the arable land is irrigated, which is only 5% of the total area.

Table 2.1.1 Number of rural population

Rural population as of begening of the year		
Year	Rural population (ths. Inhabitants)	Share of rural population in the total population (%)
2016	1577.1	42,3
2017	1564.5	42
2018	1554.8	41.7
2019	1539.1	41.3
2020	1522.4	41

The rural population has been declining in recent years, and this process is going on steadily. The main reason for the decline in the rural population is the migration of young people.

Chart 2.1.2 Distribution of agricultural lands per household by regions



Most of the agricultural land in Georgia is owned by households. Given the volume of land resources, the distribution of land across regions is unequal. The largest plots are located in Kakheti (3.6 ha), and the smallest ones in Racha-Lechkhumi and Kvemo Svaneti regions (0.2 ha). The size of the plots shows that the agricultural sector of Georgia is represented by small farms.

Table 2.1.2 Share of agriculture in GDP

Structure of GDP (%)				
	2016	2017	2018	2019*

Agricultural, forestry and fishing	8.3	7.2	7.8	7.2
Industry	13.0	14.2	14.6	14.4
Construction	8.8	9.1	8.3	8.6
Trade	13.9	14.0	13.9	14.4
Transportation ans storage	5.7	6.4	6.3	6.5
Other branches	50.3	49.1	49.0	48.8
*Preliminary data				

The share of agriculture in the structure of GDP is steadily low and ranges in between 7-8% in recent years.

Table 2.1.3 Structure of the agricultural sector (share of sectors in agricultural production (%))

Shares of plant growing, animal husbandry and agricultural services in agricultural output (%)					
	2016	2017	2018	2019*	
Output of agricutural, total	**100.0**	**100.0**	**99.0**	**100.0**	
Plant growing	41.0	39.0	45.0	43.0	
Animal hasbundry	52.0	54.0	48.0	50.0	
Agricultural services	7.0	7.0	6.0	7.0	
*Preliminary data					

In recent years in agriculture the share of plant growing ranges in between 40-45%, the share of animal husbandry - in between 48-54%, and the share of agricultural services - in between 6-7%.

Table 2.1.4 Application of mineral fertilizers per regions (thousand tones)

Shares of plant growing, animal husbandry and agricultural services in agricultural output (%)					
Mineral fertilizers of all types used					
	2016	2017	2018	2019	
Georgia	**57.6**	**46.5**	**48.1**	**42.4**	
Adjara AR	3.4	2.8	3.6	3.0	
Guria	2.7	1.7	1.4	1.0	
Imereti	9.0	8.6	7.3	6.9	
Kakheti	12.3	10.8	12.8	10.2	
Samegrelo-Zemo Svaneti	12.7	9.4	9.0	7.6	
Samtskhe-Javakheti	6.8	7.7	6.2	4.7	

Kvemo Kartli	4.1	2.3	2.8	2.7	
Shida kartli	6.2	3.0	4.6	6.1	
The remaining regions	0.4	0.2	0.4	0.2	

In recent years, the application rates of mineral fertilizers in the main agricultural regions of Georgia (Shida Kartli and Kakheti) have remained practically unchanged and have fluctuated at about the same level over the years. In other regions, this indicator has decreased (in some regions, for example, in Guria, the decline is more than 50%).

It should also be noted that this tendency depends on the type of fertilizer. if the application of nitrogenous fertilizers tends to decrease, application of complex fertilizers has a small but stable upward tendency.

Tables 2.1.5 and 2.1.6 Application of nitrogenous and other fertilizers by regions (thousand tons)

Of which					
Nitrogenous fertilizers					
	2016	2017	2018	2019	
Georgia	**50.9**	**39.7**	**41.3**	**35.0**	
Adjara AR	3.2	2.6	2.9	2.4	
Guria	2.6	1.7	1.3	1.0	
Imereti	8.8	8.3	7.0	6.4	
Kakheti	9.3	7.2	10.5	7.2	
Samegrelo-Zemo Svaneti	10.9	7.2	6.9	6.3	
Samtskhe-Javakheti	6.7	7.7	6.0	4.5	
Kvemo Kartli	3.6	2.0	2.5	2.3	
Shida kartli	5.5	2.8	3.9	4.7	
The remaining regions	0.3	0.2	0.3	0.2	

Of which					
Other fertilizers*					
	2016	2017	2018	2019	
Georgia	**6.6**	**6.7**	**6.8**	**7.7**	
Adjara AR	0.2	0.2	0.8	0.5	
Guria	0.1	0.0	0.1	0.0	
Imereti	0.1	0.3	0.3	0.5	
Kakheti	3.0	3.6	2.3	3.0	
Samegrelo-Zemo Svaneti	1.8	2.1	2.0	1.3	
Samtskhe-Javakheti	0.1	0.0	0.2	0.2	
Kvemo Kartli	0.5	0.3	0.3	0.5	
Shida kartli	0.7	0.2	0.7	1.5	

The remaining regions	0.1	0.0	0.1	0.2	
*Phosphorus, potassic and composed fertilizers and agro-minerals					

Table 2.1.7 Areas under winter and spring crops (thousand hectares)

Sown areas of winter and spring crops (ths. hectares)					
	2016	2017	2018	2019	
Sown area, total	**240.0**	**220.2**	**207.2**	**203.0**	
Of which					
Winter crops (wheat, barley)	**60.5**	**53.6**	**54.5**	**53.8**	
Spring crops	**179.5**	**166.6**	**152.7**	**149.2**	
Of which					
Grain and leguminous crops*	119.5	108.3	98.8	98.6	
Potato, vegetables and melons	38.9	37.0	34.3	32.1	
Other crops	21.1	21.3	19.6	18.5	
*wheat, burley, oats, maize, pulses					

Table 2.1.8 Number of livestock, poultry and beehives (by the end of year, thousand heads)

Number of livestock (as of end of year, ths. heads)					
	2016	2017	2018	2019	
Bovine animals	**962.7**	**909.7**	**878.9**	**869.5**	
Of which					
Above 2 years	577.7	541.5	518.4	501.4	
Dairy cows and buffaloes	509.3	477.4	458.0	441.8	
Pigs	136.2	150.7	163.2	155.5	
Sheep	875.9	855.9	819.1	841.9	
Goats	60.6	51.1	50.3	49.7	
Poultry, ths. Heads	8237.8	8386.0	8110.9	9466.4	
Beehives, ths. Hives	205.3	240.6	257.8	257.3	

Table 2.1.9 Structure of agricultural production (Shares of family holdings and agricultural enterprises in the sown areas of various crop groups - %)

Shares of family and agricultural enterprises in the sown areas od various crop groups (%)					
Share of family holdings					
	2016	2017	2018	2019	
Sown area, total	**93.7**	**93.3**	**92.7**	**91.3**	
Grain and leguminous crops	93.4	91.9	91.0	90.0	
Potato, vegetables and melons	99.2	99.0	99.2	98.4	
Other crops	86.9	94.2	94.4	89.9	
Share of agricultural enterprises					
	2016	2017	2018	2019	
Sown area, total	**6.3**	**6.7**	**7.3**	**8.7**	
Grain and leguminous crops	6.6	8.1	9.0	10.0	
Potato, vegetables and melons	0.8	1.0	0.8	1.6	
Other crops	13.1	5.8	5.6	10.1	

In plant growing sector of agriculture in Georgia, the main share of annual crop production is on family holdings. Increase of the share of agricultural enterprises is insignificant.

Table 2.1.10 Structure of perennial crops' production

Production of permanent crops		
Year	**Fruit***	**Tea leaf**
Production (ths. tons)		
2016	411.1	3.0
2017	353.0	2.3
2018	514.5	1.7
2019	502.2	2.0
Share of family holdings in the total production, %		
	2016	
2016	93.6	80.0
2017	90.9	73.3
2018	92.8	72.3
2019	90.7	59.9
Share of agricultural enterprises in the total production, %		
2016	6.4	20.0
2017	9.1	26.7
2018	7.2	27.7
2019	9.3	40.1

Despite the fact that the share of agricultural enterprises in the production of perennial crops in plant growing sector of Georgia's agriculture has increased to 9.3% in recent years, their share in total production volume is still low.

Table 2.1.11 Structure of animal husbandry production

Shares of family holdings and agricultural enterprises in livestock numbers (as of end of year, %)					
Share of family holdings					
	2016	2017	2018	2019	
Bovine animals	**99.2**	**99.2**	**99.3**	**98.0**	
Of which					
Dairy cows and buffaloes	99.2	99.3	99.1	97.5	
Pigs	91.0	94.7	91.3	90.4	
Sheep and goats	96.3	95.9	96.6	97.1	
Poultry	50.8	48.8	44.3	35.7	
Beehives	9996.4	98.8	95.0	93.5	
Share of agricultural enterprises					
	2016	2017	2018	2019	
Bovine animals	**0.8**	**0.8**	**0.7**	**2.0**	
Of which					
Dairy cows and buffaloes	0.8	0.7	0.9	2.5	
Pigs	9.0	5.3	8.7	9.6	
Sheep and goats	3.7	4.1	3.4	2.9	
Poultry	49.2	51.2	55.7	64.3	
Beehives	1.6	1.2	5.0	6.5	

There are different trends in the animal husbandry sector in Georgia. While the high rate of family holdings' share in animal husbandry sector as a whole remains generally at the same level, the share of agricultural enterprises in the beekeeping and poultry farming sectors is growing steadily.

As we see, the agricultural sector of Georgia still relies on family holdings, and this state of the sector indicates its low commercialization, as confirmed by the income level from agricultural activities.

Table 2.1.12 Share of income from selling agricultural production in the total income of households (%).

Share of income from selling agricultural products in the total income of household (%)			
2016	2017	2018	2019
6.4	4.7	5.5	5.5

Despite the fact that households make up a large share in agricultural production in Georgia, the income of the rural population from agricultural production is low and recently does not

exceed 5.5% of the total income. The remaining 94.5% are social benefits, pensions, wages, wage labor and remittances, which indicates an aging rural population and a high level of migration.

The production and consumption balances of an almost full assortment of products of various agricultural sectors also indicate the dependence of the Georgian agricultural market on imports:

Table 2.1.13 Balance sheet for wheat

Balance sheet for wheat*					
Indicators	2016	2017	2018	2019	
Supply (ths. Tons)					
Opening stock	114	95	46	76	
Domestic production	127	98	107	101	
Import	552	603	643	587	
Total supply	**793**	**796**	**796**	**764**	
Utilization (ths. Tons)					
Seed	14	13	12	12	
Feed	27	26	22	21	
Processing (into alcohol)	5	5	5	5	
Food	623	645	642	638	
Waste	13	13	15	14	
Export	16	48	24	4	
Closing stocks	95	46	76	71	
Total utilization (including stocks)	**793**	**796**	**796**	**765**	

Table 2.1.14 Balance sheet for milk and dairy products

Balance sheet for milk and milk products					
Indicators	2016	2017	2018	2019	
Supply (ths. Tons)					
Opening stock	17	16	16	17	
Domestic production	540	528	555	562	
Import	124	121	133	143	
Total supply	**681**	**665**	**704**	**722**	
Utilization (ths. Tons)					
Feed	11	11	12	10	
Food	643	627	663	678	
Waste	8	13	8	8	
Export	3	4	4	9	
Closing stocks	16	16	17	17	
Total utilization (including stocks)	**681**	**671**	**704**	**722**	

Table 2.1.15 Balance sheet for meat

Balance sheet for meat					
Indicators	2016	2017	2018	2019	
Supply (ths. Tons)					
Opening stock	2.3	2.2	2.4	2.3	
Domestic production	66.1	66.2	72.6	69.5	
Import	84.3	84.7	82.7	89.6	
Total supply	**152.7**	**153.1**	**157.7**	**161.4**	
Utilization (ths. Tons)					
Feed	0.1	0.1	0.1	0.1	
Food	136.5	139.3	137.7	147.7	
Waste	0.9	0.8	1.0	1.0	
Export	13.0	10.5	16.7	10.4	
Closing stocks	2.2	2.4	2.3	2.3	
Total utilization (including stocks)	**152.7**	**153.1**	**157.8**	**161.5**	

The presented balance sheets show that imported products occupy a large share of the food market, and their volume is steadily growing.

There are several main reasons to increase the share of imported products:

- The yield per hectare is low and does not meet market demand;
- The share of family holdings in agricultural production is high and the bulk of the production is for self-consumption;
- Unequal tax conditions for agricultural enterprises (legal entities, except for agricultural cooperatives, are exempt from profit tax for the first production process only if the turnover does not exceed 100,000 GEL, and small entrepreneurs enjoy tax incentives of up to 500,000 GEL). This fact significantly worsens the investment environment in the agricultural sector and hampers its transition to the level of modern technologies;
- There is no agricultural subsidy system in the country (except for the viticulture sector), when this system is well implemented in neighboring countries producing large amounts of agricultural products;
- Exemption from import related tariffs due to free trade agreements.

Table 2.1.16 Average yield of annual crops (t/ha)

Average yield of annual crops*					
	2016	2017	2018	2019	
Wheat, total	2.6	2.2	2.5	2.3	
Of which					
Winter wheat	2.6	2.2	2.5	2.3	

Spring wheat	2.2	1.8	2.3	2.4	
Barley, total	2.0	2.0	2.2	2.1	
Of which					
Winter barley	2.1	2.1	2.4	2.3	
Spring barley	1.9	1.9	1.9	1.9	
Oats	1.7	1.7	1.6	1.3	
Maize	2.6	1.8	2.7	2.8	
Haricot beans	0.7	0.7	0.6	0.8	
Sunflower	0.9	0.5	1.0	1.1	
Potato	12.3	9.0	2.4	11.8	
Vegetables, total	8.2	7.3	8.8	10.0	
Of which:					
Cabbage, floral cabbage and broccoli	23.1	20.9	29.9	33.0	
Tomato	9.9	9.8	11.0	13.4	
Cucumber	9.2	9.7	12.4	10.4	
Onions (dry)	8.5	6.0	6.7	6.7	
Garlic	2.9	3.1	3.3	2.4	
Melons, total	22.0	25.8	24.4	25.1	
Of which:					
Watermelon	25.2	31.2	20.9	31.2	
Melons, total	13.7	12.4	13.3	12.4	
Hay of annual grasses	3.6	3.4	4.4	4.5	
Hay of perennial grasses	3.7	3.7	3.6	3.8	
*In calculation of average yield only the harvest from pure areas is taken into account					

Key conclusions:

Analysis of the study of the agricultural sector of Georgia revealed the following trends:

- The agricultural sector in Georgia mainly consists of small family holdings - over 90%;
- A decrease in application of mineral fertilizers is evident (26% decrease over the last 4 years);
- Agricultural land makes up 44% of the total area of the country, and only 5% of the total area is irrigated;
- The migration of the rural population continues and this trend is stable;
- Income from agriculture is only 5.5% of the total income of rural residents;
- A large share of the Georgian agricultural market is occupied by imported products.

Climate change and impact on the BSB partner country

General overview of climate change related issues in Georgia.

Global climate change is a major challenge in the modern world. It is expected that serious problems will arise around the world, such as: changes in precipitation, an increase in the number of extreme climatic events (droughts, heat waves, hurricanes, etc.). Also, a change in the vegetation period is expected, which will negatively affect crop yields and food supply.

Climate change and its impact on the ecosystems and economy of Georgia pose a great threat to the sustainable development of the country. The following negative consequences of climate change are obvious in the country: increase in temperature, change in precipitation, limited access to water resources, increase of the Black Sea level, as well as an increase in the frequency and intensity of floods, landslides and avalanches. Agriculture is especially vulnerable to changes of climatic parameters.

Monitoring of climate change in Georgia started in the middle of the 20th century, but it was mainly carried out in the frame of scientific research carried out throughout the USSR. However, the results of the research were not widely reported and were often kept secret. In addition, during this period, decisions were made and implemented centrally, without coordination with the population. Thus, the population was less informed about these problems.

The period of formation of the independent state of Georgia was associated with the civil war and a deep economic crisis. At that time, the attention of the population, government and academia was focused on solving other, more urgent problems for that period. But while the country had not yet emerged from the post-civil war crisis of the 1990s, it was beginning to share global trends. In particular, Georgia became a party to the United Nations Framework Convention on Climate Change (1994), the Kyoto Protocol (1997) and the Paris Agreement (2015). Accordingly, the country has admitted the responsibility to fulfill obligations in accordance with the principles set out in the international treaty at the national level.

Therefore, as far as possible, the study of climate change issues and the preparation of forecasts started again, taking into account international agreements on the development of the country.

Climate change is influenced by both natural and anthropogenic factors. Human activities are reflected in increased concentrations of gases such as CO2, CH4, NO2, which leads to an increased greenhouse effect and, finally, to climate change. According to the data for the period 2013-2018, the intensity of emissions of harmful substances into the atmosphere was:

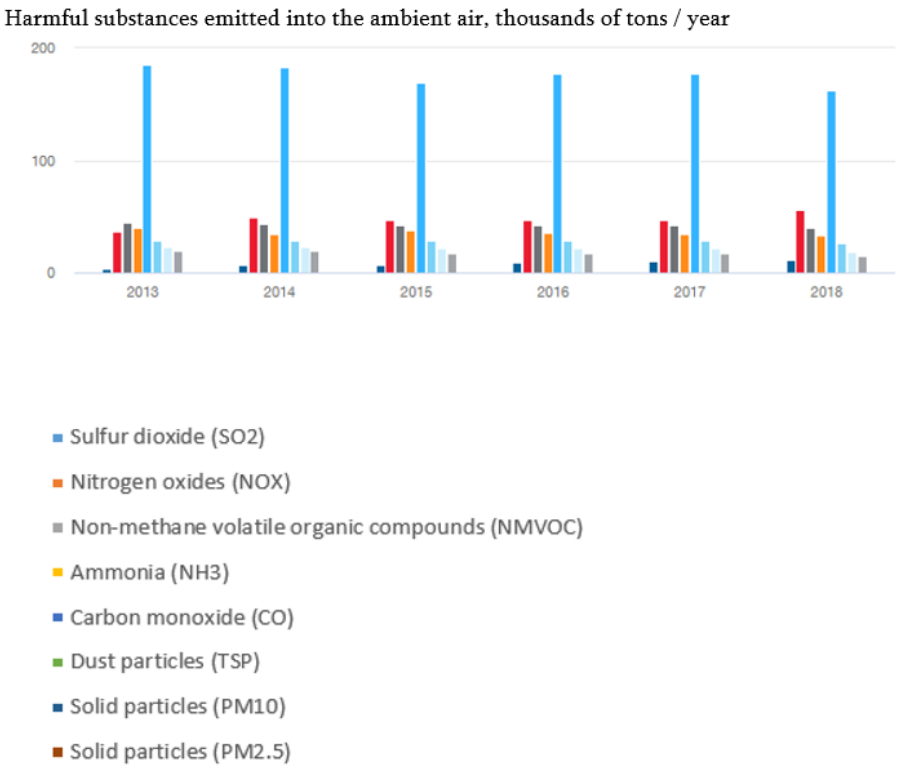
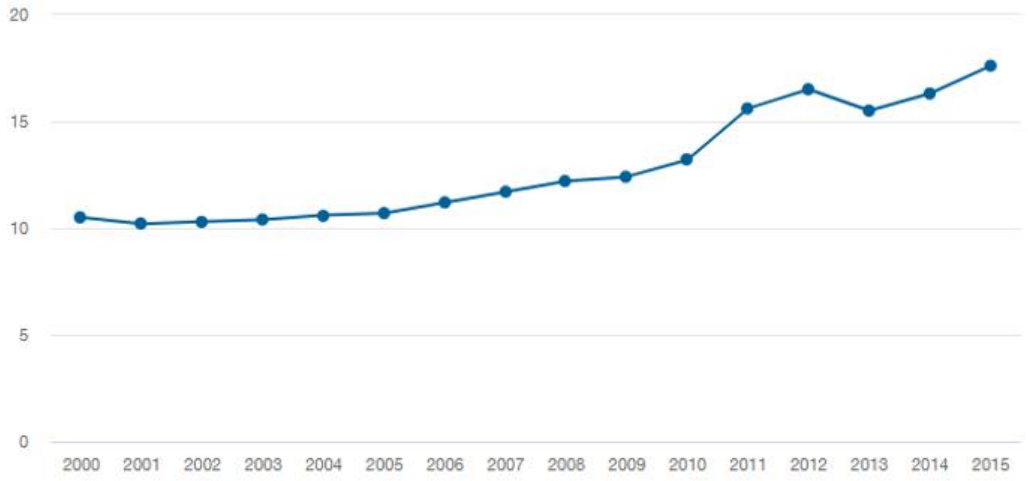


Chart 2.2.1 Source: National Statistics Office of Georgia

In 2015 total greenhouse gas emissions in Georgia was approximately the equivalent of 17,589,000 tons of CO_2, of which the share of the agricultural sector is 18%. The average annual increase of greenhouse gas emissions in 2010-2015 was 6.3%.



Graph 2.2.1 Greenhouse gas emissions, megatons / year [Total emissions (carbon dioxide equivalent)]; Source: National Statistics Office of Georgia

In 2015, global emissions were roughly equivalent to 49 billion tons of CO_2, with Georgia's share of 0.04%. It should be noted that the growth rate of global emissions for the period 2010-2015

averaged 2%, which is 3 times lower than the growth rate of emissions in Georgia. The higher level of emissions in Georgia during this period was associated with the recovery of economic activities in the country after a long period of socio-economic crisis caused by the civil war.

Over the 55 years (1961-2015) an increase in the average annual temperature was observed throughout the territory of Georgia. Over the past 100 years, the average annual air temperature has increased by 0.70 C in some regions of Western Georgia and by 0.60 C in some regions of Eastern Georgia. According to the forecast for the future, temperatures are expected to rise by 2.10 C (Sachkhere) in 2021-2050 and by 4.20 C in 2071-2100. (Batumi). The expected change of average temperature for 2071-2100 is shown on the map:

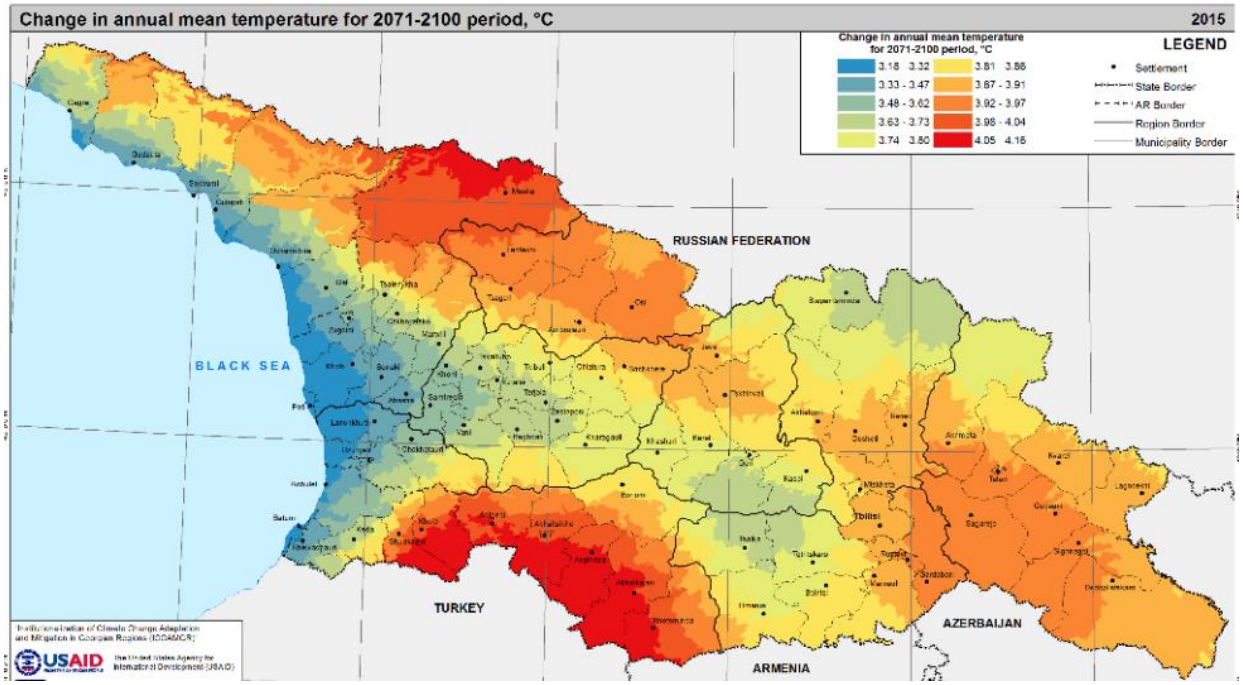


Figure 2.2.1

Between the two periods (1966-1990, 1991-2015), the total annual precipitation figures show that in Western Georgia the amount of precipitation increases, while in Eastern Georgia it decreases. The annual precipitation increased most of all in the lowlands of Svaneti and the highlands of Adjara (up to 14%). Precipitations in western Georgia will continue to increase until 2050, and in eastern Georgia precipitation decrease will change with an increase and is expected to increase by 3.4% on average. Changes in precipitation in 2021-2050 are shown on the map:

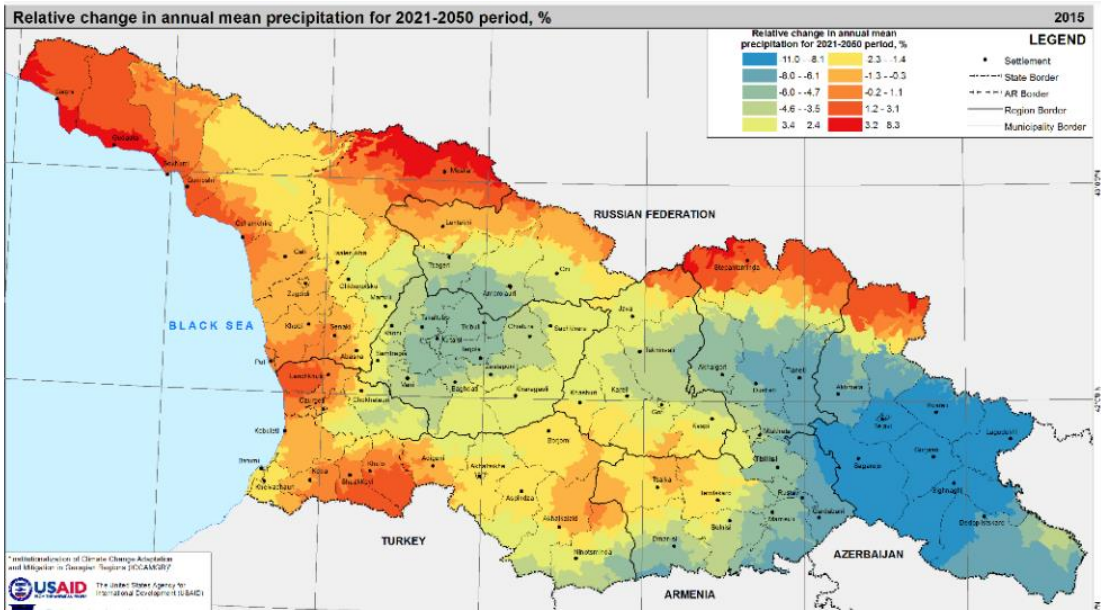


Figure 2.2.2

By 2100, a significant decrease in precipitation is expected throughout Georgia, mainly in Samegrelo, Kvemo Kartli and Kakheti (22%). Relative humidity between the two periods (1966-1990, 1991-2015) increased by 2% throughout the country, although this trend will not continue and is expected to decline by 2050-2100. The average annual wind speed between these periods decreased from 1.6 m/s to 1.3 m/s. It will continue to decline in future, until the end of 2100. The decrease the number of frosty days is observed throughout the country (1991-2015). According to the prognosis, by the end of the century this will be typical only for mountainous areas. Expected change in frosty days for 2071-2100 is indicated on the map:

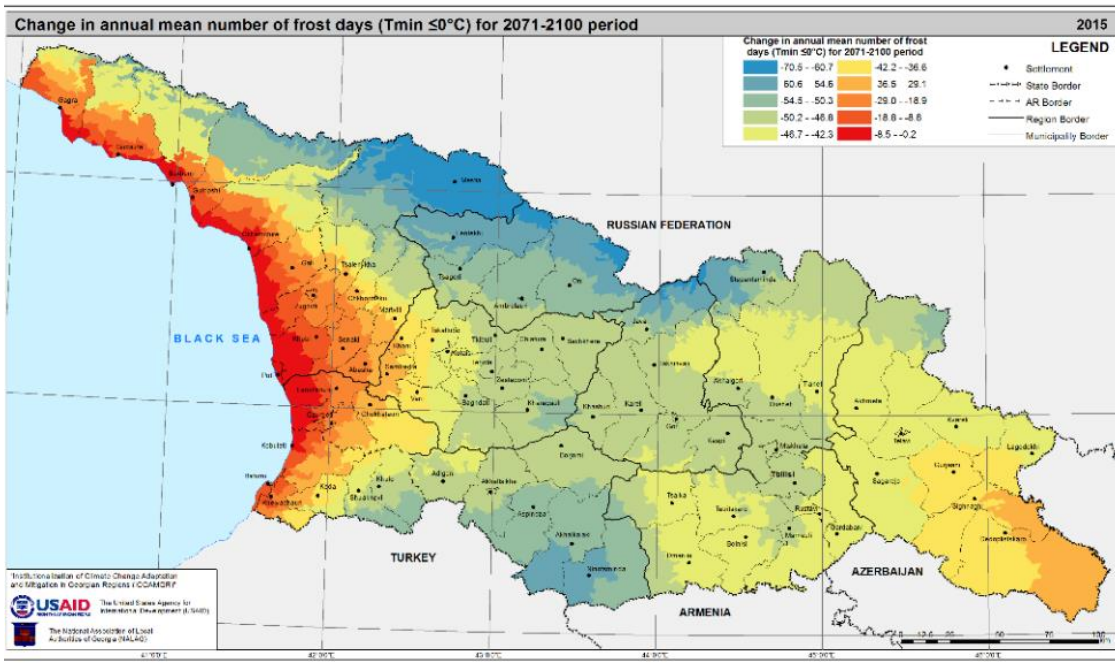


Figure 2.2.3

In 2014-2017, several important climate change assessment studies were conducted in Georgia. According to a study carried out in the frame of the project "National Plan for Adaptation of the Agricultural Sector to Climate Change," an assessment of the impact of climate change on agriculture was carried out. Several important issues were identified: changing agricultural zones, reducing productivity in the agricultural sector, reducing agricultural land and irrigated land. These factors can significantly reduce the productivity of the agricultural sector. In the frame of this project, the agro-climatic zones were divided into three parts: A (<10000 C), B (<10000C-39000 C) and C (> 39000 C). The table shows the change in the size of agro-climatic zones in Georgia during the periods of 1966-1990. 1991-2015 and 2071-2100.

Table 2.2.1 Changes in the size of agro-climatic zones in Georgia (km^2)

1966-1990 years			
	500-1000^0 (A)	1000-3900^0 (B)	>3900-5000^0 (B)
Humid >900 mm (3)		4741	4448
Moderately humid 500-900 mm (2)	12636	35502	3752
dry <500 mm (1)		1356	6772
1991-2015			
Humid >900 mm (3)		3336	5816
Moderately humid 500-900 mm (2)	11012	35639	5034
dry <500 mm (1)		881	7240
2071-2100			
Humid >900 mm (3)			1910
Moderately humid 500-900 mm (2)	2868	30316	10268
dry <500 mm (1)		9693	13097

Source: National Plan for Adaptation of the Agricultural Sector to Climate Change

One of the most serious risks associated with climate change for the agricultural sector is changing agro-climatic zones caused by rising temperatures and changing rainfall. The yield volume in agriculture depends on various factors, including wind speed, rainfall and precipitation distribution, frequency and duration of heat waves, access to water and level of evapotranspiration. These factors are changing along with climate change, which in itself poses risks to the country's agricultural sector and food security. Due to natural disasters related with climate change (landslides, mudflows, etc.), agricultural land is expected to decline in Georgia. The figure below shows the territory in Georgia, which in different years has suffered from natural geological processes and is located in a dangerous zone.

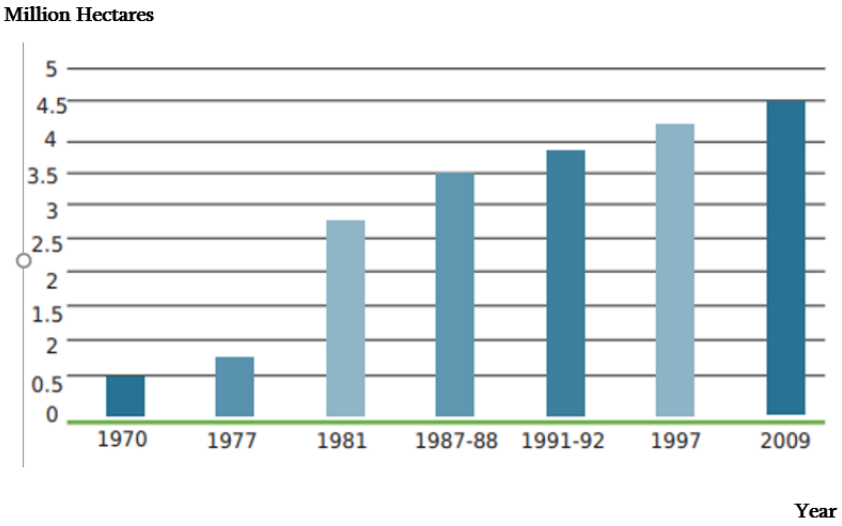


Chart 2.2.2 Source: Environmental management and decisions

It is possible that the aforementioned natural disasters will intensify the processes of land erosion, which will directly affect the productivity of the agricultural sector.

Summary conclusions:

The main challenges of climate change in Georgia are the following:

- Reduction of greenhouse gas emissions;
- Climate change mitigation; and
- Sustainable development of agricultural production.

Because of the global nature of climate change, international agreements and treaties are important in addition to national policies. Georgia, as a party to the United Nations Framework Convention on Climate Change, the Kyoto Protocol and the Paris Agreement, is obliged to take into account the principles set out in the international treaty and to fulfill its obligations at the national level. The Georgia-EU Association Agreement is one of the most important instruments defining climate change commitments at the national level. Agricultural production is closely linked to climate change, so promoting climate-smart agricultural practices is important for sustainable agriculture. A climate change adaptation plan for the agricultural sector has been prepared, focusing on the impact of climate change on the production of wheat, maize, potatoes, tangerine, hazelnuts and related adaptation measures, as well as on the impact of climate change on pastures. and animal husbandry and related adaptation measures.

SWOT analysis of the climate-smart agriculture in Georgia (BSB partner country)

S	W
• Georgia is a party of thematic international conventions; • Development of legal framework for climate-smart agriculture has already started in Georgia; • Village inhabitants and agricultural organizations are very interested in the development of climate-smart agriculture.	• Lack of information on climate-smart agriculture among the population and stakeholders; • Low investment opportunities for persons engaged in agricultural activities; • Lack of a strategic plan for the development of climate-smart agriculture in the country; • Deficit of personnel; • Financial deficit.
O	**T**
• Programs funded by the Government and donors can be used to introduce climate-smart technologies; • Weak agricultural development is an incentive for climate-smart models and income growth; • Consumer demand for quality products makes it possible to create a market for climate-smart agricultural products.	• Unfavorable prognosis of climate change for Georgia; • Expected negative impacts on incomes from agriculture; • Changes in climatic zones and reduction of agricultural biodiversity in Georgia; • Aggravation of water shortage; • Food security of the country.

3. Research methodology

For assessment of potential obstacles and contradictions both primary and secondary sources of information were used in the study.

The primary source of information was a survey of Georgian stakeholders engaged in agriculture. It was divided into two main groups:

1. Survey of the population in the regions of Georgia;
2. Survey of organizations operating in the field of agriculture.

The survey of the population was carried out according to a previously agreed questionnaire by the method of a telephone survey. The respondents were selected according to the principle of equal quantitative distribution from 11 regions of Georgia. The Elkana database was used as the initial list, according to which potential respondents were selected by region, followed by telephone interviews.

The survey of organizations operating in the field of agriculture was also conducted using a preliminary prepared questionnaire. The questionnaire consisted of closed and semi-open questions. Some of the respondents received questionnaires by e-mail after a phone call, while some of the respondents were interviewed by phone. Among the respondents were agricultural companies and entrepreneurs, as well as local and international organizations working in agriculture and rural development, donors and representatives of state agencies.

The survey results were processed in Excel format, after which the statistical data were analyzed.

Data sources

I Survey of general population and farmers

General information about the respondents

Division of respondents by age:

Age of the respondents vary from 19 to 65 years.

Your age

105 responces

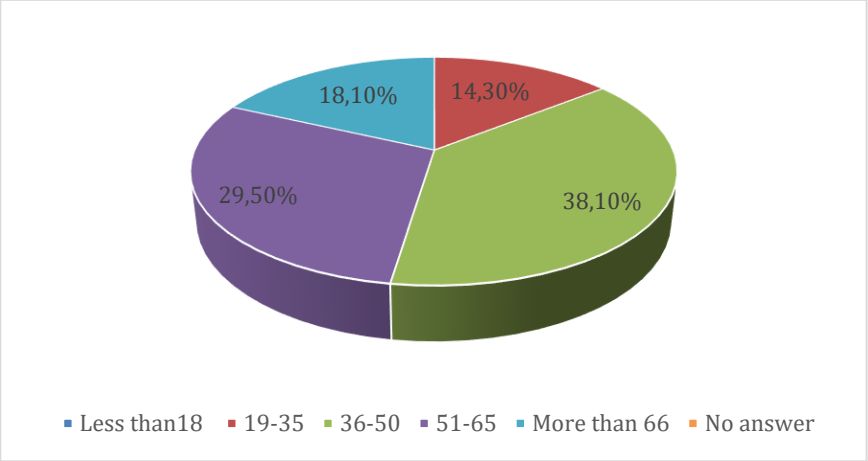


Chart 3.1.1

Distribution of respondents by place of residence

Respondents were selected throughout Georgia. Their distribution is as follows:

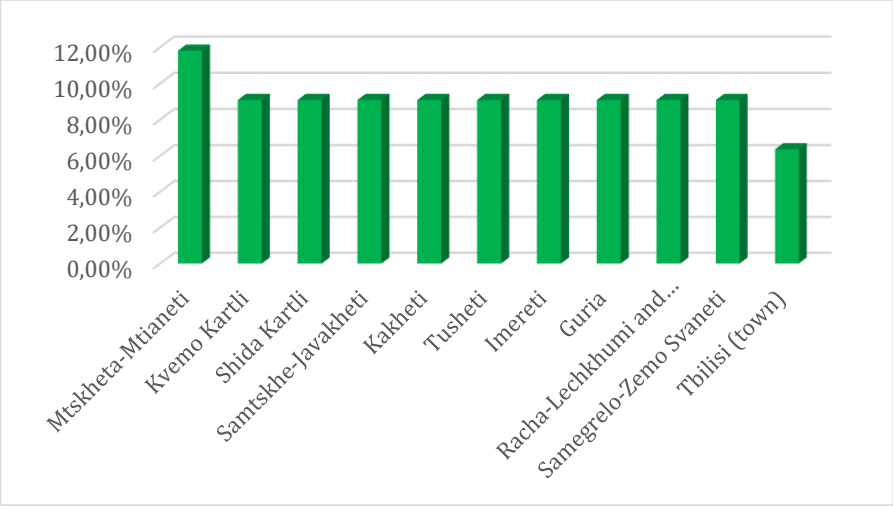


Chart 3.1.2

Education of the respondents:

Among the interviewed respondents most of all people have higher education (85.7%) (that is typical for Georgia). Only 7.6% have a specialized technical education.

Education

105 responces

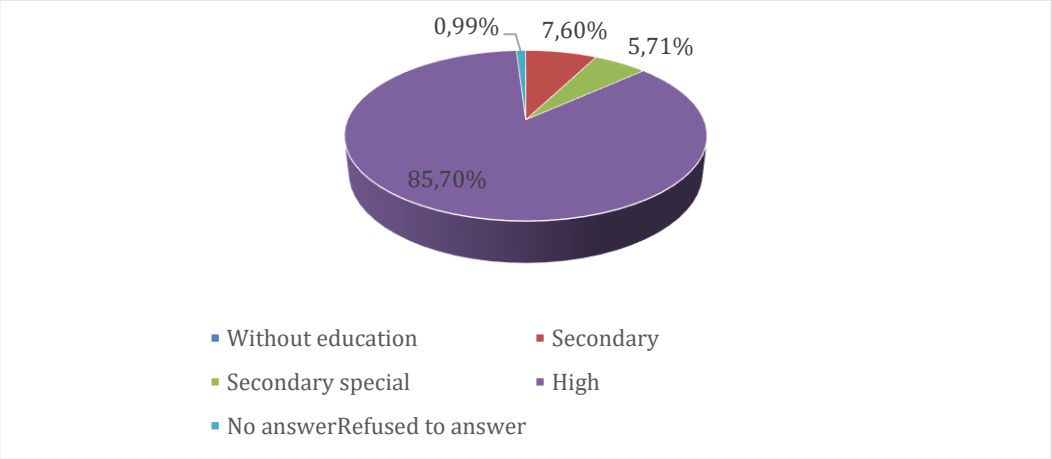


Chart 3.1.3 Survey results

Awareness of respondents about climate-smart farming practices:

The study has shown that 11.54% of respondents have general information about climate-smart agriculture, and only 2.88% are well informed. Given that 85.7% of those working in agricultural sector have higher education, these figures show that, despite acceding to international treaties and conventions, the country pays less attention to raising public awareness of the causes and dangers of climate change.

Have you heard about climate-smart agriculture?

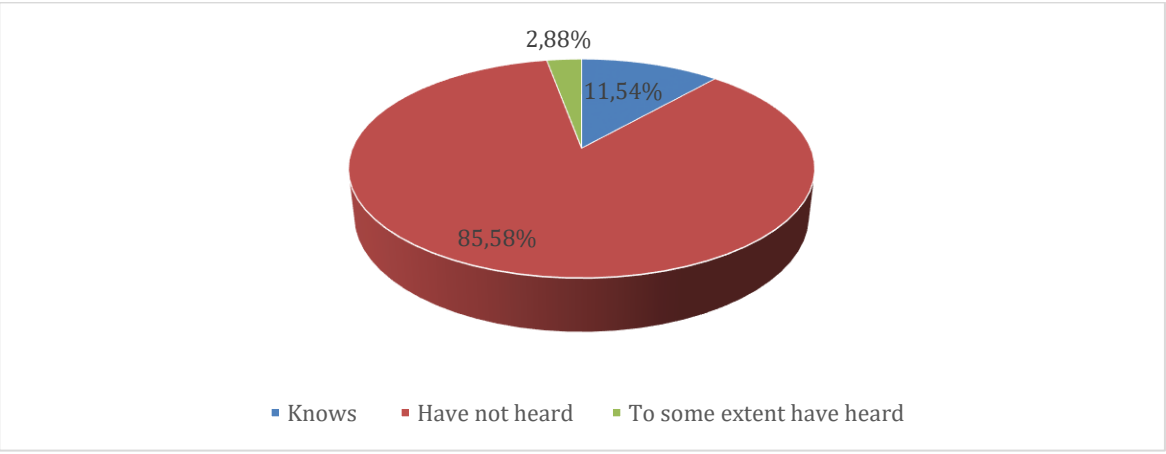


Chart 3.1.4

The importance of supporting sustainable agriculture in Georgia.

Climate smart agriculture (CSA) aims at developing strategies for securing sustainable food production under climate change (according to Food and Agriculture Organization of the United Nations). Given the above definition, do you believe that CSA should be encouraged and developed in your country?

105 responses

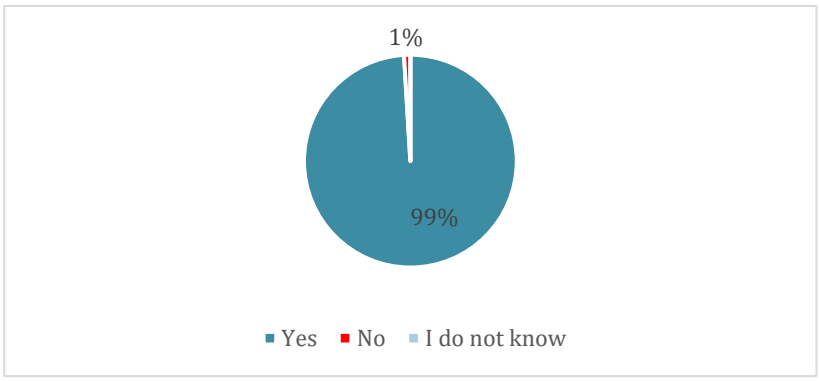


Chart 3.1.5

As we can see, 99% of respondents consider climate-smart agriculture important that indicates a positive attitude of the population towards it. It should also be noted that given the low level of awareness of the climate-smart agriculture concept in general, this positive result indicates a passive willingness to support rather than a willingness to engage in mentioned activity.

The benefits of climate-smart agriculture.

In your opinion, what will be the main benefits of climate-smart agriculture? (more than one answer can be marked)
105 responses

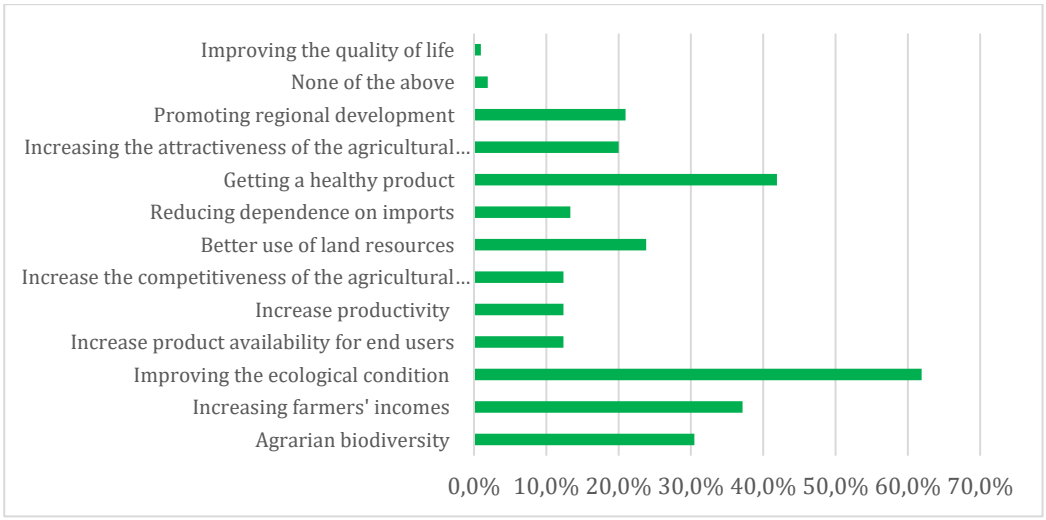


Chart 3.1.6

The answer to the question: what the respondents consider the benefits of climate-smart agriculture, on the one hand, clearly expresses the areas of public awareness and public opinion created through the media, and on the other hand, thanks to this awareness, the attitude of the population to widespread threats.

According to the survey, higher priorities for the population are:

1. Improvement of the ecological state - 61.9%. This is very important, given that the majority of the respondents are rural residents, who believe that in rural areas they live in a relatively ecologically healthy environment;
2. Consumption of healthy products - 41.9%, given that majority of respondents are engaged in the production of themselves agricultural products;
3. The increase in farmers' income - 37.1%. This is natural, since most respondents produce agricultural products themselves;
4. Agricultural biodiversity - 30.5%. This indicates that farmers' awareness of agrarian biodiversity has increased significantly in a global market environment.

It should also be noted that important and global issues, such as improving the competitiveness of the agricultural sector, increasing access for the final consumer, reducing dependence on imports, increasing the attractiveness of the agricultural sector for youth and promoting the development of the region, are less important for the respondents. The reason for this is that, on the one hand, the economic difficulties of most small farmers working in the agricultural sector do not currently allow them to think on a large scale, and they entrust these issues to others. On the other hand, the small information that they possess does not allow them to conduct analysis.

The results of the answers can be used for the development of an effective strategy of implementation climate-smart agriculture.

The indicator of positive responses show *the willingness of respondents to support climate smart agriculture in the region* (79% of respondents strongly support, and 99% expressed a positive attitude). It should also be noted that the survey of respondents does not give an unambiguous answer about how much they are ready for such changes and involvement in this activity. Their responses merely indicate that they will not strongly oppose such an initiative.

Desire to promote climate-smart agriculture in their region

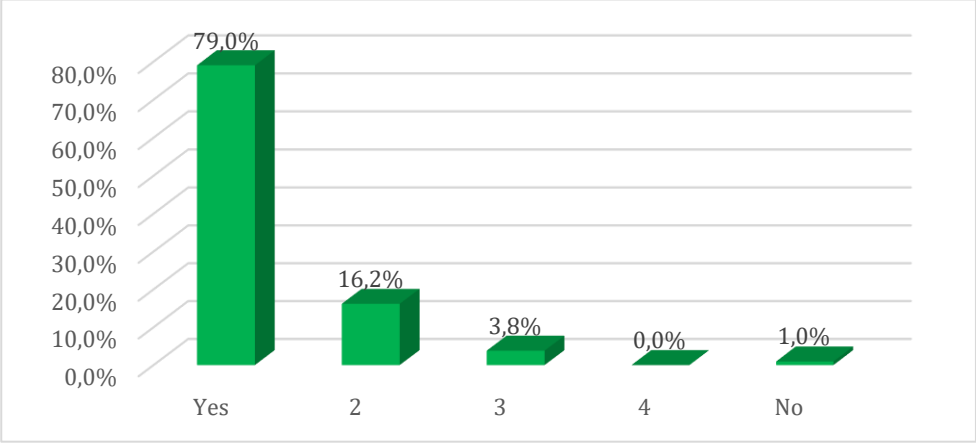


Chart 3.1.7

Labelling of climate-smart products

In your opinion, a climate-smart agricultural product should have a mark (e.g., brand or label) that will distinguish it on the market?

105 responses

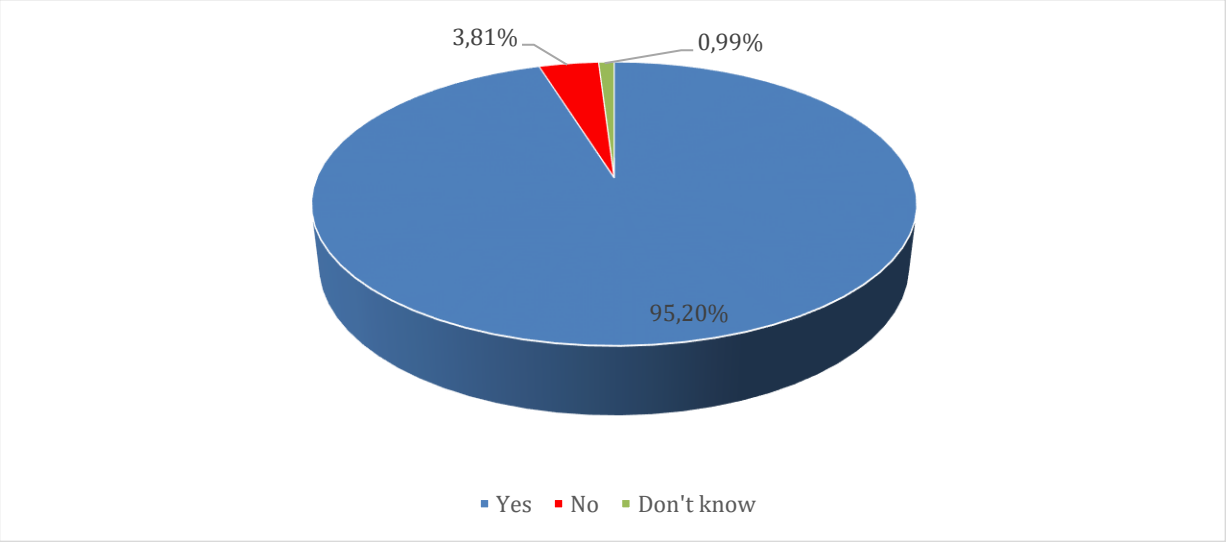


Chart 3.1.8

95.2% of respondents supported labeling of climate-smart products.

Similar results revealed the answers on the next question, where the majority of respondents (96.2%) *preferred to buy labeled climate-smart products*.

Would you prefer to buy a labeled climate-smart agricultural product compared to other products?

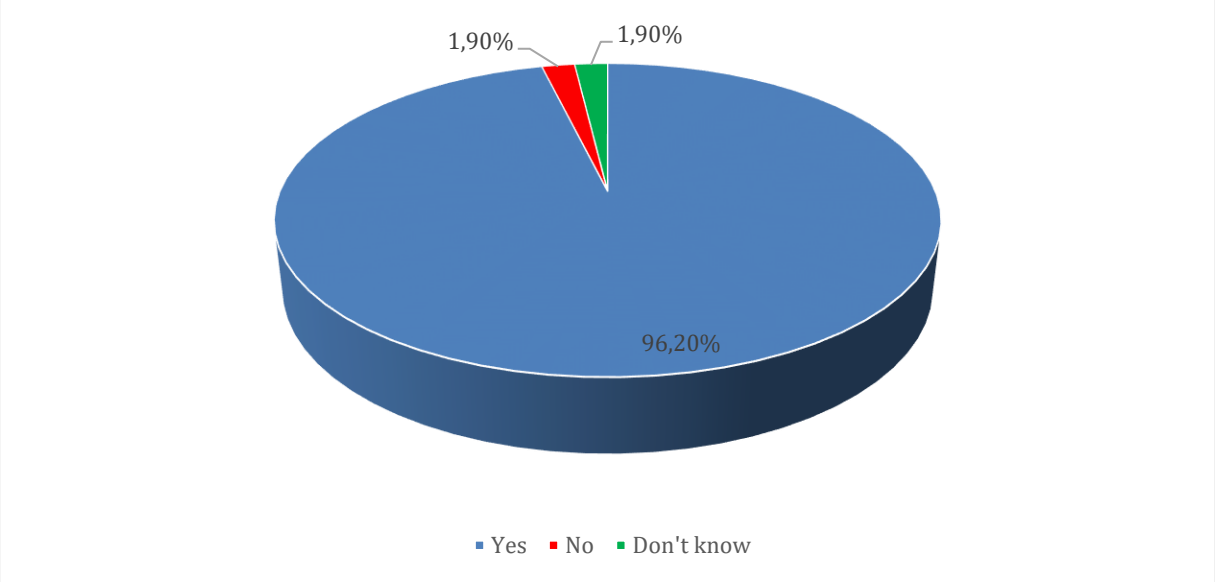


Chart 3.1.9

Would you pay more for a climate-smart agriculture product?

105 responses

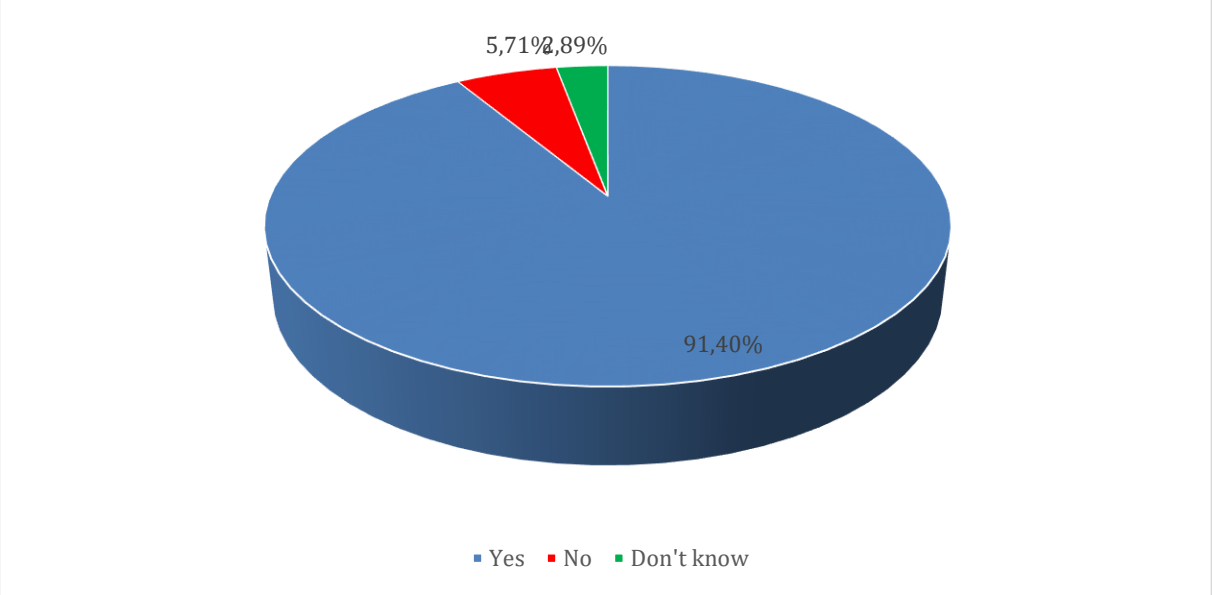


Chart 3.9.10

Motivation of purchasing of climate-smart agricultural products

It is worth to pay attention to respondent consumers' attitude towards the quality of climate-smart agricultural products.

What is your motivation when purchasing a climate-smart agricultural product? (more than one answer is allowed)

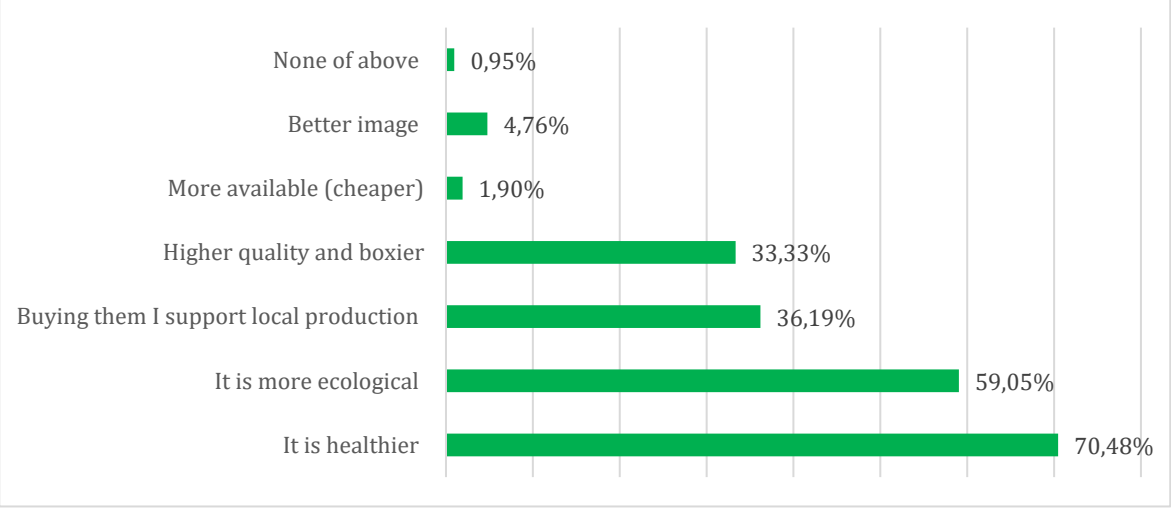


Chart 3.1.11

The main incentive to buy climate-smart products for Georgian consumers is the following:

- Healthy product (70.5%);
- Ecological purity of the product (59%);

Important factors are as well:

- Support of local production (36.2%) and
- Availability (cheapness) (33.3%).

The last factor (availability / cheapness) indicates that the population does not yet have a deep understanding of climate-related agriculture and associated costs and makes conclusions at an emotional / desire level.

Interest of climate-smart agriculture

Respondents clearly expressed a strong interest in raising knowledge in the issues of climate-smart agriculture. 93.3% of them stated that they would like to learn more about the concept.

Are you interested in climate-reasonable agriculture and want to know more about it?

105 responses

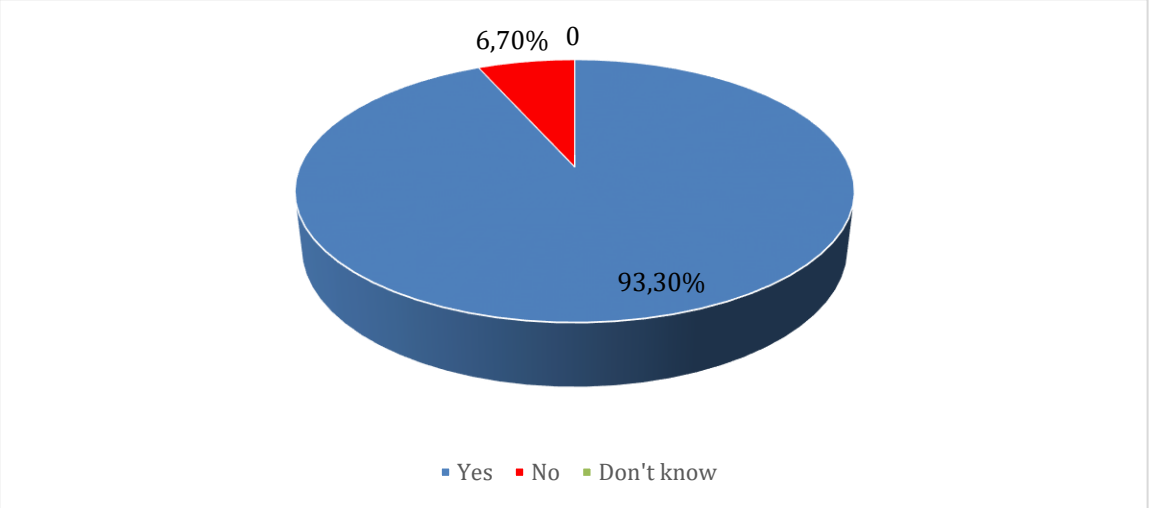


Chart 3.1.12

Summarizing the results of the individual survey of inhabitants and farmers:

Individual surveys of inhabitants throughout the country suggest that the majority of them are not familiar with the concept of climate-smart agriculture, but they logically link it to global environmental processes and development of agriculture.

At the same time, supporting climate-smart agriculture, the population has certain economic and consumer-related hopes, in particular, to improve the economic situation of farmers and to provide the population with healthy food products.

Accordingly, the population has a positive attitude towards the development of climate-smart agriculture. The concept of implementation of these approaches should include the following messages:

- Maintaining ecological environment;
- Provision with healthy products;
- Improvement of the situation with farmers;
- Providing consumers with reliable information about the product and creating a product quality assurance scheme.

II Results of survey of organizations operating in given field

With help of a questionnaire prepared separately in the frame of the study, a survey of organizations working in this field was conducted. These organizations included agricultural producers, sector and regional development organizations, international organizations and donors.

General information about the respondents:

Division of surveyed organizations according their status.

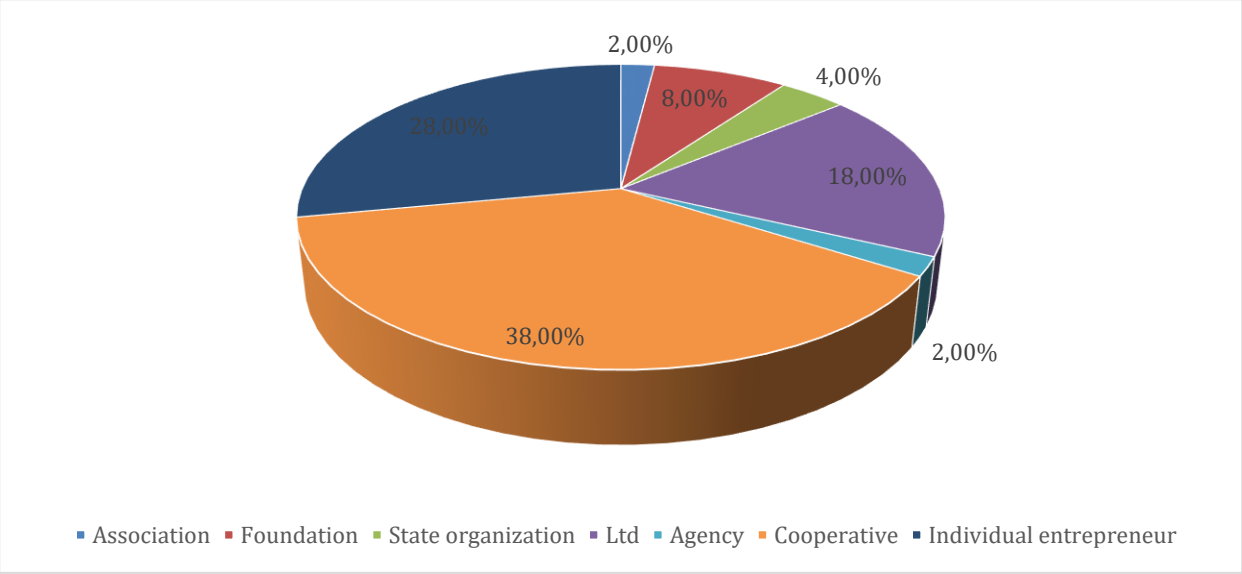


Chart 3.1.13

84% of the respondents were agricultural producers, and 16% were agricultural support organizations.

Representatives of the high and/or middle management acted as respondents.

On the question – *Do you know the term "Climate-smart agriculture" and what are its goals?*, - the answers of respondents were the following:

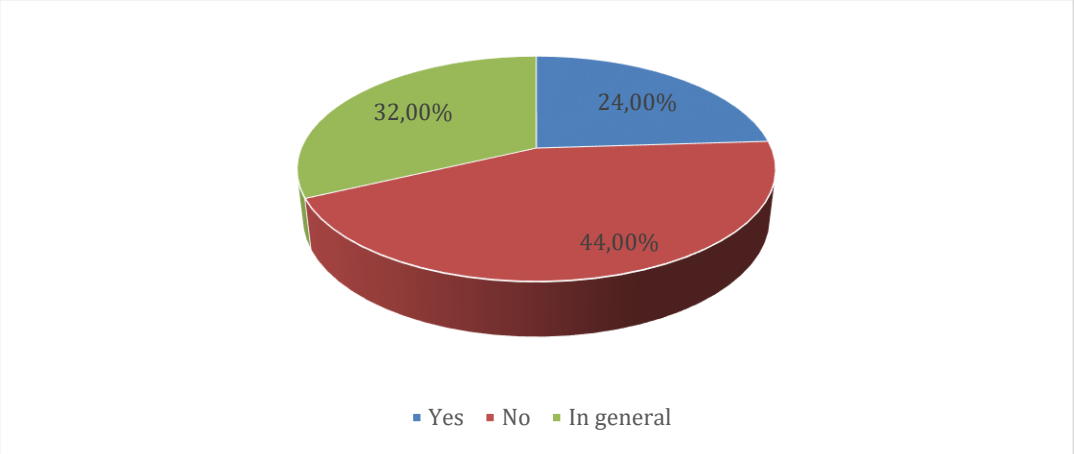


Chart 3.1.14

As it turned out, the majority of respondents - 76% - have little or no information and only 24% *have this information about climate-smart agriculture*. It is noteworthy that representatives of organizations focused on the development of agriculture have information about climate-smart agriculture, when agricultural producers did not have this information or heard about it during interviews.

The answer to the question – *"Is climate-smart agriculture developed in your country?"* was pessimistic. To this question, 100% of the respondents answered negatively and confirmed that climate-smart agriculture is not developed in the country.

The answers on the question: *"Do you think the various parties (farmers, government, consumers, society) are aware of climate-smart agriculture?"* were also negative - 100% of the respondents answered negatively.

On the question: *How can you describe climate-smart policy in your country*, the answers were the following:

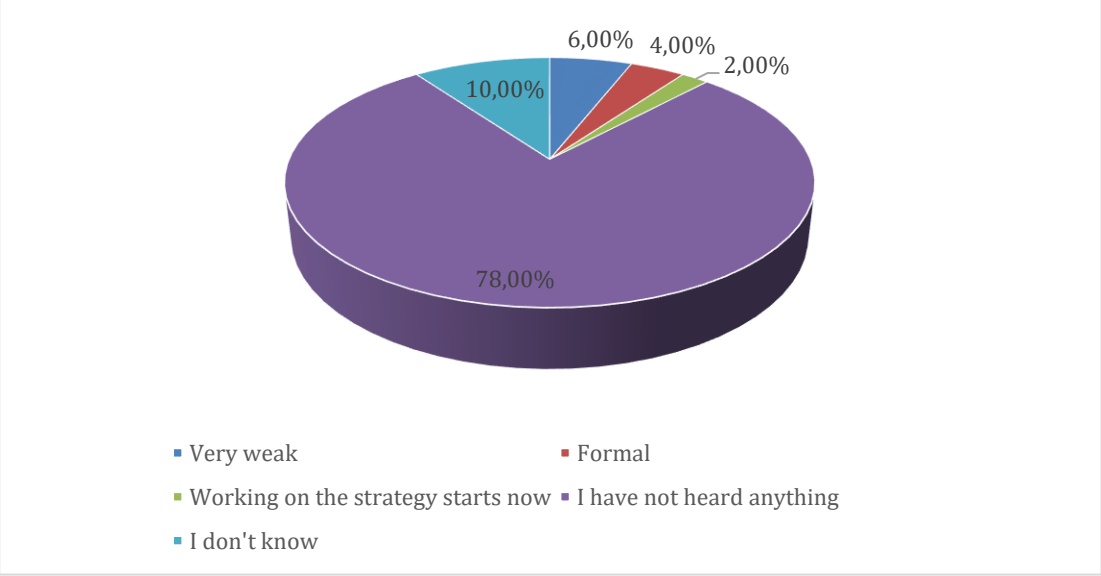


Chart 3.1.14

Only 12% of respondents answered that they have some information, stating that either government policy is too weak, or that work on a strategy is just beginning, or the approach is formal. The majority of respondents (88%) stated that they did not have any information about the country's policy in this direction.

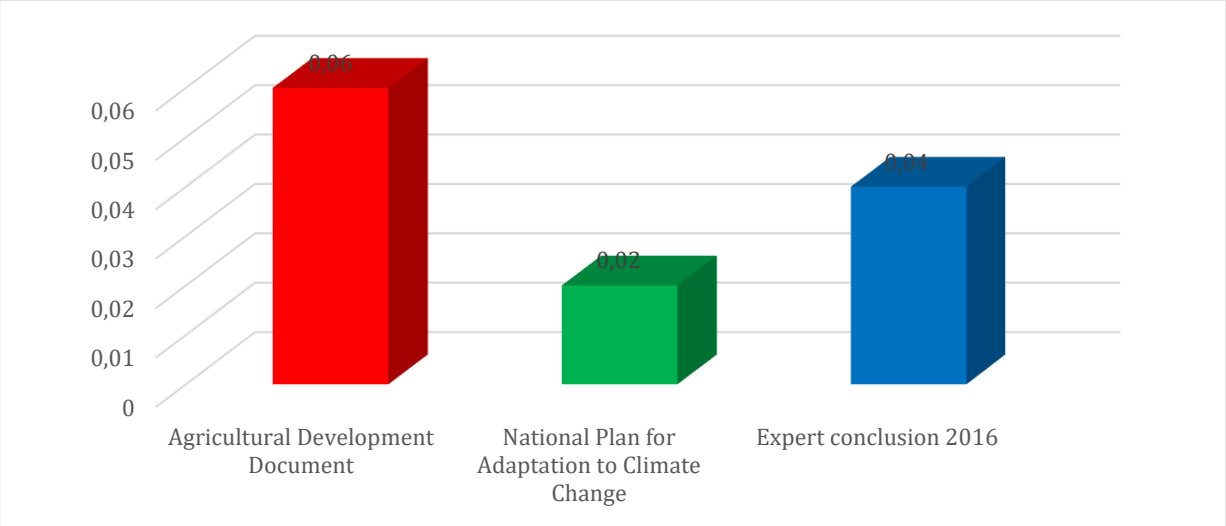


Chart 3.1.15

As we see, almost all respondents noted that at present the climate-smart agriculture policy in the country is either not in effect or is in its infancy stage. As for the accompanying documentation, only 1.2% of respondents expressed their opinion on this issue and stated that this concept is mainly included in the agricultural development strategy paper, but has only strategic goals and is not supported by an action plan and budget. According to some respondents, they remember that in 2016 an expert survey was conducted and a **Green Growth Policy Paper (GIZ)** was prepared, which was widely discussed by organizations and companies working in the field of agriculture and rural development.

The majority of respondents on the question *whether climate-optimized agriculture needs a better definition / concept*, 96% of them answered positively.

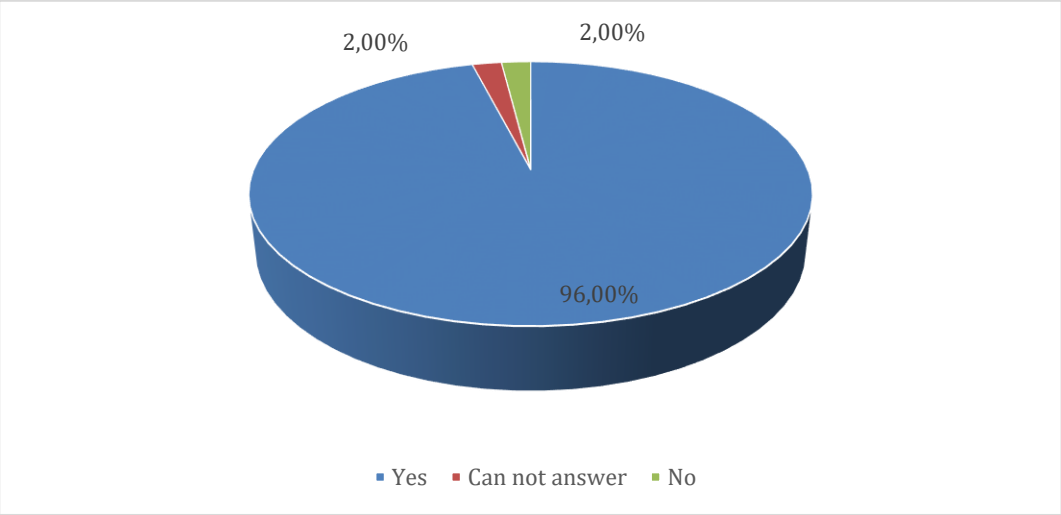


Chart 3.1.16

On the question *whether the government should more encourage the enhancement of climate-smart agriculture popularity among farmers and consumers*, 100% of the respondents answered positively.

On the question *how they see the main benefits of climate-smart agriculture development in the country and where they see the main costs / challenges*, the respondents expressed different opinions.

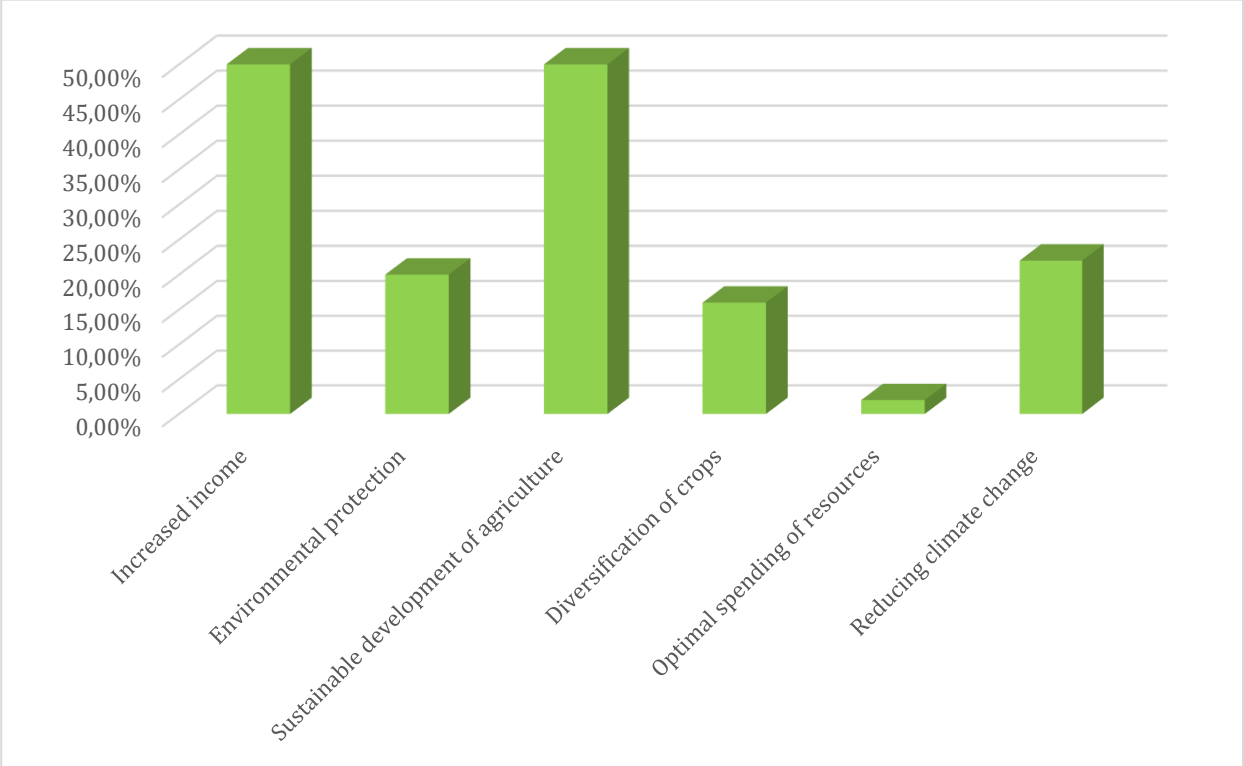


Chart 3.1.17

As we see, the hope of positive impacts of climate-smart agriculture is primarily linked to the prosperity of the agricultural sector and the growth of incomes, and secondly, to environmental protection, climate change mitigation and crop diversification. Sustainable use of resources is less important for the respondents.

It should be noted that the respondents named the following factors as *the main challenges for the development of climate-smart agriculture*:

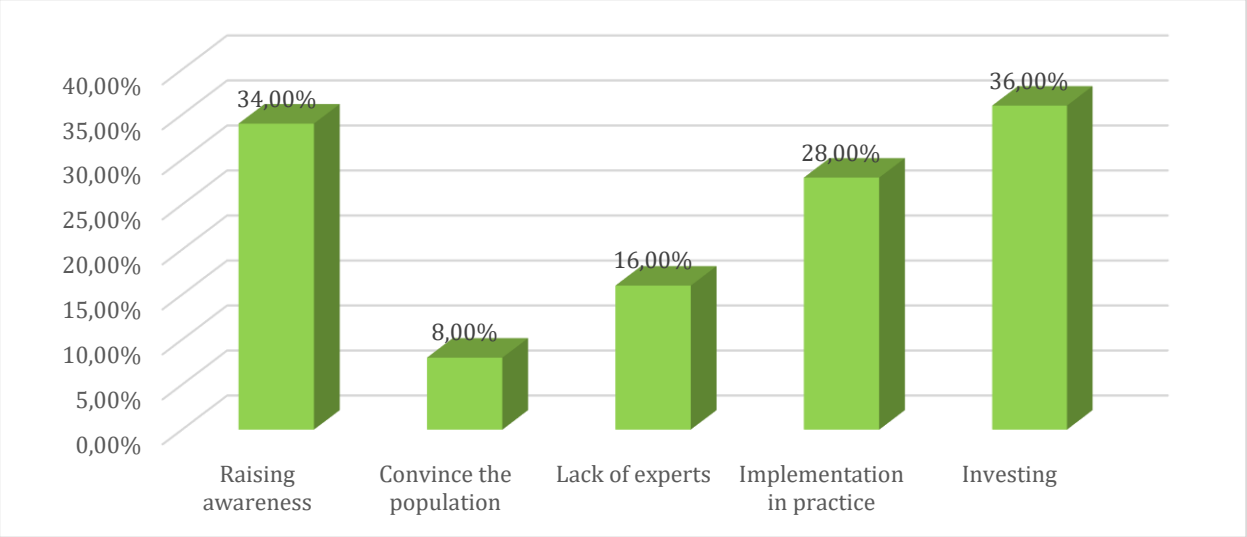


Chart 3.1.18

The main problem according to the respondents is the low awareness of the population and the lack of finances. At the same time, most of them see the problem in implementation in practice and in the lack of qualified personnel. It should be noted that public conviction and involvement in climate-smart agriculture is in last place, which indicates that agricultural organizations are focusing more on organizations and individuals involved in the sector, rather than on raising public awareness.

Among the supporters of the climate-smart alliance, there were 94% of respondents, and 6% found it difficult to answer this question.

Among the supporters of labeling of climate-smart agricultural products, there were 84% of respondents, and 16% refrained from answering.

Respondents stated once again that the country pays less attention to the dissemination of information about climate-smart agriculture, as well as to its implementation:

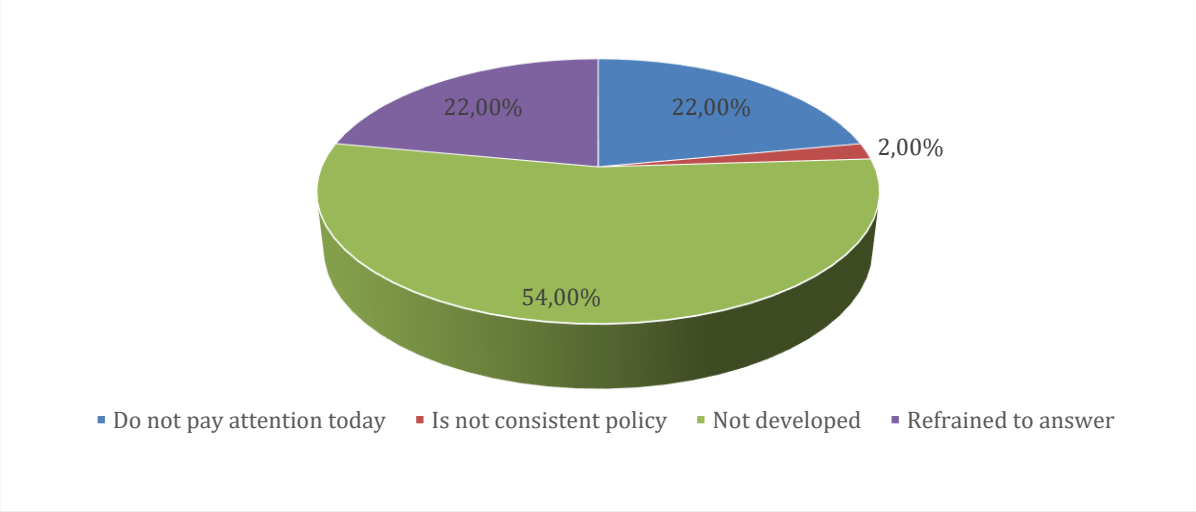


Chart 3.1.19

However, their expectations for the *future prospects* are more optimistic:

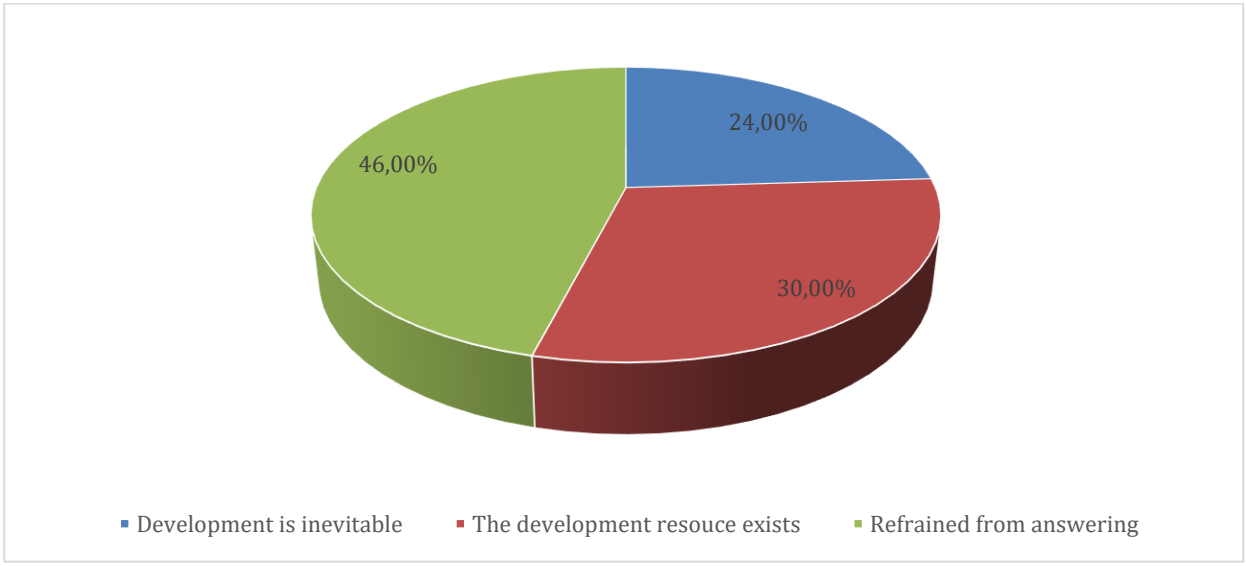
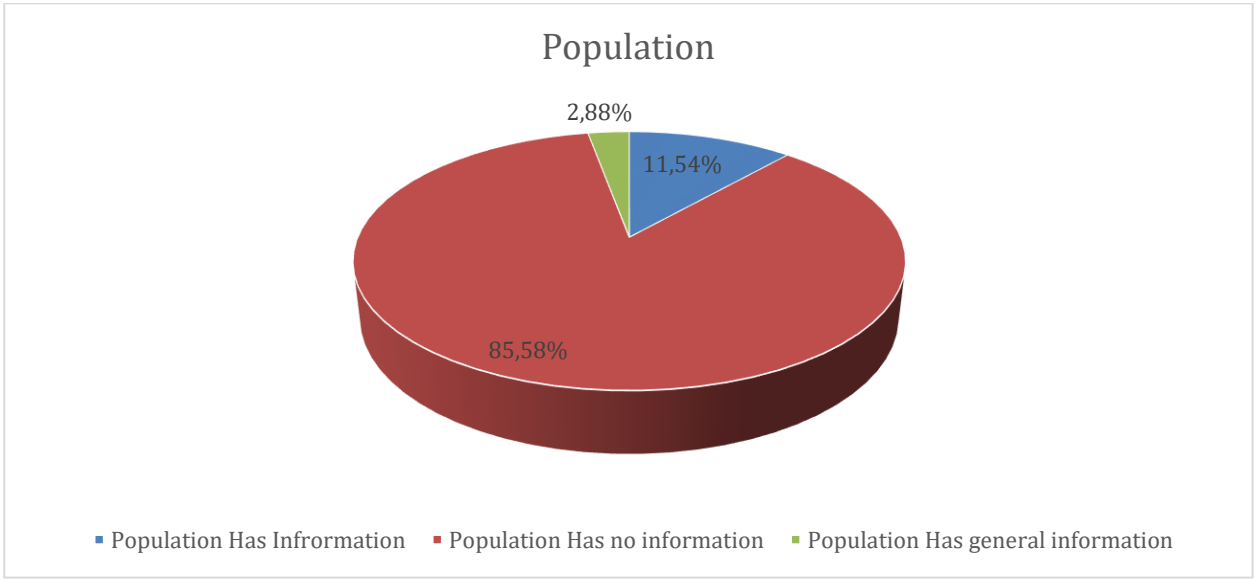


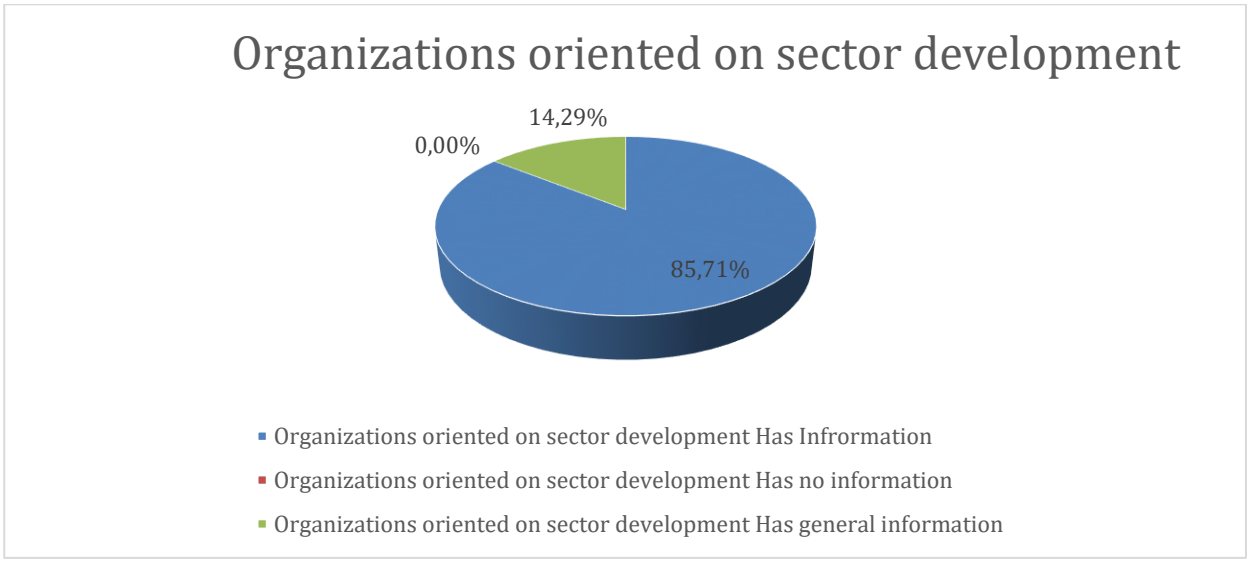
Chart 3.1.20

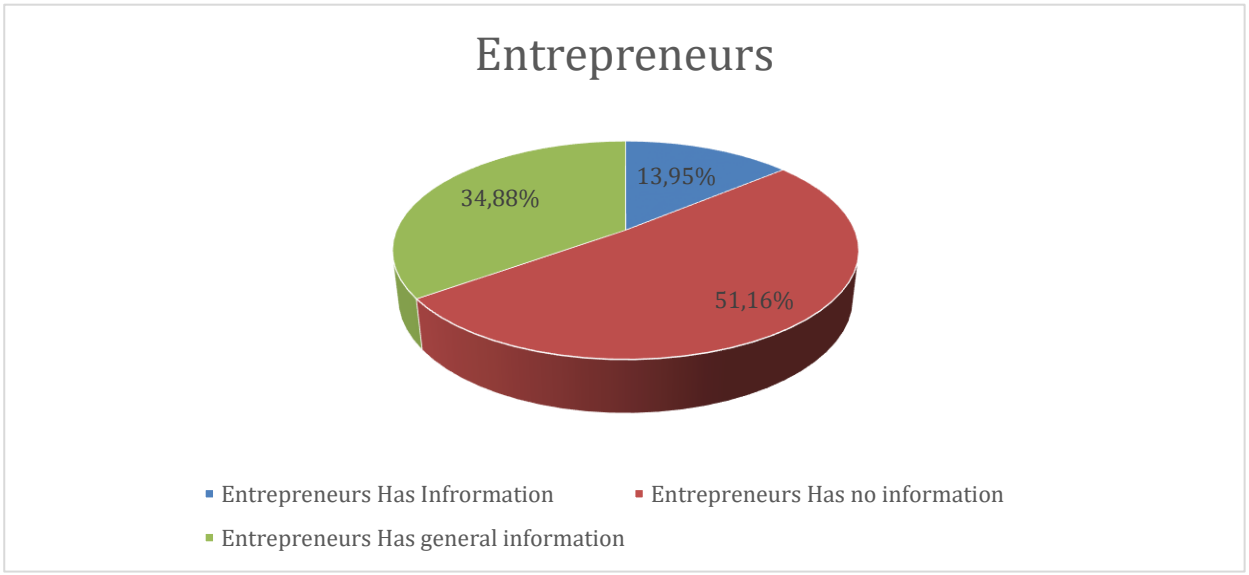
Noteworthy that 46% of respondents refrained from commenting on the prospects for the future.

Summary of the survey results of the organizations operating in agriculture and rural development.

The survey of agricultural and rural development organizations across the country shows that the level of awareness of climate-smart agriculture in Georgia depends on the category of respondents. There is a significant difference between these categories.







Charts 3.1.21 - 3.1.23

Only the management personnel of agricultural and rural development organizations is well-informed about the information on climate-smart agriculture. The population, as well as farmers and companies working in the field of agriculture, do not have any information about this or have only a general idea. Country policies for climate smart agriculture are considered weak and formal, and information about specific documents for implementation of these approaches in the country is limited to information provided by donor-funded research or presentations on the development of policy documents. It should also be noted that this fact is either denied, or left without comment by representatives of state organizations. Most of them believe that the state pays due attention to climate-smart agriculture issues and think that it is enough that climate-related agriculture issues are included in the strategic documents. At the same time, development of climate-smart agriculture is considered inevitable, and it is recognized that the country has the resources and potential for this.

It should also be noted that the main challenges in implementing climate-smart agricultural approaches are the following:

At policy level:

- There is no information campaign for the population to explain them the idea of climate-smart agriculture;
- Public policy is formal and is not supported by an appropriate action plan;
- State policy does not yet foresee retraining of personnel in climate-oriented agriculture.

At the level of public awareness:

- Only a small part of business structures have information about climate-smart agriculture;
- The population has almost no information about climate-smart agriculture.

At the financial level:

- The government strategy does not include an action plan and budget for implementing the climate-smart agriculture concept.

Background analysis

Desk study on existing Strategies, legislation documents, academic literature, sociological and statistical researches etc.

Georgia is a party of various international environmental conventions. Among them:

- UN Framework Convention on Climate Change;
- Convention on Biological Diversity; and
- UN Convention to Combat Desertification.

In the frame of the aforementioned conventions, the following legal framework has been developed in Georgia:

- Law of Georgia on Soil Protection (12.05.1994);
- Law of Georgia on Environmental Protection (10.12.1996);
- Law of Georgia on Wildlife (25.12.1996);
- Law of Georgia on Water (16.10.1997);
- Law of Georgia on Pesticides and Agro-Chemicals (25.11.1998);
- Law of Georgia on Ambient Air Protection (22.06.1999);
- Forest Code of Georgia (22.06.1999);
- Law of Georgia on Soil Conservation and Restoration-Improvement of Soil Fertility (08.05.2003);
- Law of Georgia About the "Red List" and the "Red Book" of Georgia (06.06.2003);
- Resolution # 242 of Georgian Government on Rules for Use of Forest (20.08.2010);
- Law of Georgia on New Breeds of Animals and Varieties of Plants (15.12.2010);
- Law of Georgia: Food Products/Animal Feed Safety, Veterinary and Plant Protection Code (08.05.2012);

- Resolution # 198 of Georgian Government on Bio Production (20.07.2013);
- Resolution # 17 of Georgian Government on Technical Regulations on Environmental Protection (03.01.2014);
- Ordinance of the Government of Georgia #145 "Additional conditions for the distribution of seeds and planting material in Georgia" (13.02.2014);
- Resolution # 190 of Georgian Government on "Red List" of Georgia;
- Law of Georgia: Waste Management Code (26.12.2014);
- Law of Georgia: Environmental Assessment Code (01.06.2017);
- Law of Georgia on permission for the distribution of agricultural plant species subject to mandatory certification and on seed production (01.06.2017);
- Resolution of the Government of Georgia #383 on "Technical Regulation - Approval of Ambient Air Quality Standards" (27.07.2018);
- Agriculture and Rural Development Strategy of Georgia 2021 – 2027, and
- Action Plan 2021-2023 of the Agriculture and Rural Development Strategy of Georgia 2021-2027;
- Climate Change National Adaptation Plan for Georgia's Agriculture Sector (2017)

These are the main important documents that outline climate change mitigation and adaptation measures for the agricultural sector.

Research limitations

The study period coincided with travel restrictions caused by the COVID-19 pandemic that hampered arrangement of meetings with respondents. Most of the population is not adapted to conducting online meetings that which makes it difficult to obtain reliable information and requires more time and effort from the interviewer.

In addition, a limiting factor was that most of the respondents did not have information about the term "climate-smart agriculture", so it took the interviewer some time to explain this term and its idea to the respondent.

4. State of art of organic farming and sustainable agricultural practices in Georgia (BSB partner country)

Country-specific conditions for sustainable agriculture implementation

According to experts of agricultural and rural development programs and organizations, Georgia's natural, climatic and soil conditions contribute to the development of climate-smart agriculture in the country. Particular attention is paid to reducing the negative impact of climate change on agricultural productivity. The introduction of these approaches has become especially relevant recently, when the low competitiveness of Georgian agricultural products compared to imported products has become obvious in the conditions of free trade, despite the fact that the country has created better conditions for production.
In addition, according to experts, the low productivity of agriculture in Georgia can be a trigger for promotion and implementation of climate-smart agricultural approaches, in the sense that these technologies can quickly achieve positive economic results in agricultural holdings. Positive results can be achieved both by increasing productivity and by growing new or rare / indigenous crops, which give rapid and high economic results. It should be noted that the development of tourism in Georgia had a great influence on the formation of the market for local products (that usually are sold at a higher price than imported ones) and on the growth of demand on high-quality local products.
One of the most important and promising directions for the development of climate-smart agriculture in Georgia is organic production.

Organic production data is based on 2020 data obtained from the organic certification body "Caucascert".

- There is 2,220 ha of land in Georgia under organic production;
- Currently, 126 business operators are involved in the certification process in Georgia today;
- In 2019, Georgian organic products in the amount of USD 2,018,278 were certified and almost completely exported mainly to European Union countries.

National Capacities

Land resources and land users of Georgia:

The territory of Georgia is 69,000 km2, of which 44% are agricultural land, 20% are pastures, 40% are forests and 4% are protected areas; Only 5% of the area is irrigated.

According the data of 2014, there are 642,209 farms in total in Georgia, of which 639,963 are household farms and 2,246 are commercial farms.

Stakeholders and Relevant Agencies:

Ministry of Environment Protection and Agriculture of Georgia;

Environmental and agricultural NGOs;

Local and international organizations operating in environmental and agricultural sectors;

Environmental movements.

Existing policies and instruments for funding

The Government of Georgia has developed the following programs aimed at improving financial access to agriculture for introduction of modern technologies, climate-smart technologies among them:

- Resolution # 622 of the Government of Georgia "On Approval of State Program "Produce in Georgia"" (10.11.2014);
- Decree of the Government of Georgia # 139 "On measures to be taken within the framework of preferential agro-credits and co-financing of agricultural processing enterprises" (27.01.2014);
- Resolution of the Government of Georgia # 56 on the approval of the State Program "Implement the Future".

In addition, international organizations and donors working in Georgia, such as UNDP, FAO, USAID, Brot fűr die Welt, Heks Eper, Austrian Development Agency, etc., contribute to the economic empowerment of Georgian farmers through grants and finance introduction of climate-smart technologies too.

In 2019, the Ministry of Environment and Agriculture of Georgia announced the launch of organic production development support program, but in the same year, but before starting its implementation, this program was suspended due to the refusal of allocation of financial resources from the budget.

Domestic and international markets for climate smart agriculture

- Demand

On the agricultural market of Georgia, the demand for such products that can be considered as climate-smart agricultural production, is growing from year to year. Consumers are increasingly paying attention to the origin of products, abandoning genetically modified food and preferring products grown without the use of chemical fertilizers. In addition, the quality of imported agricultural products does not meet the requirements of consumers, who may pay a higher price for local products. This is partly due to the fact that imported agricultural products are represented by high-yielding and industrial varieties, which are intended for transportation over long distances, which, obviously, negatively affects the taste of products.

The organic market in Georgia is only in its infancy stage. Most local producers, in order to save money, apply for organic certificate for export-only and sell uncertified products in the local market as organic products based on personal trust and direct advertising, which in some cases is not true.

- Suppy

Imported products occupy a large share of the Georgian agricultural market, and this applies to almost all segments of foodstuff. The main importers of primary agricultural products are

Turkey, Iran, Egypt, Ukraine, Central Asian countries, Brazil, and importers of processed products are Ukraine, Russia, Turkey, Iran and European countries.

Along with other products, organic products are also imported into the country, but this is not done purposefully and they are included in a wide range of other products imported into the country, or because of the relatively low wholesale price.

It is not possible to determine the exact supply of local organic products on the market due to the fact that in the absence of an organic market, farmers applying organic methods do not certify their products in order to reduce costs. The results of the 2019 survey show that Georgian farmers applying organic methods produce and sell products worth about GEL 7,000,000 on the spot.

- Competition

Food products imported into the agricultural market of Georgia occupy a significant market share, namely:

- The share of imported wheat is 77%;
- The share of imported milk and dairy products is 19.9%. It should be kept in mind that in statistical data, products made in Georgia from imported raw materials are also considered as Georgian products, and the volume of these products makes up a significant share of the total;
- According to statistical data, the share of imported meat products is 56%. In this case, like dairy products, meat products made from imported frozen meat are considered as Georgian products.

This market situation is conditioned by the agrarian sector of Georgia, where the main producers are small household farms - mostly self-sufficient. Consequently, Georgian agricultural products, which mainly depends on imported agricultural inputs (which, due to the devaluation of the Georgian currency, constantly increases costs) and is characterized by low yields and high costs, does not ensure its competitiveness.

Benefits of Climate Smart and Green Agriculture practices

The introduction of climate-smart agricultural practices in Georgia can have the following positive results:

Socio-economic:

- Increasing the income of farmers;
- Increasing agricultural sector productivity;
- Development of the agricultural sector;
- Effective resource management in agriculture;
- Reduced migration.

Physical:

- Mitigation of climate change;
- Decreasing the speed of agricultural land decline;
- Reducing the shortage of water resources;

- Decreasing average annual temperature rise;
- Decreasing the change in precipitation regime;
- Improving access to water;
- Reduction of force majeure circumstances: decreasing frequency and intensity of floods, landslides and avalanches;
- Reducing the change of climate zones.

Environmental:

- Reduction of greenhouse gas emissions;
- Climate change mitigation;
- Reduction of soil, water and air pollution.

Challenges before the implementation of CSA practices

The main challenges before the implementation of climate-smart practices are:

- Low-yield agriculture;
- Uncontrolled application of chemical fertilizers and plant protection means;
- Low level of public awareness about climate-smart technologies;
- Shortage of qualified personnel;
- Low competitiveness of Georgian products compared to imported ones;
- Reduction of agrarian biodiversity.

5. Climate-smart agricultural practices and crop models in Georgia (BSB partner country)

General Overview

The study showed that farmers have very little awareness of climate-smart agriculture. However, the components and technologies of climate-friendly agriculture are used and are becoming more widespread in the country. The reasons of this are the following:

- Water shortage and low level of precipitations caused by climate change in the country, especially in main agricultural regions;
- Increase in prices on production assets;
- Rising prices for agricultural products caused by the rapid growth of the tourism sector, increased food consumption and devaluation of GEL;
- Diversification of agricultural products in accordance with market demand;
- Development of niche product segments in the agricultural market, including for products produced without application of organic / chemical substances;
- Deficiency and high cost of skilled labor force in the country;
- Occupation of 80% of the Georgian agricultural market with imported products;
- Recent policies to stimulate primary agricultural production, including tax incentives for small farmers and agricultural cooperatives, improved access to finances, implementation of targeted programs and projects for facilitation of farm expansion;
- Positive attitude of the population towards environmental issues and healthy lifestyle;
- Still a serious financial shortfall among household farms - the largest share of producers - engaged in agriculture in the country.

Resulting from all the above-mentioned factors, in recent years started the process of introducing climate-smart methods and technologies in agriculture in Georgia that is directly related to the increase of production profitability, low costs and production of high-value products.

Model 1

Production of indigenous wheat varieties

Wheat production was one of the traditional activities in Georgia, and this country is recognized throughout the world as the birthplace of wheat. Five endemic species and more than 150 varieties of wheat are of Georgian origin. However, the production of local wheat in the country ceased in the 1950s, as Georgia was forced to supply three main products to the Soviet market - wine, tea and citrus fruits under the conditions of the Soviet planned economy; Wheat and other cereals were imported into the country from Russia and Ukraine. In regions where wheat was still produced on a small scale, during the industrialization period of the Soviet era, local wheat varieties were replaced by selectively bred industrial varieties that corresponded to the parameters of economic feasibility of that period and gave higher yields per hectare (an average of 6 t / ha). As a result, Georgian wheat remained only in scientific institutes and gene banks. In the 1990s, when funding for central science institutes stopped, local wheat varieties were

threatened with extinction. Since 1996, the Biological Farming Association ELKANA has been implementing a project for the restoration and sustainable use of agricultural diversity. Within the frame of this project, field collections of the Department of Cultural Flora of the Institute of Botany (wheat, barley, flax, chickpea, horse bean, grass pea, Italian millet, etc.) were propagated and disseminated in farms (mainly in Samtskhe - Javakheti, Kakheti and Shida and Kvemo Kartli).

In the process of distribution, local wheat revealed the following main advantages and disadvantages:

Advantages	Disadvantages
1. Increased resistance to unfavorable climatic conditions with low technological support and a guarantee of a stable harvest (2-2.5 t / ha), even when the harvest of industrial wheat varieties completely destructs due to climatic conditions; 2. High taste and nutritional properties of products made from Georgian wheat flour.	1. Low maximum yield (4 t / ha) under favorable climatic and proper care conditions in comparison with industrial wheat varieties; 2. Lack of mechanized capability of harvesting some varieties of wheat.

In parallel with the distribution of seed material, the association periodically held bread festivals, tasting events and farmers' days to raise awareness of farmers and the population about Georgian wheat.

In discussing this model, we must mention the preconditions behind which Georgian smallholder farmers decide to grow wheat:

- Abundance of non-irrigated land;
- The need for crop rotation in the production of vegetables;
- The small size of the plots, which often makes it unprofitable to grow wheat according to the classical technological cycle with the use of mechanization.

Among wheat producers Elkana farmer Anzor Maisuradze, who lives in the village of Nabakhtevi, Khashuri municipality, has expressed his interest in growing Georgian wheat. In the advantages of local wheat, he saw a good opportunity to find his place in the market, which was preceded by the following market situation:

- Dissatisfaction of the population with the quality of industrial bread existed on the market;
- Readiness of consumers to pay more for quality bread;
- Consumer demand for the so-called Ecological product.

To take advantage of these opportunities, at the first stage he had to establish a complete bread production chain, which included cultivation of various varieties of wheat, production of

flour and baking of bread. After the formation and development of a niche market, he now sells only wheat and flour to small bakeries who offer the consumer exclusive products.

The economic benefits of growing local wheat varieties on small farms compared with industrial varieties can be seen using the following data:

Local wheat	Industrial wheat
Minimal volume of harvest – 2 t/ha Minimal price (grain) – 2 GEL/kg	Maximal harvest volume in small farms without technological process - 1.7 t / ha Maximal price (grain) – 0,75 GEL/kg
Minimum income per hectare - 4000 GEL/ha	Maximal income per hectare - 1275 GEL/ha

At the same cost, the economic benefit from climate-smart model reaches about 200%.

Model 2

Production of tomato seedlings in the village of Mejvriskhevi, Gori municipality

To explain this model, a general overview of the vegetable market is needed, in particular the trends in the tomato market. The tomato market is characterized by a sharp seasonality, which directly affects the price of this product and depends on the following factors:

- Most of the tomatoes are grown in the Shida Kartli and Kvemo Kartli regions of Georgia in the open field;
- Early and late tomatoes are mainly grown in so-called “cold” greenhouses (no heating) in the subtropical regions of Georgia, in the municipalities of Kvemo Imereti (Kutaisi and Samtredia) and Kakheti (Lagodekhi). The existing production is small and cannot fully meet the demand;
- Georgian off-season tomatoes mainly compete with tomatoes grown without heating in neighboring countries (mainly in Turkey), which are imported into Georgia on the basis of a preferential customs regime. Greenhouse tomato production in Turkey is large-scale and also subsidized, the climate is warmer than in Georgia and therefore the imported product is very competitive with local products.

Georgian tomato production, as a rule, lags behind imported ones by a month. It ripens when the prices are falling. Usually, during the period of mass ripening of local tomatoes, imports are stopped due to high transport and logistics costs. The following factors should also be considered:

- As a rule, the mass release of tomatoes to the local market in Georgia begins in July;
- At the beginning of tomato harvesting, the selling price is reduced by 2-3 times;
- Tomatoes are harvested until October when temperatures begin to decrease.

In the farm of Leri Tsitsagi, a small farmer in Gori municipality, was introduced a production method that would help increase production during periods of relatively high market prices. Like almost every small Georgian farmer, Leri Tsitsagi had a serious financial deficit to achieve this goal. In addition, climatic conditions were a serious challenge - the danger of a sharp drop

of air temperature in early spring - due to the location in the foothill zone and the flow of cold air from the valley during this period.

In this situation, the following decision was made:

- Arrangement of 100 m^2 greenhouse;
- Production of tomato seedlings in cassettes in a greenhouse farm;
- Organize seedling cultivation in such a way that almost fully-grown plants can be moved to open ground as soon as the danger of a drop in temperature disappears.

After this, the example of the climate-smart model had the following form:

- Using 80% of the greenhouse area, 37,000 seedlings could be grown in a 100 m^2 greenhouse with a single-tier cassette layout;
- Seedling growth period was 25-30 days ahead of traditional growth period;
- Plants transplanted into the ground ripened 20-25 days earlier than plants planted in the traditional way.

This model gave the following economic effect:

- Growing period increased by 25%, which increased the yield by about 20%;
- the ripening period of 20% of the additional harvest coincided with the period when the selling price (due to the peculiarities of the year) was 140% higher than the seasonal price;
- With a one-time small investment, this model brought farmers 32% more annual income.

Model 3

In the farms

In the frame of Agrarian Biodiversity Program the Biological Farming Association ELKANA works for the conservation of indigenous varieties of legumes (cowpea, grass pea, chickpea and faba bean). Propagation of seeds for distribution among farmers on the demonstration plot of Elkana "Grain Ark" (village Tsnisi, Samtskhe-Javakheti), takes place anually. Local residents, if interested, can take a few amount (kg) of seeds free of charge under the agreement, provided that they return 1.5 portions of the harvest afterwards to the common "ark" to involve other farmers in the conservation program.

Legumes have an important place in the diet of the Georgian population for a long time. This protein-rich food successfully replaces meat and is used in many traditional dishes. During the development of industrial agriculture in Georgia, as throughout the Soviet Union, emphasis was made on monocultures, and the choice was made in favor of haricot, that could be more easily grown and harvesting using mechanization. It almost completely replaced traditional legumes. The cultivation of beans did not have a large scale in the industrial production of Georgia. It was grown mainly in small household plots, and in rare cases - in a mechanized way for crop rotation.

Legumes remain popular to this day and are in steady demand. In addition, during certain periods, there is a sharp increase in demand for this product, which coincides with the periods

of fasting, which is followed by a large part of the population of Georgia. It is also noteworthy that over the past 10-15 years, when the economic situation of the population has improved, consumer demand has also changed, and the need arose to diversify the market. This trend was also reflected on legumes, which were repeatedly presented to consumers at various presentations or tasting events in the framework of the project "Sustainable conservation and use of agricultural biodiversity", where they were highly appreciated.

The Biological Farming Association ELKANA supported the establishment of a niche market for local legumes and a direct offer of various legumes to target consumers.

As a result, more than 40 farmers are already growing and distributing local legumes today. An incentive is the difference in prices offered by the market. In the case of wholesale, farmers are paid at least 30% more. When delivered directly to the customer, their profit is increased by 100% compared to haricot production.

Considering that the yield of local legumes is about the same as that of haricot (1.5-2.5 t / ha) and at the same time they tolerate drought better, the financial effect is even higher.

It should be noted that the cultivation of legumes completely depends on manual labor, so they are common only in small farms and household plots, where manual labor is mainly used. However, on small farms, legumes diversify production, increase soil fertility and generate additional income for farmers.

Model 4

Drip irrigation systems

The process of introducing drip irrigation systems in Georgia was going very slowly for a long time for the following reasons:

- Low cost for using water resources;
- Farmer mentality - Georgian farmers were convinced, and in some regions still believe, that natural precipitations is enough to get harvest;
- Small size of farms;
- Low cost of labor force.

Recently the situation has changed a lot, and the use of drip irrigation systems has become one of the most widely used technologies, which was facilitated by the following factors:

- Expansion of farms;
- Water shortage that in some cases makes impossible timely irrigation of plots;
- Cultivation of industrial, especially perennial crops;
- Distribution and introduction of mechanization and modern agricultural machinery in agricultural production;
- Raised costs of labor force;
- Increased competition on the agricultural market;
- Reducing the number of employed labor force;
- Increase of productivity;

- Reduction of needed water resources;
- Timely irrigation;
- Reducing the cost for application of production means (fertilizers).

In addition, the widespread use of drip irrigation systems is also facilitated by agricultural development programs and projects that are implemented or are being implemented by the state, international and non-governmental organizations. Under these programs and projects, in order to receive some assistance to expand their agricultural production, farmers must invest or co-invest in the purchase and installation of a drip irrigation system.

This process began with the cultivation of perennial orchards and today extends to the vegetable sector, regardless of traditional, organic or other production standards.

As a result, drip irrigation systems are widespread in almost all regions of Georgia and have become an integral part of modern agricultural production. This has been largely aided by improved technology, lower prices for irrigation systems, and increased yields for at least 40% using these systems, which in some cases have reduced the return on investment to one year.

Model 5

Production of organic humus (vermicompost)

Attempts to produce vermicompost using vermiculture in Georgia began in the early 2000s, but significant results were achieved only in the last 2-3 years. The reasons of the process stagnation were the following:

- Shortage of local production and deficit of agricultural products on the market;
- Low purchasing power of the population and high demand for cheap products;
- Shortage of information among farmers and the population about the negative impact of chemicals on human health;
- Broad promotion of agricultural production expansion by conventional methods.

Today, more and more consumers are paying attention to the origin of food and its production methods and more farmers consider this. In addition, greenhouse farms are widely developed, where farmers see the negative results of using untreated manure. These factors have increased the demand for vermicompost. It is worth noting that the majority of Georgian farmers own diversified farms, where, in addition to plant growing, they are engaged in animal husbandry, and the issue of efficient use of their own farm resources is becoming more and more urgent in the face of rising prices and market competition.

These factors coincided with the project implemented by IFAD, ARDA and ELKANA. In the frame of this project, demonstration units for the production of vermicompost were established in different regions of Georgia. One of them was organized in the village of Karaleti, Gori municipality, on the site of the farmer Zaza Kharibegashvili.

A vermicompost production area of 60 m^2 was organized, for which a special building of sandwich panels was built. In the frame of the project, 20 kg of local worms were purchased for processing of manure.

Demonstration of the farmer's work results and the financial results aroused great interest among the farmers who visited the model farm during the demonstration and study tours.

The financial results were the following:

- The cost of vermiculture sold by a farmer within 17 months (including winter, when productivity is significantly reduced), reached 15,000 GEL (price in 2020 - 1 GEL / kg). It should also be noted that in 2021 the selling price is 1.2 GEL / kg;
- The cost of additionally sold worms by the farmer was 12,000 GEL (120 GEL / kg). 100 kg of worms remained at his disposal for reproduction;
- The additional income of the farm was 27,000 GEL.

The main economic results of vermicompost production, in addition to financial, are:

- Utilization of 25-30 tons of manure;
- 17 tons of high quality, virus free fertilizer.

6. Conclusions

From the analysis of study of the agrarian sector of Georgia, we see that:

- The agricultural sector of Georgia mainly consists of small household farms - over 90%;
- Application of mineral fertilizers is decreasing (over the past 4 years it has decreased by 26%);
- Agricultural land makes up 44% of the territory of the country, while only 5% of the territory of Georgia is irrigated;
- The process of migration of people from rural areas continues and this trend is stable;
- The share of agricultural activities in the income of the rural population is only 5.5%;
- Imported products occupy a large share of agricultural market of Georgia.

Summary of the results of individual surveys of the population and farmers:

Based on the results of individual surveys of the population across the country, it can be concluded that the population logically links climate-smart agriculture with global environmental processes and agricultural development, despite the fact that most of them are not familiar with the concept of climate-smart agriculture.

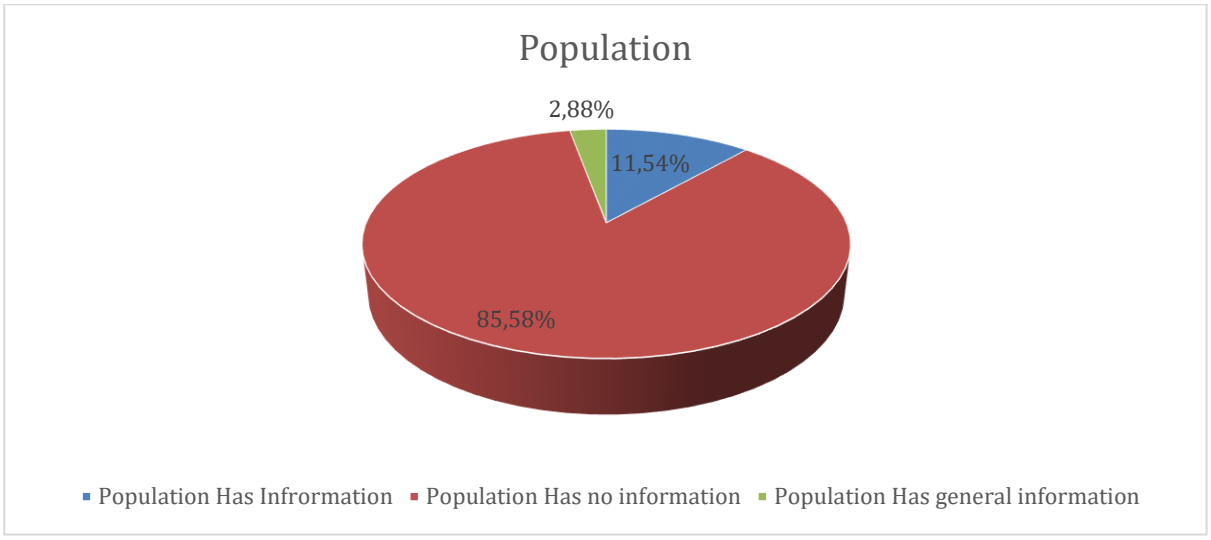
At the same time, the support of climate-smart agriculture is associated with agriculture and consumer-related hopes: improving the economic situation of farmers and providing the population with healthy products.

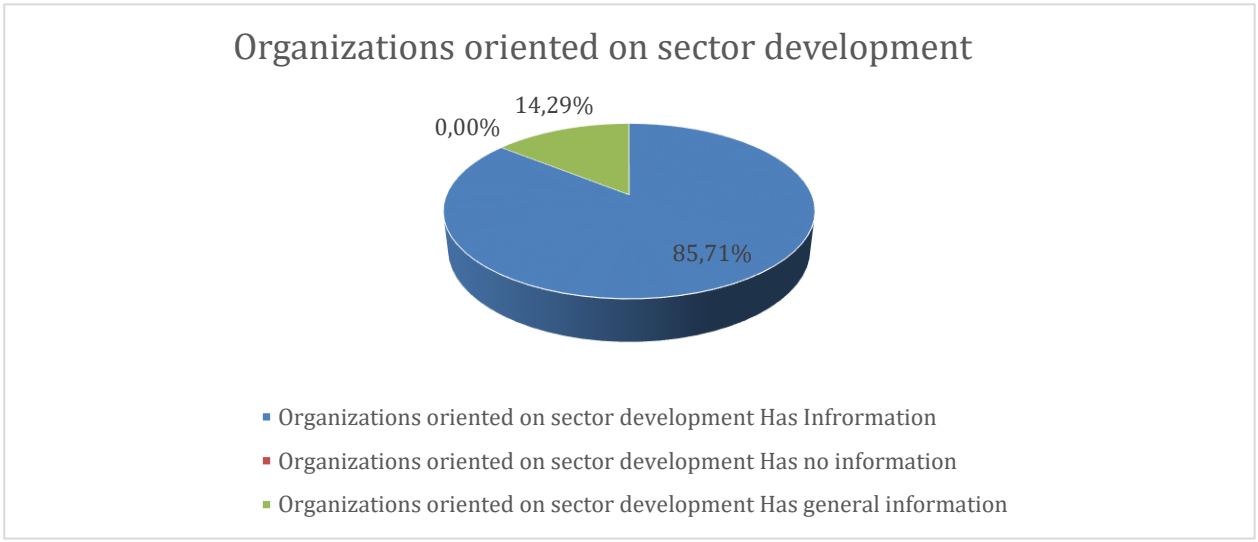
It is logical to conclude that the population has a positive attitude towards the development of climate-smart agriculture, and the concept of implementation of these approaches should include the following messages:

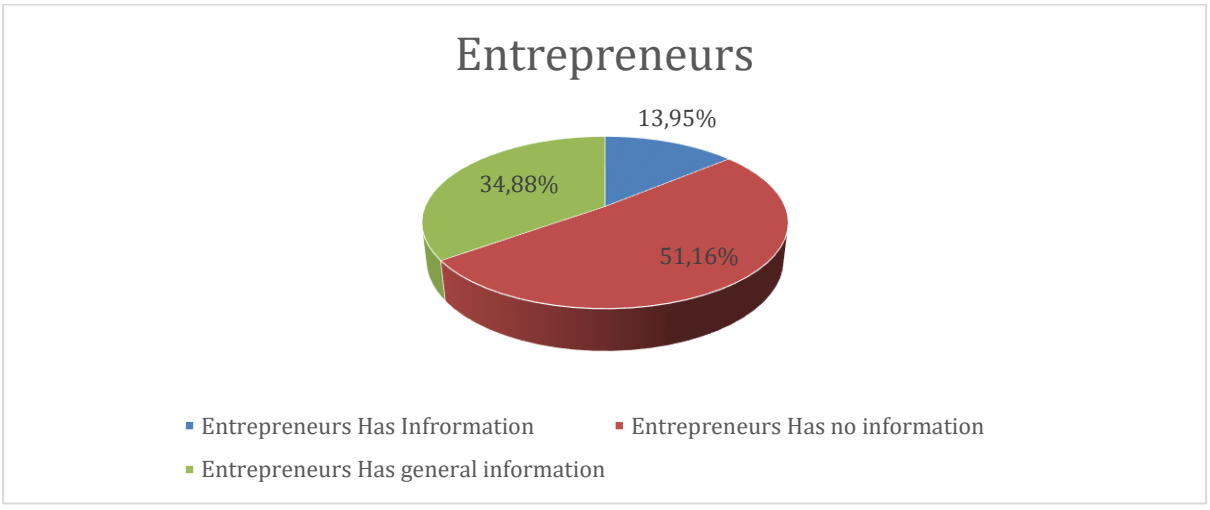
- Preserve the ecological environment;
- Provision of healthy products;
- Improving the conditions of farmers;
- Provide consumers with reliable product information and guarantee product quality.

Summary of the survey results of the organizations operating in agriculture and rural development

The survey of agricultural and rural development organizations across the country shows that the level of awareness of climate-smart agriculture in Georgia depends on the category of respondents. There is a significant difference between these categories.


Population
2,88%
11,54%
85,58%
Population Has Infrormation
Population Has no information
Population Has general information


Organizations oriented on sector development
0,00%
14,29%
85,71%
Organizations oriented on sector development Has Infrormation
Organizations oriented on sector development Has no information
Organizations oriented on sector development Has general information


Entrepreneurs
13,95%
34,88%
51,16%
Entrepreneurs Has Infrormation
Entrepreneurs Has no information
Entrepreneurs Has general information

Charts 6.1 – 6.3

Only the management personnel of agricultural and rural development organizations is well-informed about the information on climate-smart agriculture. The population, as well as farmers and companies working in the field of agriculture, do not have any information about this or have only a general idea. Country policies for climate smart agriculture are considered weak and formal, and information about specific documents for implementation of these approaches in the country is limited to information provided by donor-funded research or presentations on the development of policy documents. It should also be noted that this fact is either denied, or left without comment by representatives of state organizations. Most of them believe that the state pays due attention to climate-smart agriculture issues and think that it is enough that climate-related agriculture issues are included in the strategic documents. At the same time, development of climate-smart agriculture is considered inevitable, and it is recognized that the country has the resources and potential for this.

It should also be noted that in implementing climate-smart agricultural approaches the following main challenges are recognized:

- Raising awareness of population and all people/organizations involved in agricultural activities on climate-smart agriculture;
- Investing in implementation of climate-smart technologies;
- Implementation of climate-smart agriculture practices;
- Involvement of the population and key stakeholders;
- Critical shortage of qualified personnel.

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Joint Operational Programme Black Sea Basin 2014-2020
Biological Farming Association Elkana
April 2021
Joint Operational Programme Black Sea Basin 2014-2020 is co-financed by the European Union through the European Neighbourhood Instrument and by the participating countries: Armenia, Bulgaria, Georgia, Greece, Republic of Moldova, Romania, Turkey and Ukraine.
This publication was produced with the financial support of the European Union. Its contents are the sole responsibility of Biological Farming Association Elkana and do not necessarily reflect the views of the European Union.