Interreg
EUROPEAN UNION
Balkan-Mediterranean
BalkanRoad

Towards farms with zero carbon-, waste- and water-footprint. Roadmap for sustainable management strategies for Balkan agricultural sector

PROJECT DELIVERABLE

Project Partner:	Association of Agri-Environmental Farmers, Bulgaria – PP5
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Extended Summary

As a component of the INTERREG BalkanROAD project, an in-depth GAP analysis was conducted to define and evaluate the gaps for adoption of sustainable agricultural and product processing practices in Bulgaria. Within the scope of this analysis, the most crucial gaps were defined and further evaluated as follows:

• Valorizing the current situation of the agri-business sector and identifying the gaps for its sustainable improvement
• Identifying the key-issues restraining the expansion or implementation of sustainable agriculture
• Identifying the approach of the farmers towards applying sustainable agricultural practices
• Assessing the agri-production chain and its related market as well as identifying emerging trends and insights for trade opportunities (import/export) and
• Assessing the status of digitalization of the farmers/market representatives/other target groups and quantifying the benefits arising from facilitating the dissemination of information

The analysis started with a literature review (step 1) followed by an in-depth survey (step 2). The third step (Gap assessment) assessed the gaps identified in steps 1 and 2 for their relevance and/or impact to Gap objectives.

The analysis was designed for two key target groups to gauge their opinions, concerns and priorities regarding agri-business behavior to resources and waste management as well as future implementation of environment friendly technologies in the agricultural sector in Bulgaria. The first target group (TG-1) was composed of two groups: managers/heads of farmer cooperatives/agronomists serving as links between the government and the farmers including individual farmers/producers of different agricultural products. The second target group (TG-2) consisted of policy makers and regional authorities, such as leaders and heads of local and national authorities, decision makers, state agencies and other stakeholders.

After the completion of the literature review, an e-survey took place between March and May 2018. In total, 13 farmers / representatives from the agribusiness and 5 policy makers from Bulgaria participated in the survey by filling in the respective e-questionnaires.

The main findings of this survey indicate the urgent need for education/training of farmers/enterprises designed to cover the needs of TG-1 in a holistic way. Many of the obstacles for producers to implement sustainable practices, as identified by TG-1 were: lack of information flow from the competent authorities to producers, lack of support from governmental agencies, poor information, poor support from local agronomists, and weak support for orienting sustainable agriculture products to the market.

Considering the prevailing conditions of European and international market competition, the big share of farmers enterprises that do not have a business plan is without doubt a significant weakness of the sector.

Encouraging finding is that 92,3% of farmers consider that sustainable best practices are important at farm level and thus express their definitive intention to continue applying such practices or to begin applying them, where the process is not yet started.

By comparing and analyzing the answers of the TG-1 and TG-2 and considering also that the predefined answers structure a favorable environment for farmers and agribusinesses to shift to sustainable practices, it is concluded that a reforming of the current policy is required. In order the reforming to be effective and reach the anticipated targets, policy makers should take into consideration the weaknesses of the TG-1, as these were recorded in this GAP analysis.

Considering the importance of the subject, the limited adoption of the current policies and the limited information that producers have about current policies and practices of sustainable agriculture, it can be summarized that the processes at the level of policy making do not provide policy makers with the appropriate qualifications to cope with the specific issue's demands.

Governmental structures should improve their communication with farmers, reduce bureaucracy burden and support producers with training and advice in the implementation of sustainable practices.

1 Introduction

1.1 Current status – Purpose of GAP analysis

The situation in the Balkan region

Nowadays, the Balkan region faces a big challenge to develop a genuine economic model for long-term growth that is both efficient and environmental/eco-friendly. In this context, the Western Balkan countries, such as FYROM (Former Yugoslav Republic of Macedonia) and Albania can be characterized by their shared goal for rapid accession to the EU. On the other hand, due to recent economic crisis within EU, the rest of the Balkan countries i.e. Greece and Bulgaria along with Cyprus are struggling to recover and regain economic credibility and growth. To this end, **agriculture** is an important element to achieving both target goals while maintaining sustainability.

However, the existing agricultural enterprises in the Balkan region are mostly based on producing, delivering and capturing economic value, with limited or no attention to the other two pillars of sustainability i.e. environmental and social. As a result, the Balkan agri-sector needs to be strengthened in terms of adopting sustainable agricultural and product processing practices. This will improve trade opportunities, particularly the export of agri-products as well as also open up employment opportunities.

Gap Analysis offers a scientific-based approach for evaluating the current status of businesses and their actual performance and, in turn, identifying the necessary improvements required to close the gap and reach the desired, future level of performance. In order to achieve the aforementioned goal, it is necessary to evaluate the four fundamental key business areas, namely Strategy, Systems, Processes and People and compare the outcomes to defined baselines. In this sense, an in-depth GAP analysis was conducted as a component of BalkanROAD (WP3) focusing on the agri-business sector of 5 countries (Greece, Albania, FYROM, Bulgaria and Cyprus). The methodological strategy of the GAP analysis targets at representatives of national/regional/local authorities, farmer associations, private agribusinesses, educational sector, consumers, and environmental associations. The Gap Analysis presented below is only for Bulgaria and will be integrated with the Gap Analyses of Greece, Albania, FYROM and Cyprus in a common Gap Analysis. This integrated **GAP analysis will act as a basis (background knowledge/ inventory) for further development** (next steps) of the future Actions of the WP3 (LCA, SWOT) and WP4 that will be implemented during BalkanROAD in order to finally meet its objectives.

The situation in Bulgaria

With good natural resources, Bulgaria's low agricultural productivity (compared to the rest of the EU) would seem to be consistent with a relatively sustainable agriculture. However, the potential for significantly increasing sustainable practices while increasing production is significant. Currently, larger farms (with more than 20 hectares) account for 5 percent of all farm holdings but 95 percent of utilized agricultural land (UAL). Clearly, this is where the focus for sustainable agriculture should be most strongly directed, particularly since these farms are using less traditional practices with significant purchased inputs. Small holders (with less than 20 hectare), on the other hand, tend to use relatively more traditional practices where sustainable farming was more important.

The consolidation of land into larger farming units means that there is a strong focus on increased production and income with less regard for sustainable practices in the short term. While crop rotation is practiced, it is less than optimal for the maintenance of soil quality. On the other hand, the fallow requirement that is part of the CAP program is encouraging the more "at risk" and lower productivity land is be set aside in fallow.

Certified organic farming is small but growing rapidly. In 2016, organic control system areas occupied 3.2 percent of the total utilized agricultural land, up from 2.4 percent in 2015. This is important both for sustainable farming as well as for generating higher prices and incomes. This serves as an example of sustainable farming for other farms as well as providing increased knowledge of sustainable practices. Currently, most of the output of organic farms is exported. Organic farming allows the output to be differentiated from other production and allows for branding.

1.2 Scope of the deliverable

Within **the scope of the present GAP analysis**, the most crucial **gaps** for adoption of sustainable agricultural and product processing practices in Bulgaria under study will be clearly defined and further evaluated by

- Valorizing the current situation of the agri-business sector and identifying the gaps for its sustainable improvement that still remain
- Identifying the key-issues of expansion or implementation of sustainable agriculture
- Identifying the approach of the farmers towards applying sustainable agriculture practices
- Assessing the agri-production chain and its related market as well as identifying emerging trends and insights for trade opportunities (import/export) and
- Assessing the status of digitalization of the farmers/market representatives/other target groups and quantifying the benefits arising from facilitating the dissemination of information

2 GAP Analysis

2.1 A brief history - Definitions

The term **"Gap Analysis"** was firstly introduced by Scott in 1982 in order to explore more systematic and efficient strategies to conserve biodiversity in Hawaii by identifying priorities for species and habitat types (Scott et al., 1987). Since its first reference, Gap analysis has

gained a plethora of meanings depending on the particular field or industry that is applied e.g. policy gap analysis (Hoberg et al., 2016), yield gap analysis (Hochman et al., 2016), service gap analysis (Saraswati, 2015), environmental gap analysis (El Ammari et al., 2015), data gap analysis (Andréfouët et al., 2015) etc.

So far, the most widely accepted definition of Gap analysis is that concerning business strategy i.e. "A way to compare current conditions and practices in order to identify gaps and areas in need of improvement with regards to compliance to the relevant standards". Nowadays, Gap analysis has been extensively used by several businesses, firms and even organizations such as Food and Agriculture Organization of the United Nations (FAO), World Health Organization (WHO), International Water Association (IWA) and others in order to analyze certain processes of any division of their organization. It is therefore evident that a Gap analysis is not a stand-alone task but an integral part of a project that strongly connects its current procedures and operational structures with long-term planning and implementation.

2.2 Existing methodological approaches for GAP

According to Scott (2000), the need for GAP analysis can be summarized by four key questions:

1. Where do we stand today in the area of concern?
2. Where are we headed?
3. Where do we want to go?
4. How will we get there?

However, Gap analysis is a flexible tool that can be easily modified to fit the specific needs and risks of a project. In this context, several methodologies for conducting environmental-based GAP exist in the literature. Common elements of these types of gap analysis methodologies include evaluation of the current status of the existing element under review, determination of the desired future status of the target element, and development of steps to bridge that gap.

Some approaches reported in relevant literature are given below (Mauree and Geneletti, 2016):

- **Environmental Scan methodology.** Environmental Scan is "an analysis and evaluation of internal conditions and external data and factors that affect the organization. This analysis is often used to establish a framework for planning". In workforce planning, environmental scan helps an agency develop the understanding of the internal and external environment needed to determine whether the business needs of the agency are in sync with the availability and competency of the workforce. Environmental scan was originally applied to evaluate business management by gathering information from the environment to give themselves a competitive advantage. Environmental scan methodology is now widely used by the public and private sector as part of any strategic or business planning process. It can help an agency to shape its workforce plan in response to rapid workplace changes and create a vision of future workforce. For example, environmental scan can assist a Human Resources manager to understand the availability and competency of the available workforce and the factors that may be important in the recruitment and retention of the workforce.

- **SWOT analysis methodology.** SWOT analysis is a strategic planning tool used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a project, a business venture or in any other situation requiring a decision (Johnson et al., 2005). Strengths and weaknesses are internal to an organization. Opportunities and threats relate to external factors (Johnson et al., 2005).
- **PESTLE methodology.** PESTLE analysis provides a framework for investigating and analyzing the external environment for an organization. The framework identifies six key areas i.e. political, economic, socio-cultural, technological, environmental (or ecological), and legal that should be considered when attempting to identify the sources of change. In the case of an environmental-based analysis, for example, factors arising from concerns about the natural (or Ecological) affects are primarily evaluated including 'green' issues, such as concerns about packaging, pollution and other related issues.

2.3 Methodology adopted in BalkanROAD for GAP analysis

As a component of BalkanROAD, an in-depth Gap analysis was conducted to define and evaluate the gaps for adoption of sustainable agricultural & product processing practices. This involved a multi-step process as shown in Figure 1.

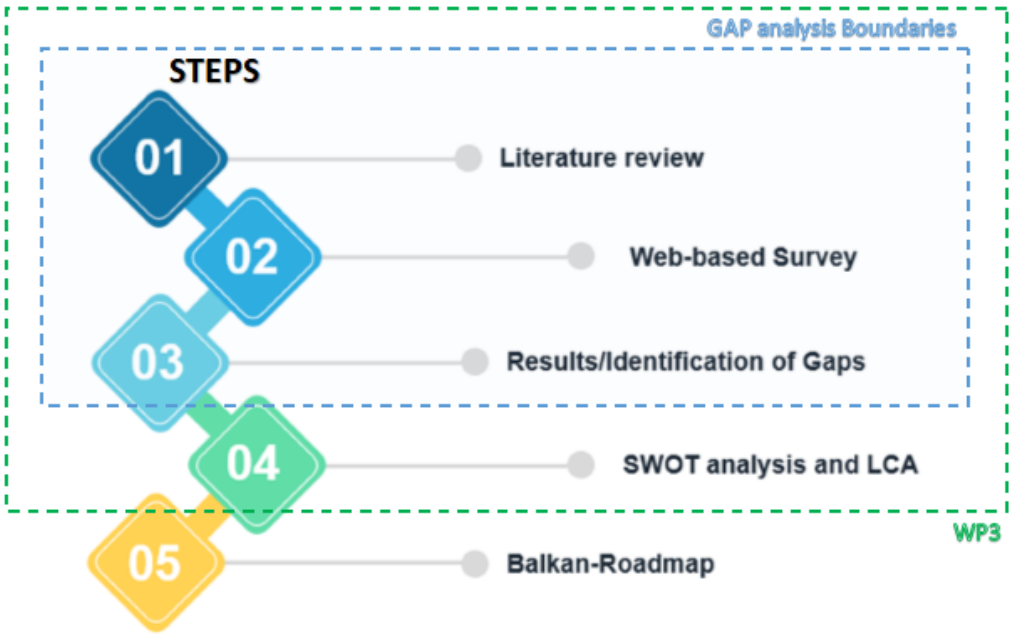

Figure 1. Methodological steps of GAP analysis adopted in BalkanROAD.

In the 3rd methodological step (Gap assessment), the gaps identified in steps 1 (literature review) and 2 (in-depth web survey) are assessed in terms of their relevance and/or impact to the Gap objectives. The obtained GAP results provide the knowledge background for both the SWOT analysis and LCA that are implemented in the WP3. In WP3, issues of current research and of future needs for research are extracted for Bulgaria and integrated with results from the 5 countries under study. This will comprise the roadmap dimensions and topics of interest for the overall success of the BalkanROAD project.

2.3.1 Literature review for GAP

In order to cover the initial requirements for GAP analysis, a focused literature review (step 1) was performed to obtain the current status (baseline) of Bulgaria in terms of statistical

and economic data, information regarding climate change and agriculture, penetration/impact of IT in agriculture, and the setting of national targets for agriculture.

In this context, a variety of web- and hard copy-based resources were examined, including academic sources, peer-reviewed journal articles along with publications of central and provisional governments and related organizations.

2.3.2 GAP Survey

The GAP survey (step 2) was designed to elicit the views of two different target groups (policy makers and farmers) related to BalkanROAD. The survey primarily consisted of multiple choice/check-box style questions administered over the web with opportunities to supply additional commentary. In order to maximize participation/response rate, the survey was designed to take 10 minutes or less to complete.

2.3.2.1 Development of web based application for GAP analysis survey

The GAP analysis survey questions and answers organized in proper form in order to develop a web-based application using XLS Forms and Survey123 for ArcGIS, hosted in BPI's ArcGIS online for Organizations. The questions were divided between those addressed to policy makers and those to producers and agribusiness. The possible answers to each question were predefined as values on the XLS Forms (Figure 2). An ArcGIS account created in ArcGIS online with user level credentials for submitting and analyzing data.

	A	B	C	D	E	F	G	H	I	J	K	L
1	type	name	label	hint	constraint	constraint_message	required	required_message	appearance	default	readonly	relevant
2	note	generated_note_surveyDescription		Which are the obstacles that prevent agribusinesses to adopt alternative and environment friendly practices?								
3	select_one list_0	field_20	Choose your profession				yes	This is a required question - Choose your profession	horizontal	choice1		
4	select_one list_1	field_11	Country				yes	This is a required question -	minimal			
5	date	field_13	Date of submission				yes	This is a required question -		today()		
6	begin group	GQ	General questions									
7	select_multiple list_5	field_69	Which is your field of policy making				yes	This is a required question -	r horizontal-compact			${field_20}='choice0'
8	text	field_69_other	Please specify									selected(${field_69}, 'Other')
9	select_one list_51	field_70	Please indicate your sector				yes	This is a required question -	horizontal			${field_20}='choice0'
10	select_one list_3	field_14	Age						horizontal			${field_20}='choice1'
11	select_one list_4	field_15	Education level						horizontal			${field_20}='choice1'
12	select_one list_5	field_19	How many years of experience do you have in agriculture?				yes	This is a required question - How many years of experienc	horizontal			${field_20}='choice1'
13	select_one list_6	field_21	How many hectares do you farm?				yes	This is a required question - How many hectares do you fa	horizontal			${field_20}='choice1'
14	select_multiple list_7	field_22	What types of crops do you cultivate?				yes	This is a required question - What types of crops do you c	horizontal			${field_20}='choice1'
15	text	field_22_other	Please specify									selected(${field_22}, 'Other')
16	select_multiple list_8	field_23	Which are your marketing outlets?				yes	This is a required question - Which are your marketing ou	horizontal			${field_20}='choice1'
17	text	field_23_other	Please specify									selected(${field_23}, 'Other')
18	select_one list_9	field_24	How many employees do you occupy?				yes	This is a required question - How many employees do you	horizontal			${field_20}='choice1'
19	select_one list_10	field_25	Are you familiar with information and communication technologies (ICT)?				yes	This is a required question - Are you familiar with informa	horizontal			${field_20}='choice1'
20	select_multiple list_1	field_26	What challenges do you face in improving your production and marketing of your products?				yes	This is a required question - What challenges do you face	horizontal			${field_20}='choice1'
21	text	field_26_other	Please specify									selected(${field_26}, 'Other')
22	select_one list_12	field_28	Do you know the reasons for evident climate changes?				yes	This is a required question - Do you know the reasons for	horizontal			${field_20}='choice1'
23	select_multiple list_1	field_29	How are you getting informed on the situation with current environment issues?				yes	This is a required question - How are you getting informe	horizontal			${field_20}='choice1'
24	select_one list_14	field_30	Are you informed about circular economy?				yes	This is a required question - Are you informed about circu	horizontal			${field_20}='choice1'
25	select_one list_15	field_31	Do you plan to introduce re-use of water, green energy, decrease of energy use, re-use of organic waste				yes	This is a required question - Do you plan to introduce re-u	horizontal			${field_20}='choice1'
26	select_multiple list_1	field_32	Please specify				yes	This is a required question - Please specify	horizontal			${field_31}='choice0'

Required Message
When a required field has no response, this message will appear to prompt for an answer (e.g., Please enter you name. This information is required.).

Figure 2. GAP analysis survey XLS form.

A user friendly smart phone/web App was developed containing single, multiple choice and Likert scale questions as illustrated in Figure 3.

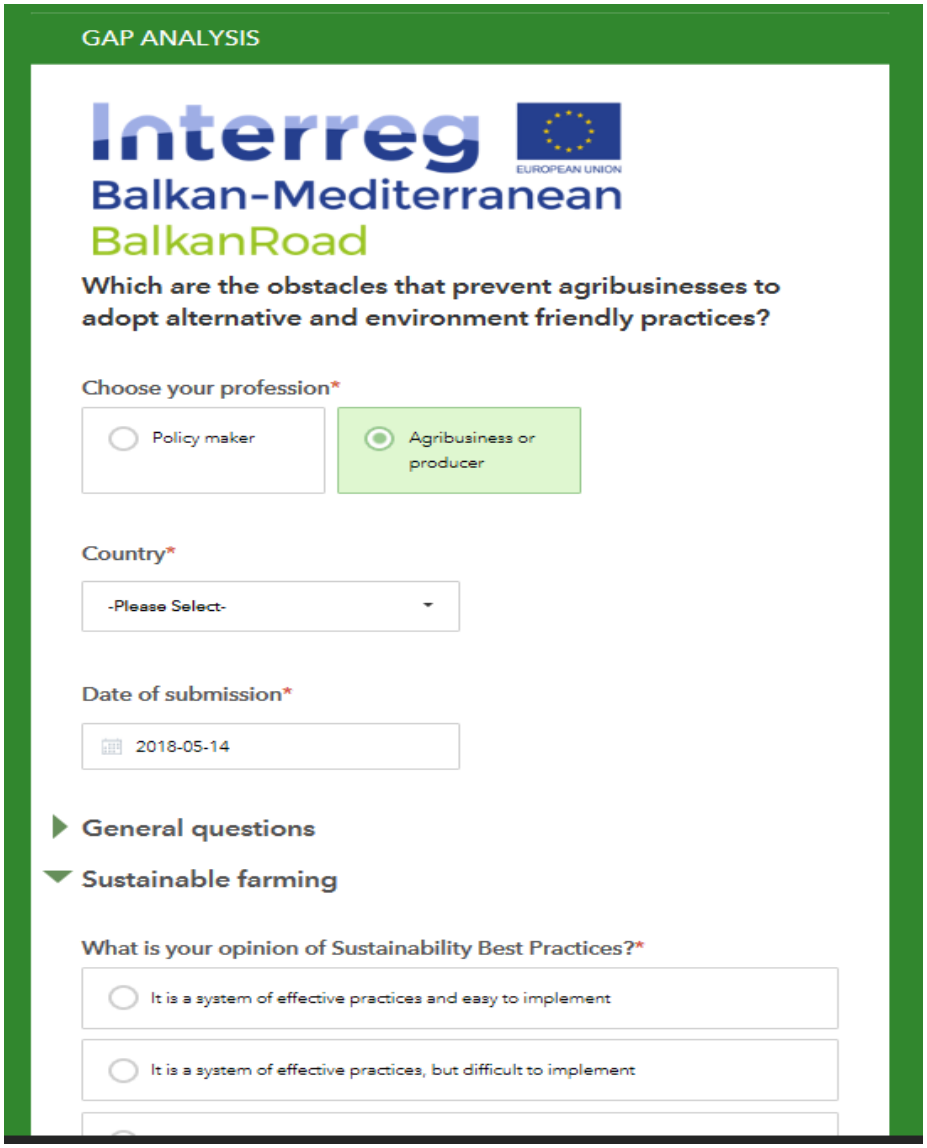

Figure 3. GAP Analysis survey App.

The collected answers were analysed online through the web based survey 123 tools (Figure 4). In addition, the resulting data was exported for further analysis using statistical software (SPSS, Excel, e.tc) (Figure 5).

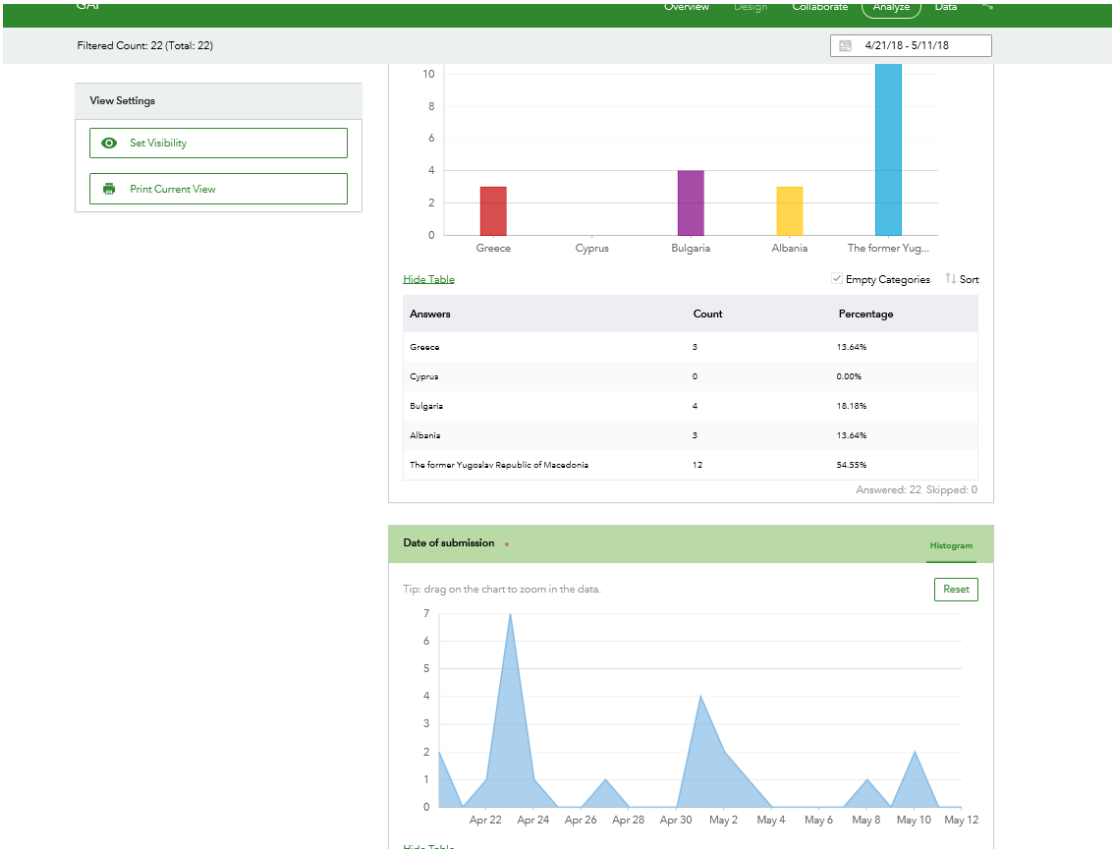

Figure 4. GAP analysis data analysed using web tools

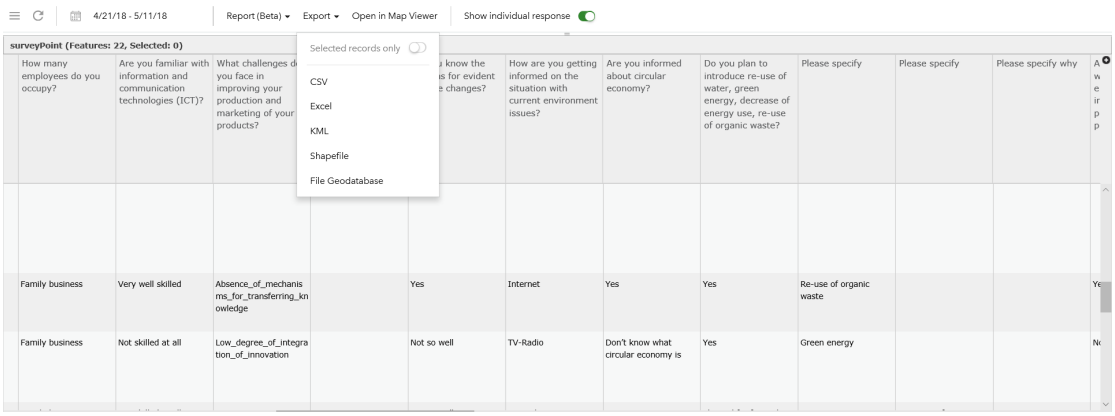

Figure 5. GAP analysis data export.

2.4 Target groups

The GAP analysis was designed for two key target groups to gauge their opinions, concerns and priorities regarding agri-business behavior to resources and waste management as well as future implementation of Environment friendly technologies in the Bulgarian agricultural sector.

The first target group consisted of policy makers and regional authorities such as leaders and heads of public authorities decision makers, state agencies and other stakeholders while the second target group was composed of farmers and managers/heads of farmer cooperatives/agronomists as persons/links between the government and farmers. Multiple agricultural products were represented in the survey.

2.5 Key questions

Depending on each target group assessed, a series of 28 and 47 key questions were used in the survey for the policy makers and the farmers, respectively. These key questions along with their pre-defined answers are provided in detail below (Table 1).

Table 1. Key questions of GAP analysis focused on the two groups under study.

Question	***Choice of Answers***	
1. Choose your profession	- Policy maker	- Agribusiness or producer
2. Country	- Greece - Cyprus - Bulgaria	- Albania - The former Yugoslav Republic of Macedonia
3. Date of submission	Month, XX, 2018	
General questions		
4*. Which is your field of policy making	- agricultural sector - environment - climate change	- business environment and growth - other
5*. Please indicate your sector	- Municipality - Regional Authority	- National Authority
4**. Age	- Younger than 20 - 20-30 - 31-40	- 41-50 - Older than 50
5**. Education level	- Primary - Secondary	- Higher - Post-graduate
6**. How many years of experience do you have in agriculture?	- 0-2 - 2-5 - 5-10	- 10-20 - More than 20
7**. How many hectares do you farm?	- 0-0.1 ha - 0.1-0.5 ha - 0.5-1 ha	- 1-5 ha - More than 5ha
8**. What types of crops do you cultivate?	- Olive trees - Grape Vines - Citrus - Cereals - Vegetables	- Nut trees - Legumes - Pome fruits - Herbals - Other
9**. Which are your marketing outlets?	- Local markets - European markets (export) - International markets (export) - Food industry	- Super markets - Neighborhood markets - Open markets - Other
10**. How many employees do you occupy?	- Family business - 0-2 - 2-5	- 5-10 - 10-50 - More than 50
11**. Are you familiar with information and communication technologies (ICT)?	- Very well skilled - Skilled - Not so well skilled	- Not skilled at all - Don't know what ICT is
12**. What challenges do you face in	- Economic recession	

improving your production and marketing of your products?	- Poor vocational training of human resources - Underdeveloped system of agricultural advisors - Low degree of integration of innovation - Absence of mechanisms for transferring knowledge - High costs - Poor or no national funding incentives - Limited scientific and policy maker guidelines - Other	
13**. Do you know the reasons for evident climate changes?	- Yes - Not so well - No	- Don't know what climate change is
14**. How are you getting informed on the situation with current environment issues?	- Press - Internet - TV-Radio - Local advisors - Seminars	- Subscription to relative newsletters - Different sources within the social network - I am not informed
15**. Are you informed about circular economy?	- Yes - Not much - No	- Don't know what circular economy is
16**. Do you plan to introduce re-use of water, green energy, decrease of energy use, re-use of organic waste?	- Yes - Planned for future but not decided yet - No	
17**. Please specify	- Re-use of water - Green energy	- Decrease of energy use - Re-use of organic waste
18**. Are you acquainted with the environmental impact of currently practiced agriculture production?	- Yes - Not so well - No	- Don't know what environmental impact is
19**. Do you keep up to date with all of national and European laws and regulations?	- Yes - Often - Sometimes	- Rarely - No
20**. Do you comply with all national and European laws and regulations?	- Yes - Often - Sometimes	- Rarely - No
21**. Do you have a business plan for the long-term viability of your farm?	- Yes - Don't know what long viability or, and business plan mean - No	
22**. Do you keep a record of yields, inputs, costs, income and profitability of the enterprise?	- Yes, always - Only the last 5 years	- I plan to do so - No
23**. Did you evaluate the land suitability of your property prior to cultivation?	- Yes - I plan to do so - No	
Sustainable farming		
24**. What is your opinion of Sustainability Best Practices?	- It is a system of effective practices and easy to implement - It is a system of effective practices, but difficult	

	to implement - It is not as effective as conventional practices but is environmentally friendly - It is generally an ineffective system of practices at farmers' level - I don't know what Sustainability Best Practices are	
25/6. Is there an available know-how in your native language about sustainable agriculture?	- Yes - No - I don't know	
26/7. Have your ever received training in sustainable farming practices?	- Yes - Never	
27/8. Yes through?	- Seminars - Practical training at field	- Educational training - Other
28/9. How important is farm sustainability in your region?	- Very important - Important	- Not so important - Not important
29/10. What are the main challenges in agricultural practices for preserving farm sustainability in your region?	- Poor cultivation practices - Poor irrigation practices - Poor fertilization practices - Poor plant protection practices - Poor harvesting practices - Poor post-harvesting practices - Poor processing practices - Poor packaging practices - Other	

Sustainable farming > Which are the obstacles that farmers face towards implementing sustainability practices? Please rate the importance of the obstacle (1 Low – 5 High)	
30/11. Weather	1 -5
31/12. Increased costs	1 -5
32/13. Labor intensity	1 -5
33/14. Poor efficacy	1 -5
34/15. Yield reduction	1 -5
35/16. Crop risk	1 -5
36/17. Complexity of sustainable practices	1 -5
37/18. Management & resources required to adopt these practices	1 -5
38/19. Poor information availability on sustainable practices	1 -5
39/20. Poor support from agronomists and state agencies	1-5
40/21. Marketing effort required in promoting products produced sustainably	1-5
41/22. Is there currently a favorable environment to stimulate adoption of a more sustainable production practices by agri-businesses?	- Yes - No - I don't know
42/23. What hinders the development	- Limited funding for Sustainability Best Practices

of Sustainability Best Practices in your region?	research - National policy without clear and quantified objectives - Insufficient education and training of producers - Lack of favorable governmental policies - Lack of significant economic and other incentives from the State to producers - Low level of education on the topic of local counselors and agronomists - I don't know - Other	
43/24. What incentives may be beneficial for farmers to consider making a shift to 'sustainable farming?	- Additional points in scoring, when I apply under the Rural Development Program - Higher tier payments incentives for consumers to be willing to pay a higher price for goods with an integrated production' label - Less administrative bureaucracy (documents, reporting, etc. according to the regulations in place) to be tackled - Expert advice available at field - Other	
44/25. Are there any available governmental subsidies or favorable financial instruments which agro-businesses can use to switch to sustainable production?	- Yes - No - I don't know	
45/26. Have you exploited national, bank, EU, IFI or another subsidy funding to become more-environment-friendly?	- Yes - No - Though own means	
46/27. Have you been involved in discussions in your Sector or made decisions on Sustainable Agriculture and its adoption by farmers?	- Yes - No	
47/28. What incentives are planned by your sector, for farmers, who will make a shift towards sustainable farming and in what way?	- Financial - Develop a monitoring network and consultants	- Education - Product promotion through the carrier - Other

** only to 1st target group (policy makers)*

*** only to 2nd target group (farmers)*

3 Agri-business background of Bulgaria

Bulgaria is richly endowed with natural resources, including significant arable land with high quality, fertile soils and generally plentiful water. This allows it to produce a wide range of high-value crops and livestock. However, it is challenged by the small size of farms, low levels of formal education and high levels of poverty. As a result, there are significant gaps in social and economic standards between rural and urban areas.

Bulgaria has a total area of 110,994 km^2 and an estimated population of 7.2 million inhabitants. According to the EC definition of "rural" areas, 53.7 percent of the area is classified as predominantly rural with 37.1 percent of the total population. The population density in these predominantly rural areas is 39.3 inhabitants / km^2, which is lower than the EU-28 average of 52.6 inhabitants / km^2 and reflects the significant number of less densely populated, smaller-scale settlements that exist in Bulgaria.

3.1 Statistical data for agricultural production

3.1.1 Agricultural Sector Overview

Agriculture is an important sector for Bulgaria as a result of its favorable geo-strategic, climatic and natural endowments. From its long history, numerous old traditions in both plant-growing and livestock breeding exist. With the extreme polarity that exists in farm size, skills and resources, on-farm productivity is highly variable and commonly falls short of potential, especially as a result of low productivity and low income of the small scale farmers.

The agricultural sector generated 4.4 percent of the total Gross Value Added (GVA) in Bulgaria in 2016. Employment in agriculture and its share in total employment decreased over the period 2010-2015 at an annual average of 1.1 percent. In 2015, 5.8 percent of the total population was employed in agriculture compared to the average 4.2 percent in EU 28 Member States. However, the productivity of this labour force is very low (5,622 EUR / employee in 2015) - less than 30 percent of the EU-28 average and way below countries such as the Netherlands, Denmark and Belgium which have an estimated labour productivity in agriculture of 67,699, 47,945 EUR and 40,195 EUR / employee respectively . In 2013, 36.7 percent of the farm managers in Bulgaria were 65 years old or over and those aged 55 to 64 accounted for a quarter of all farm managers; in comparison, almost 1 in 3 farm managers in the EU were aged above 65.

Bulgaria's rural areas are challenged by the rapid decline and aging of population. Over the course of the last three decades, Bulgaria has become the third oldest country of Europe and its working age population is projected to decline by 40 percent in 2050. The outmigration started in the late 80's and is intensified by negative natural population growth. In particular the youth and potentially active farmers progressively move away from rural settlements, while seeking employment in urban centers of Bulgaria or elsewhere. As a consequence of steady out-migration, the population structure in the rural areas shows an unfavorable age dependence ratios, as the share of people above 65 years of age is above 25 percent.

Box 1: Utilized Agricultural Area (UAA) in Bulgaria

According to the 2013 Farm Structure Survey (Eurostat, 2015), the total area of Utilized Agricultural Area (UAA) in Bulgaria is around 4.65 million ha, representing approximately 42 percent of the total territory. Between 2007 and 2013 the share of irrigated UAA increased significantly in Bulgaria (by 35.8 percent); however total irrigated land was only 3.4 percent of total UAA, less than the EU average of 5.8 percent. In 2013, of the total UAA:

- 70.5 percent (3.27 million ha) was *arable land*: *cereal grains, particularly wheat and spelt, as well as grain maize are the most important crops; field-grown vegetables and horticultural products are also important;*
- 27.3 percent (1.27 million ha) was *permanent grassland and meadow*;
- 2.0 percent (95,000 ha) was *permanent crops*, *notably orchards and vineyards; and*
- 0.1 percent (5,200 ha) was *kitchen gardens*: *these are defined as small plots of arable land or permanent crops growing products intended mainly for own consumption.*

Source: Eurostat, 2015.

Bulgaria has witnessed a significant increase in the average farm size, much faster than the other new Member States. The number of farms decreased by 52.4 percent over the period 2005-12. Among the main reasons for the steep decline are the gradual farm consolidation, the modernization of technologies and the introduction of new machinery. Since EU accession in 2007, the number of farms has halved, but the standard output per farm has quadrupled. There are a total of 254,410 registered agricultural holdings in Bulgaria; the average size of agricultural holdings increased from 5.2 ha in 2005 to 18.3 ha in 2013, a bit higher than the EU-28 average of 16.1 ha.

Table 2. Breakdown of Agricultural Holdings by Standard Output (EUR) Classification

Classification of farm type - YEAR 2013	**Standard Output (EUR)[1]**	**Number of holdings**	**% of total holdings**
Subsistence	< 2,000	140,228	55.11
Semi-subsistence	>=2000 < 8000	78,934	31.02
Small semi-commercial farms	>=8000 < 50,000	26,925	10.58
Medium and Large commercial farms	>=50,000	8,058	3.16
TOTAL	**-**	**254,410**	**100.0**

Source: European Commission Statistical Factsheet for Bulgaria, April 2016.

The Bulgarian Agriculture sector is characterized by a highly polarized dual farm structure. The share of small agricultural holdings is much higher than the EU-28 average. Small farms are important in terms of providing employment and economic activity in rural areas. Small

[1] The Standard Output (SO) of an agricultural product (crop or livestock) is the average monetary value of the agricultural output at farm-gate price, in Euro per hectare or per head of livestock.

holdings are dominant in the disadvantaged and mountainous areas, and in areas with intensive vegetable, fruit and tobacco growing. The small agricultural holdings are considered important for preserving the landscape and local culture. They provide the majority of jobs and incomes in the sector and thus have a vital contribution to a balanced social and territorial development of the country. 72 percent of the total number of farm holdings had a UAA of less than 2 ha, representing approximately 3 percent of the total UAA. In contrast, less than 2 percent of the total number of farm holdings were large commercial farms (with more than 100 ha UAA) and totaled approximately 80 percent of the total UAA.

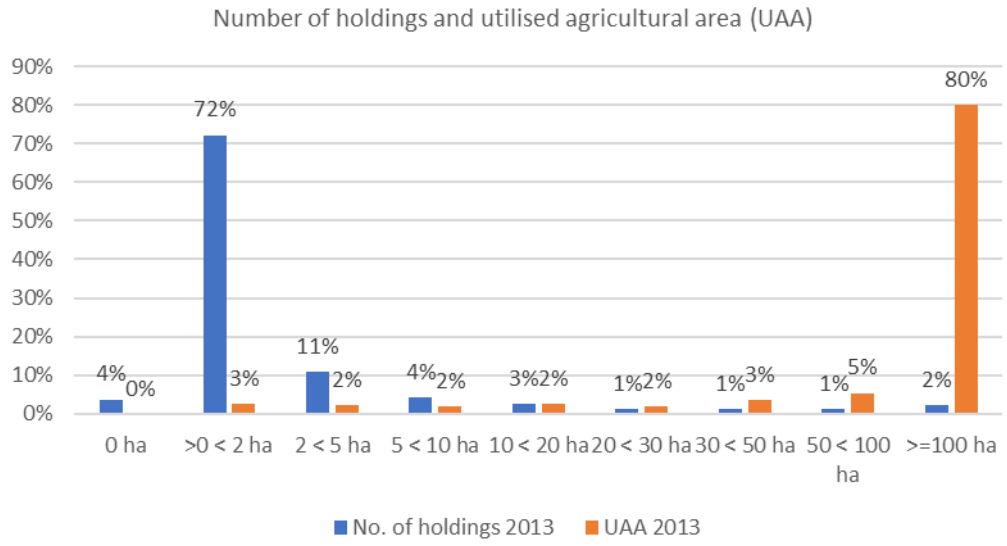

Figure 6. Number of Holdings and Utilized Agricultural Area (UAA) (***Source:*** Data from Farm Structure Survey, 2013)

- **Subsistence farms** are defined as smaller than 2,000 EUR standard output (SO) size and have a utilized agricultural area of up to 1 ha. Subsistence farms produce mainly for own consumption and distribution within the family. In 2013, the total number of subsistence farms was 140,228, representing around 55 percent of the total holdings by standard output size and generated 4 percent of the total standard output. Their total number decreased by 32 percent during the period 2005-2013.
- **Semi-subsistence farms** are defined as small farm holdings between 2,000 and 8,000 EUR SO, with a utilized agricultural area of up to 10 ha and with a potential for development in the long run. Semi-subsistence farms produce for own consumption and also for market sales.
- **Small semi-commercial farms** have a SO of 8,000–50,000 EUR. These form an emerging sub-sector of increasingly commercial "family farms" selling between 50 to 100 percent of their products into formal markets. Small semi-commercial farms have a relatively diverse production structure.
- **Medium and large** commercial farms have a SO of over 50,000 EUR and currently hold over 80 percent of the total UAA.
- **Small-holdings** are considered important as they provide a strong socio-economic underpinning in rural areas. They provide a basic livelihood for a significant proportion of the rural population, as well as a supplementary source of food for their family members in the urban areas. They also play an important role in maintaining the vitality of rural

communities and providing important social, cultural and environmental services (public goods) to the wider society.

- **Bulgaria has significant agricultural potential but average yields are low, underlining a less than optimal use of production factors.** Certain traditional agricultural sectors (such as fruit, vegetables, and livestock) are underperforming and experiencing structural difficulties. Average agricultural production yields are much lower compared to Bulgaria's neighbours within and outside the EU (2012): for tomatoes, 28 t/ha compared to 60 t/ha in Turkey; for sunflower, 1.7 t/ha compared to 2 t/ha in Hungary or 4.3 t/ha in Greece; and for apples, 6.7 t/ha compared to 18.7 t/ha in Greece, 8.2 t/ha in Romania and 16.5 t/ha in Turkey. The factors for lower productivity in Bulgarian crop production compared to its direct competitors are inefficient usage of inputs, poor farming practices and challenges with natural conditions.

3.1.2 Agricultural Sector Production

Overview: The Bulgarian agricultural sector generated Euro 4,004 Million in 2016 (at base prices), an increase of 4.8 percent over 2010 and accounted for 2 percent of the EU's agricultural output according to Eurostat. However, from 2014 to 2016, the value of output declined by 6.9 percent.

The Bulgarian Ministry of Agriculture, Food and Forestry (MAFF) reported the 2016 value of agricultural output (at producer prices) as 6.5 percent lower than the Eurostat value. Plant production is rising relative to animal production. This can be seen in the distribution of output for 2014 and 2016 in Table 3.

Table 3. Value of Farm Production, Farm Consumption and Gross Value Added

Characteristic	*2014*	*2016*	*% change in value*
Total Value of Production	4,313	3,743	-13.2%
Plant Production	64.1%	67.7%	-8.4%
Animal Production	26.0%	23.3%	-22.3%
Agricultural Services	6.1%	6.0%	-14.1%
Non-agricultural inseparable secondary activities	3.8%	3.0%	-31.8%
Total Production	100.0%	100.0%	-13.2%
Inputs/ Farm Consumption	59.7%	59.8%	-12.5%
Gross Value Added	40.3%	40.2%	-12.6%

Source: Ministry of Agriculture, Food and Forestry, Annual Report on the Situation and Development of Agriculture, Agrarian Report 2017

Inputs into crop and animal production accounted for Euro 2,249 Million in 2016 (Eurostat), or about 60 percent of the value of production (MAFF). Of this expenditure, seeds, fertilisers and plant protection in crop production accounted for 17.1 percent in 2016, down from 18.6 in 2010. Feeding stuffs and veterinary expenses in animal production accounted for 59.5 percent, down from 74.9 percent in 2010 (Eurostat). The gross value added of the Bulgarian agriculture sector estimated by Eurostat was Euro 1,777 Million in 2016, an increase of 31 percent over 2010, compared to Euro 1,514 million by MAFF. In 2016, Bulgaria accounted for 1.07 percent of the EU total. Subsidies on production amounted to Euro 810 Million in 2016,

an increase of 74 percent over 2010. In 2016, Bulgaria accounted for 1.54 percent of the EU total subsidies (Eurostat, 2017).

Agricultural income per annual work unit (AWU) has been rising rapidly in Bulgaria with an increase of 88 percent from 2010 to 2016. This is the third highest in the EU behind Poland and Slovakia. This measure is the return to labour, capital and land per AWU and is a measure of relative labour productivity. This increase is mostly due to the reduced labour force, consolidation of land into more productive enterprises and increased relative prices.

After adjusting for inflation using a harmonized index of consumer prices, crop prices in Bulgaria have risen 12.0 percent from 2010 to 2016 versus an EU average of 4.2 percent. Over the same period, animal prices have risen 3.4 percent versus a decline in the EU average prices of 2.8 percent. Prices of goods used in the production of agricultural products decreased slightly during this period in Bulgaria, about in line with the 0.2 percent decrease in the EU.

Use of Arable Land: In 2016, Bulgaria had total arable land assigned to agriculture of 5.2 million hectares. This is 47 percent of the total area of 11.04 million hectares. Of this area, cereals accounted for 36.8 percent, oilseeds for 20.8 percent and permanent pastures and meadows for 26.54 percent. The usage for 2016 is broken down in Table 4.

Table 4. Usage of Utilized Agricultural Land by Crop, 2016

Usage	2016 Land usage Hectare	Percent of Agricultural Land
Wheat	1,215,684	23.31
Maize	468,762	8.99
Other cereal	236,132	4.53
Sunflower	887,845	17.03
Tobacco	13,930	0.27
Industrial oil seed crops	196,958	3.78
Other industrial crops	55,144	1.06
Potatoes	10,109	0.19
Legumes	33,928	0.65
Fresh vegetables	46,527	0.89
Annual fodder crops	14,223	0.03
Meadows planted with legumes & cereals	108,793	2.09
Fallow land	191,537	3.67
Greenhouses	1,419	0.03
Total Arable Land	3,480,991	66.75
Family Gardens	15,367	0.26
Orchards	77,625	1.49
Vineyards	52,517	1.01
Other perennial	10,824	0.21
Total Perennial Crops	140,966	2.70
Permanent Grasslands, Meadows	1,384,088	26.54
Utilized Agricultural Area	5,021,412	96.29

Non-cultivated lands	193,228	3.71
Area Assigned for Agriculture	5,214,640	100.00

Source: Ministry of Agriculture, Food and Forestry, Annual Report on the Situation and Development of Agriculture, Agrarian Report 2017

Main contributors to the value of agricultural output. Table 5 highlights the relative contribution of different products in 2016.Survey results

Table 5. Value of Agricultural Output by Crop, 2016

Cultivation	Euro Million	Percent
Soft Wheat	705	18.7
Other Cereals	477	12.9
Total Cereals	1,182	31.6
Sunflower	596	15.8
Other Oilseeds	173	4.7
Total Oilseeds	769	20.5
Tobacco	77	2.1
Fruit	157	4.2
Vegetables	139	3.7
Total Plant Production	2,519	67.3
Milk	336	8.5
Cattle	115	3.0
Pigs	132	3.5
Poultry	120	3.2
Eggs	76	2.0
Total Animal Production	892	23.7
Total Plant & Animal Production	3,406	90.0
Agricultural Services	225	6.0
Non-agricultural inseparable secondary activities	112	3.0
Total Value of Agricultural Output (at producer prices)	**3,743**	**100.0**

Source: Ministry of Agriculture, Food and Forestry, Annual Report on the Situation and Development of Agriculture, Agrarian Report 2017

Cereal Production in Bulgaria was 8.945 Thousand Tons and accounted for 2.97 percent of the EU total in 2016. However, there is considerable variability from year to year in area planted, average yield and average price, and hence in production and value of output. This can be seen in the comparison between 2015 and 2016 of the production components by crop in Table 6.

Table 6. Production of Cereals in Harvest Years 2015 and 2016

Crop	Harvested areas (ha)			Average Yield (tonnes/ha)			Production (tonnes)		
	2015	2016	Change 2015 /2016	2015	2016	Change 2015 /2016	2015	2016	Change 2015 /2016
Wheat	*1105916*	*1192589*	*7.8%*	*4.53*	*4.75*	*4.9%*	*5011597*	*5662721*	*13.0%*
Rye	*6304*	*7468*	*18.5%*	*1.78*	*2.03*	*14.0%*	*11210*	*15178*	*35.4%*
Triticale	*12714*	*16096*	*26.6%*	*3.02*	*3.06*	*1.3%*	*38402*	*49265*	*28.3%*
Barley	*175957*	*159830*	*-9.2%*	*3.97*	*4.32*	*8.75*	*697863*	*689850*	*-1.1%*
Oats	*11076*	*15323*	*38.3%*	*1.96*	*2.05*	*4.4%*	*21694*	*31372*	*44.6%*
Maize for grain	*498644*	*406942*	*-18.4%*	*5.41*	*5.47*	*1.1%*	*2696923*	*2226094*	*-17.5%*
Rice	*12410*	*11988*	*-3.4%*	*5.45*	*5.40*	*-0.9%*	*67684*	*64773*	*-4.3%*

Source: MAFF, AgroStatistics Department, Yields of crop survey

Oilseed production: Similarly to cereals, there is considerable variability from year to year in the area, average yield and average price of oilseeds, and hence of production and value of output. This can be seen for production in Table 7.

Table 7. Production of Oilseed Crops for 2015 and 2016 Harvests

Crop	Harvested areas (ha)			Average Yield (tonnes/ha)			Production (tonnes)		
	2015	2016	Change 2015 /2016	2015	2016	Change 2015 /2016	2015	2016	Change 2015 /2016
Sunflower	810841	817511	0.8%	2.10	2.25	7.3%	1.699.228	1.837.677	8.1%
Rape seed	170421	171511	0.6%	2.48	2.97	19.8%	422.092	509.251	20.6%

Source: MAFF, AgroStatistics Department

Fruit production. While fruit production is important to the Bulgarian economy, it is a small producer relative to other EU-28 countries. For example, apple production amounts to 0.36 percent and peaches to 1.08 percent of the EU-28 total production. As with other crops, there is significant variability from year to year in production and value of fruit output. The area dedicated to each crop is adjusting as farmers reposition their production. Also, yield is variable depending upon weather, diseases, pests, pollination, and so on. This can be seen in Table 8Table 8..

Table 8. Production of Fruit by Crop for Harvest Years 2015 and 2016

Fruit crops	Harvested areas (ha)			Average Yield (kg/ha)			Production (tonnes)		
	2015	2016	Change 2016/2015	2015	2016	Change 2016/2015	2015	2016	Change 2016/2015
Apples	4 765	4 111	-13,7%	12 260	10 887	-11,2%	58 419	44 755	-23,4%
Pears	528	410	-22,3%	5 593	4 859	-13,1%	2 953	1 992	-32,5%
Apricots and sour apricots	2 481	2 554	2,9%	5 715	6 070	6,2%	14 179	15 503	9,3%
Peaches and nectarines	3 711	3 816	2,8%	9 521	7 975	-16,2%	35 334	30 432	-13,9%
Plums and cherry plums	6 827	6 705	-1,8%	5 299	7 253	36,9%	36 176	48 630	34,4%
Cherries	8 055	8 463	5,1%	6 136	4 549	-25,9%	49 423	38 496	-22,1%
Sour cherries	1 207	1 137	-5,8%	2 838	3 119	9,9%	3 425	3 546	3,5%
Walnuts	5 055	6 280	24,2%	718	790	10,0%	3 627	4 959	36,7%
Almonds	574	987	72,0%	739	852	15,3%	424	841	98,3%
Hazelnuts	496	544	9,7%	728	410	-43,7%	361	223	-38,2%
Raspberries	1 522	1 833	20,4%	4 497	4 582	1,9%	6 845	8 398	22,7%
Others	433	351	-18,9%	-	-	-	1 856	1 207	-35,0%
Total	**35 654**	**37 191**	**4,3%**	**-**	**-**	**-**	**213 022**	**198 982**	**-6,6%**

Source: *MAFF, Agro Statistics Department, Fruit Production - Harvest 2016*

Vegetable Production. Like fruit, vegetables are an important component of the Bulgarian economy but remain as a low percentage of the EU-28 output A total area of 58,069 hectares were planted to vegetables in 2016, an increase of 32.2 percent over 2015. Total vegetable production amounted to 812,263 tons, an increase of 32.4 percent. The main vegetable crops are shown in Table 9.

Table 9. Total Production of the Main Vegetable in Harvest 2015 and 2016 Years

Types of vegetables	Harvest 2015	Harvest 2016	Change 2016/2015
Tomatoes	121 646	141 367	16,2%
Pepper (sweet and hot)	67 819	72 030	6,2%
Eggplants	9 933	7 905	-20,4%
Cucumbers and gherkins	50 335	66 653	32,4%
Watermelons	59 960	85 651	42,8%
Headed cabbage	42 447	75 650	78,2%
Onions	8 926	14 921	67,2%
Strawberries	4 999	5 150	3,0%

Source: *MAFF, Agro Statistics Department, Vegetable Production – Harvests 2016 and 2015*

Greenhouses are a growing factor in vegetable production accounting for 1.66 percent of the harvested area and 13.9 percent of total output in 2016. Table 10 shows that tomatoes and cucumbers make up the major share of production.

Table 10. Greenhouse Production of Main Vegetables in Harvest 2015 and 2016 Years

Types of vegetables	Harvest 2015	Harvest 2016	Change 2016/2015
Tomatoes	50 105	49 037	-2,1%
Sweet peppers	2 780	3 887	39,8%
Cucumbers	41 584	56 987	37,0%
Gherkins	258	309	19,8%
Salads and lettuces	1 658	1 938	16,9%
Total	**97 214**	**113 112**	**16,4%**

Source: *MAFF, Agro Statistics Department, Vegetable Production – Harvests 2016 and 2015*

Grape and Wine Production. The area planted to vines has been decreasing and in 2016 it was 62,916 hectares, down from 128,857 hectares in 2006, a reduction of 51 percent over 10 years. However, a significant share of the planted area has been abandoned resulting in a production area of 50,892 hectares in 2016 compared to 85,320 hectares in 2006. Over this time period, yield has also decreased. This reduction is the result of socio-economic reasons where many vineyards have not been taken care of, particularly by small holders, and the vineyards are aging. Total production in 2016 was 211,083 tons, a reduction of 19 percent form 2015. Wine grapes (white 34% and red 66%) account for 95 percent of the total output and table grapes for 5 percent.

Wine production amounted to 1,207,785 hectoliters in 2016, a decrease of 8 percent over 2015. Of this production, 30 percent were wines with protected geographical indication or protected designation of origin and 69 percent without such protection.

Organic Farming. Organic farming is developing rapidly with an increase in the number of operators (6,173 in 2015 and 7,262 in 2016), land area (118,571 hectares in 2015 and 162,352 hectares in 2016) and number of animals. Bulgaria has well preserved ecological areas that are conducive to organic farming. The Rural Development Programs and MAFF are strongly supporting this development with the MAFF operating an official Organic Farming Control program. Organic certification provides confidence to consumers and allows for higher prices.

In 2016, organic control system areas occupied 3.2 percent of the total utilized agricultural area, up from 2.4 percent in 2015. This growth can be seen in the area transitioning to organic production in Table 11.

Table 11. Areas of Organically Raised Agricultural Crops and Transition Areas in 2015 and 2016, in ha

Type of crops	Areas in transition period		Areas, which have undergone transition period		Total areas	
	2015	2016	2015	2016	2015	2016
Grain and cereals, including rice	18 540	22 102	3 650	8 837	22 191	30 940
Industrial crops	15 881	24 332	4 992	6 179	20 873	30 512
Fresh vegetables, melons, strawberries, cultivated mushrooms (total)	976	2 524	890	1 153	1 866	3 678
Permanent plantations	19 811	21 802	6 135	11 372	25 946	33 174
Permanent pastures and meadows	28 361	32 909	3 435	5 826	31 796	38 736
Forage crops from arable lands (green crops)	7 166	13 170	1 164	1 740	8 330	14 911
Fallow land	5 233	7 120	976	954	6 209	8 074

Source: *MAFF, according to organic production control entities' annual reports data*

The area under permanent organic crops was 33,174 hectare in 2016, an increase of 28 percent over 2015. Land dedicated to both fruit and nuts is increasing with nuts using 18,484 hectare in 2016, an increase of 20 percent over 2015.

The Bulgarian organic food market is small but growing with a growing number of specialized shops and presence in supermarkets. However, most of the production is currently exported outside Bulgaria.

Trends in Inputs (Intermediate Farm Consumption). In 2016, total intermediate consumption was Euro 2,347 Million compared to 2,546 in 2015 and 2,725 in 2014. This represents a decline of 13.9 percent over the two years. Only seed and plant propagation material (+5.3) and pesticides and plant protection chemicals (+11.2) increased over the period 2014 to 2016. In terms of purchases outside of the agricultural sector, seeds and plant propagation material (+23.5), pesticides and plant protection chemicals (+11.2) and feed supplements (+12.6) increased. This shows a move to non-farm sources for these inputs. Significantly, expenditure on fertilizer and soil conditioners decreased by 12.9 percent and fuel and oils by 4.1 percent. This will have a positive effect on the generation of greenhouse gases related to agriculture. Table 12 shows the breakdown by type of input.

Table 12. Value of Intermediate Farm Consumption for 2014-2016

Product	Total 2014 Euro M	Total 2016 Euro M	Percent Change 2014-2106	Purchased Outside Ag 2014 Euro M	Purchased Outside Ag 2016 Euro M	Percent Change 2014-2106
Seeds & propagation material	133	140	+5.3	72	88	+23.5
Fuels & Oils	584	560	-4.1	584	560	-4.1
Fertilizers & soil conditioners	213	185	-12.9	209	181	-13.2
Pesticides & plant protection	127	141	+11.2	127	141	+11.2
Veterinary Costs	147	128	-12.9	147	128	-12.9
Feed supplements	650	487	-25.1	208	234	+12.6
Feed additives	44	23	-46.8	44	23	-46.8
Machinery	185	161	-12.7	185	161	-12.7

maintenance						
Building maintenance	91	79	-13.0	91	79	-13.0
Agricultural services	262	225	-14.2	262	225	-14.2
PHYSIM	44	39	-10.6			
Other goods & services	244	175	-28.2	134	117	-12.7

Source: National Statistical Institute and Ministry of Agriculture, Food and Forestry, Annual Report on the Situation and Development of Agriculture, Agrarian Report 2017

Agricultural Associations. There is a large number of agricultural associations in support of agriculture in Bulgaria. There are sector specific associations, such as those for oilseeds and sheep, general agricultural associations, such as BAAP and BAF, input supplier associations such as those of chemicals and farm machinery, and processor/marketing associations, such as those for organic products, fruits and vegetables, and dairy. All provide information to members and advocate on their behalf. Some of the main associations are as follows:

- NGPA - National Grain Produces Association
- Agrolink Association
- AMB – Association of Meat Processors in Bulgaria
- BAALO – Bulgarian Association of Agricultural Land Owners
- BAAP – Bulgarian Association of Agricultural Producers
- BADP – Bulgarian Association of Dairy Processors
- BAF – Bulgarian Farmers Association
- BATA AGRO – Bulgarian Association of Traders of Agro-machinary
- BAPOP – Bulgarian Association of Greenhouse Production
- BBF – Bulgarian Biodiversity Foundation
- BG CPA – Bulgarian Crop Protection Association
- Bioselena – Foundation for Organic Agriculture
- BOPA – Bulgarian Organic Product Association
- NARMOB – National Association of Milky Sheep Breeders in Bulgaria
- UPFV – Union of Processors of Fruits and Vegetables
- IA – Irrigation Associations
- AAEF – Association of Agroecological Farmers

3.2 Economic Data

According to the National Statistical Institute, Bulgaria's GDP was Euro 48,128 Million in 2016, an increase of 14.7 percent in current prices from 2012. This was Euro 6,752 on a per capita basis. In terms of Gross Value Added, the total for Bulgaria in 2016 was Euro 41,526 Million with agriculture contributing 4.7 percent. This is down from 5.3 percent five years earlier.

The average number of employed persons 15 years or greater in 2016 was 3.02 million with agriculture accounting for 6.8 percent. The unemployment rate has been declining and was 7.6 percent in 2015. The average wage in 2016 was Euro 5,900, up by 9.5 percent compared to 2015. The average wage in agriculture in 2016 was Euro 4,883, or 17.2 percent less than the national average.

Agricultural Commodities Trade. Agriculture is an important component of Bulgaria's exports, with a total of Euro 2,064 Million in 2016, accounting for 17.1 percent of total exports. Overall, agriculture had a positive trade balance of Euro 612 Million, while the country had a negative trade balance. This can be seen in Table 13.

Table 13. Agriculture's Relative Share of Bulgaria's Foreign Trade in 2015-2016 (in EURO Thousand)

Year	2015		*Agricultural sector's share in %*	2016		*Agricultural sector's share in %*
	Country's total	Agricultural sector		Country's total	Agricultural sector	
Export FOB	22.982.301	3.730.850	16,2	23.575.817	4 036 993	17,1
Import CIF	26 356 581	2 707 597	10,3	26 090 153	2 839 205	10,9
Trade flow	49 338 882	6 438 447	13,1	49 665 970	6 876 198	13,8

Source: *NSI data, processed by MAFF, Preliminary data for 2016*

For 2016 in terms of destinations, the EU accounted for 69.6 percent of exports and 79.2 percent of imports, giving a positive trade balance of Euro 561 Million. The other OECD members accounted for 12.4 percent of exports and 6.1 percent of imports, giving a positive trade balance of Euro 325 Million. And, the League of Arab States accounted for 9.3 percent of exports and 0.4 percent of imports giving a positive trade balance of Euro 365 Million.

In value terms for 2016, the major export markets in the EU were Greece – 20.1 percent, Romania – 16.4 percent, Germany – 9.7 percent, Spain - 9.3 percent and Italy – 8.6 percent. The major import sources into Bulgaria were Romania – 15.7 percent, Greece – 14.6 percent, Germany – 13.4 percent, and Poland – 10.5 percent. For the Balkan trading region (including Turkey), exports were 35.5 percent and imports were 32.8 percent of the total for 2016.

Trade by commodity. Grains and oilseeds account for the major share of Bulgaria's agricultural exports with grain accounting for 22.6 percent and sunflower and other oilseeds for 19.4 percent. Meat products (9.4%), sugar (4%), cocoa and products (3.9%), and coffee and products (3.7%) account for the major share of agricultural imports

Table 14. Leading Agricultural Commodity Exports from Bulgaria in 2016

Product name	Quantity (tons)	Value (EUR)	Relative share in total agricultural export in %
Wheat and wheat and meslin mix	4 414 160	693 773 454	17,2
Sunflower seeds even broken ones	688 018	370 179 099	9,2
Rape or colza seeds, even broken ones	574 259	219 037 579	5,4
Maize	1 319 047	218 034 175	5,4
Sunflower-seed, safflower or cotton-seed oil and fractions thereof, refined or not, but not chemically modified	253 101	195 533 640	4,8
Bakery, confectionary products or biscuits even the ones containing cocoa	82 131	187 636 320	4,6
Raw or non-manufactured tobacco; tobacco refuse	40 691	166 073 101	4,1
Meat and edible offal from poultry under No. 0105, fresh, chilled or frozen	40 955	149 625 548	3,7
Cigars (including those with cut ends), cigarillos and cigars of tobacco or tobacco substitutes	12 826	141 370 205	3,5
Chocolate and other foodstuffs containing cocoa	27 116	103 589 362	2,6
Preparations of the kinds used in animal feeding	93 692	85 702 956	2,1
Cheese and curd	25 308	84 648 767	2,1
Coffee and coffee substitutes, containing coffee, regardless of the proportion in the mixture	17 107	75 526 039	1,9

Source: NSI data processed by MAFF, preliminary data for 2016.

3.3 Climate Change Impact on Agricultural Productivity[2]

Weather conditions are among the main factors determining the productivity of agricultural crops. Extreme weather events and climate anomalies have a strong impact, and can compromise yields and/or reduce the quality of output. Temperature is a main factor determining the timing of crop production. Increased temperatures may require changes in cultivars and times of planting and harvesting.

In Bulgaria, spring crops sown on less fertile soils will be increasingly vulnerable, as well as the arable land in south-eastern Bulgaria where the precipitation is currently insufficient to ensure normal growth, development and yield of crops. Rising concentrations of carbon dioxide in the future has the potential for increasing the yield of major crops; however, this increase in yields may be hindered by the increased risk of drought and a shortening of the reproductive period, due to increased air temperatures. There will be a shift in the dates of maturity of different crops, shortening of the growing period and changes in their yields.

Horticultural crops rely on an adequate rainfall supplemented by irrigation water, where available. With the likelihood of increased droughts, this will put pressure on these crops as well as limit the availability of irrigation water. Since the south-central region of Bulgaria is the major producing area with reliance on irrigation water, the production of horticultural crops is likely to continue to be volatile. For example, vegetables suffered heavily from water

[2] This sub-section is based on the World Bank report on Climate Change Adaptation in Bulgaria and the Risk and Vulnerability Analysis and Assessment in the Agriculture and Soils chapter of: *Risk and Vulnerability Analysis and Assessment of the Bulgarian Economic Sectors to Climate Change Report,*, developed under the EU Operational Program 'Environment 2007-2013', with financial support from the European Regional Development Fund.

shortages during the droughts of 2009, 2011 and 2012. This was acerbated by unfavorable climatic conditions as well as the old irrigation infrastructure. In 2012, the average yields per hectare compared to the previous year, decreased by: 51 percent for cucumbers; 30 percent for cabbage; 23 percent for tomatoes; and 11 percent for pepper. The effect of these droughts can be seen in Figure 7.

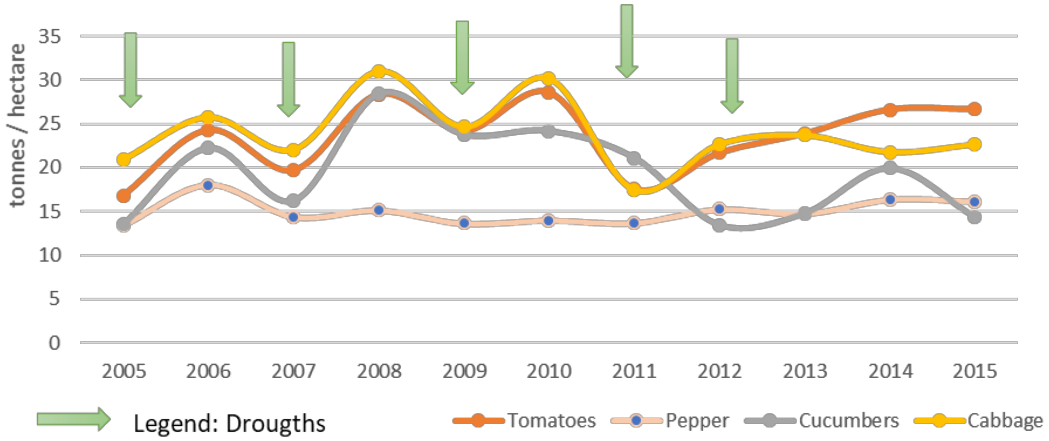

Figure 7. Vegetable Yields (Annual Average Tons per Hectare) Source: WB representation based on NSI data, 2016.

For fruits, the drought months did not significantly impact the yields. However, fruit is particularly vulnerable to unfavorable climate conditions during bud breaking, blooming and harvesting. In general, warmer winters could reduce yield volumes from stone fruit species, which need a certain amount of chilling units for their normal growth.

The largest cultivated areas with cereals are in the North-East Region and North-Central Region. Grain maize yields were most affected by the drought of 2012 (average decrease of 33 percent compared the previous year). It is expected that given the temperature increase over time, fewer cold days may hinder vernalization in winter cereals. The effect of drought can be seen in Figure 8.

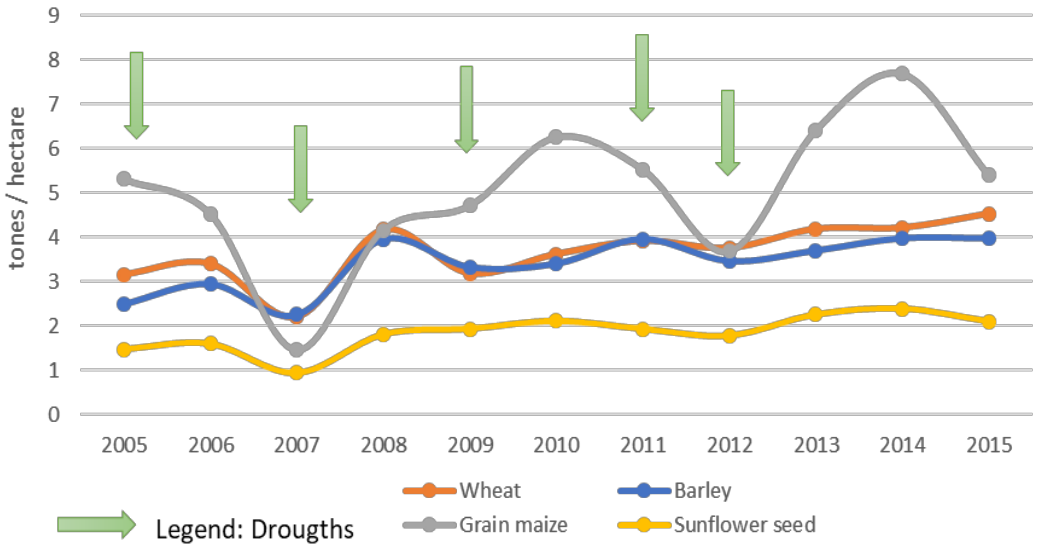

Figure 8. Cereal Yields (Annual Average Tons per Hectare) (Source: WB representation based on NSI data)

Crop and Livestock Productivity Factors. Agriculture needs to adapt to the on-going climate change. In terms of crop production and productivity, the following factors need to be considered as part of the effort to achieve a sustainable agriculture.

- **Changes in length of growing season.** The growing season is determined by the number of days with an air temperature above a certain temperature threshold. Global warming is expected to result in an early onset of vegetation in spring and a longer period in autumn. A longer growing season would allow better distribution of individual species, especially thermophilic ones, as sufficient light and thermal resources shall better serve their growth, development and productivity. At the same time, a prolonged growing season would improve opportunities for growing new, more thermophilic species or secondary crops, particularly where irrigation water is available. Simulation data results from agro-climatic models indicate that the cropping cycle will move forward. For example, the corn crop would be completed in August. Vegetative growth for winter wheat would be completed about one or two weeks earlier in 2050 and approximately two to three weeks earlier in 2080.
- **Agrophenology**. Fruit is particularly sensitive to the timing of the phenological phases, including the flowering or ripening stages. This is largely controlled by weather conditions. In Bulgaria, earlier flowering of trees, a longer season for vines and changes in the other natural crop cycles are expected with the potential for impacting crop yields. In general, a longer growing season for the respective crops strongly correlates with higher yields, because it allows better use of available light, thermal and water resources. However, for cereals a contraction of inter-phase periods from flowering to ripening are expected resulting in less time for grain filling, which would negatively impact yields.
- **Crop yields.** Yields depend on the length of the growing season and crop growth. For example, for cereal and oilseed crops the length of the grain formation and ripening periods controls yield. Due to projected temperature rises and reduced rainfall, changes in yield volumes for major crops (winter wheat, corn and sunflower) during the production formation periods are likely. Simulation models show that yields are likely to

increase and then decrease. For wheat, it is projected that yields will rise by 12 to 25 percent due fertilization and increased CO2 levels. For sunflower, yields in Central and Western Bulgaria are projected to rise by about 15 percent over the period to 2050 and fall by about 10 percent in Eastern Bulgaria in the short term and fall a further 10-20 percent over the period 2041-2050.

- **Livestock breeding will be adversely affected by greater heat stress and changes in fodder and pasture resources**. Changes in temperature and precipitation due to climate change may affect livestock breeding in terms of reproduction, metabolism, health and feeding patterns. Rising air temperatures may in some cases cause stress to animals and even result in their death due to overheating. Heat stress could have several negative effects on livestock production, including reduced reproductive performance in dairy cattle and decreased fertility in sows. Climate change may also impact the availability of fodder and grazing resources, indirectly affecting feeding patterns and influencing the profitability of livestock farms. Changes in the precipitation distribution in pasture areas would lead to less grass and thus, would limit possibilities to feed livestock. Consequently, fewer pastures during certain periods of the year as a result of climate change could lead to overgrazing and erosion risks in those regions.
- **Increased risk of pests, diseases and weeds due to climate change.** Changes in temperature, moisture and the concentration of atmospheric gases could stimulate the growth and generation of plants, fungi and insects as well as change the interactions between pests and their natural enemies and hosts. In Bulgaria there are 347 alien terrestrial arthropods, of which 52 species are crop pests with potential negative impact on forestry, agriculture, horticulture and greenhouse production . Rising temperatures might shorten the reproductive cycle of many pests, which would then increase the risk for agricultural plants. Pests and diseases can lead to harvest losses and result in an increased use of pesticides and veterinary drugs that ultimately enter the food chain. Increased toxigenic micro-fungi that can easily contaminate foods such as peanuts, wheat or corn is a major risk.
- **Increased Soil Risks due to Climate Change.** Bulgaria is fortunately endowed with a diversity of fertile soils. However, all soil types are vulnerable to climate change. Most types of soil do not have a high natural resistance to deteriorating physical conditions, such as rising temperatures or high intensity rainfall. The temperature rise will increase the water deficit in soils with low precipitation rates, leading to an increase in the occurrence, intensity and impact of soil droughts. Increased evaporation and transpiration in plants may also be expected, given the respective projections for rising temperatures, which would further exacerbate the water deficit issue during the warm period.
- **Increased Risk of Soil Erosion and Desertification.** More frequent and intense droughts will likely increase soil aridity, which combined with hot winds, will increase the risk of wind erosion and soil degradation. This includes the risk of desertification, marginalization and abandonment of agricultural land in the areas where soils are most light and vulnerable to erosion. Desertification occurs when certain environmental factors trigger irreversible change in the plant-soil system. Climate change itself does not trigger desertification directly, but it impacts upon other processes (i.e. the increased wind erosion of light arid soils) which do trigger desertification.
- **Increased Risk of Soil Degradation.** Soil degrades due to water and wind erosion, pollution, reduction of organic matter stocks (humus), compaction, acidification, salinization, loss of biodiversity. Erosion aggravates the structure, as well as the water

and air regime of soil. About 65 percent of the cultivated land area in Bulgaria is threatened by varying degrees of water erosion, while another 24 percent of the cultivated land area is threatened by wind erosion. The increased incidence of heavy rain storms, with high intensity and short duration, will generate increased short-term surface runoff and the risk of increased soil erosion by water on sloping land. Salinization is expected to be an increasing problem and currently affects about 35,000 hectare. To mitigate the impacts of soil erosion, desertification and salinization, adaptation measures are required, including soil conservation and runoff regulating measures.

- **Risk of water shortage and impact on irrigation.** Climate change may lead to water shortages and to increased irrigation requirements. Higher temperatures and lower relative humidity will increase water needs for evapotranspiration in agriculture; also, increased carbon dioxide levels in the atmosphere will result in higher water use efficiency due to reduced transpiration and an increased rate of photosynthesis. Thus, the effect of climate change on crop water consumption will depend on a combination of changes in air temperature and CO_2 concentration. Reduced precipitation levels, as projected by climate scenarios, would cause a sudden drop in water reserves and the accumulation of less water for irrigation that would reduce the water available for crop irrigation. With increased competition from urban water users, the availability of water for irrigation will be further reduced.

3.4 Sustainable Agriculture

3.4.1 Current Situation—practices and level of acceptance and adoption

Based on the World Bank report on climate change adaptation in Bulgaria, there is an increasing awareness of climate change issues, but limited awareness of climate change adaptation and sustainable agricultural production. Policy-making has been so far almost exclusively focused on the identification and implementation of climate change mitigation measures and not on climate change adaptation (CCA). The Bulgarian policies and principal objectives in the field of climate change mitigation and adaptation are related to the country's international and EU commitments. The Third National Action Plan on Climate Change 2013 – 2020 outlines the framework for action in the fight against climate change for the period 2013-2020. The document defines a number of mitigation measures in the agriculture and forestry sectors, but does not explicitly stipulate policies and actions on adapting to climate change.

Governmental institutions are aware of and recognize the importance of the issues related to environmental protection, pollution impact and climate change. However, climate change receives little attention on the public agenda and national public awareness of climate change adaptation is limited. While the central governmental structures have published a range of strategic and legal documents (such as Climate Change Mitigation Act and the National Action Plan on Climate Change (NAPCC)) acknowledging the importance of climate change and the need for climate change adaptation, at present there is no specific program or initiative on climate change adaptation in the agricultural sector. Moreover, often local authorities generally have no climate change related actions in their policy documents.

There is a lack of systematic studies on the impact of climate change in the agriculture sector in Bulgaria. Climate change, in general, and its impacts on the agriculture sector, in particular, are subject of research of various scientific and research institutes, including the National Institute of Meteorology and Hydrology (NIMH), the Agricultural Academy-Bulgaria

and the Bulgarian Academy of Sciences (BAS). The NIMH developed a range of studies focusing on the potential impacts of climate change based on different scientific approaches (e.g. physical modeling, econometric analysis, impacts assessment and vulnerability, risk, adaptation, etc.). In addition, the Nikola Pushkarov Institute of Soil Science and Agroecology studies soil parameters and soil erosion, and analyses climate change impacts on soil degradation.

The major farm associations actively participate in different expert groups and commissions dealing with policy development of the individual sectors; they also contribute to drafting legal acts and get involved in decision making processes. However, specific discussions on the climate change effects and climate change adaptation are not widespread and many interested stakeholders are not familiar with climate change impacts on agriculture. The farm community as a whole knows about climate change, but their knowledge and experience, when it comes to climate change adaptation options and measures, is still limited. Consequently, farmers lack sufficient information and knowledge about the vulnerabilities of the agricultural sector and the opportunities for changing crops in response to climate trends.

3.4.2 Gaps and Barriers

- Lack of government support at the local and regional levels. Government services and incentives for sustainable agricultural practices are minimal at the farm level.
- Lack of a dedicated long term vision for agriculture in Bulgaria. A plan is needed to provide direction and substance to developing a sustainable agriculture.
- Need for stronger legal and institutional framework at the national level in support and promotion of sustainable agriculture. This includes the need for clear responsibilities and specific mandates assigned to relevant entities.
- Lack of a systematic and unified collection and processing of agri-sector data. This inhibits the a systematic long term analysis of the agri-sector and the development of a fact based development plan.
- Lack of systematic and unified collection and processing of eco-system data. This inhibits the comparison of status and effects over time, including the impact of sustainable agricultural programs.
- High general lack of available research results and the coordinated presentation of best practices to farmers. Significant knowledge exists in Bulgaria and outside, but this needs to be made available in a practical form. This is acerbated by the lack of formal programs to link the stakeholders, including researchers, government, agricultural support personnel, and farmers.
- High general lack of awareness and understanding of sustainable agriculture and the measures that can be used to achieve it by farmers.
- Cost of implementing practices related to sustainable farming. In many cases, the increased cost has to be justified on the basis of long term benefits and related socio-economic-environmental benefits.
- Lack of formal and informal training programs related sustainable agriculture.
- Lack of knowledge sharing platforms and services providing up-to-date information and detailing best practices.
- Water availability for irrigation. Only a limited number of farmers have access to water for irrigation. Building supplemental water supplies requires significant capital.
- Irrigation practices and management. Managing crop water requirements is a science that most farmers lack. Knowledge and measurement tools are required.

3.4.3 Policies and actions by national and regional authorities in support

The Partnership Agreement (PA) 2014-2020 between the EU and Bulgaria is the national strategic document outlining the framework for the management of EU structural and investment funds in Bulgaria in the programming period 2014-2020. The PA identifies adverse climate changes and insufficient adaptation as important factors for the deterioration in the sustainability of agricultural holdings. It also highlights the need to shift to suitable agricultural practices adapted to climate change and improve access to irrigation water. The adverse impacts of climate change and adaptation measures against its negative effects are explicitly addressed under the third strategic priority: "Connectivity and Green Economy for Sustainable Growth", and its Sub-priority: "Climate and Climate Change, Prevention and Risk Management". The PA envisages additional incentives for conservation and ecosystem restoration, as well as for resource efficiency and for the development of a climate-resilient economy.

The EU's Common Agricultural Policy (CAP) for 2014-2020 is investing around EUR 7.4 billion in the Bulgarian farming sector and rural areas. Of this amount, around EUR 5.1 billion is available for direct payments where 30 percent is linked to three environmentally-friendly farming practices: crop diversification, maintaining permanent grassland and conserving 5% of areas of ecological interest or measures considered to have at least equivalent environmental benefit.

The Bulgarian Rural Development Program (RDP) 2014-2020 is one of the basic national documents that form the country's policy related to sustainable development of rural areas and is aligned with the second pillar of the CAP. The RPD 2014-2020 has three objectives: (1) improving competitiveness and balanced development of agriculture and the food processing industry; (2) preservation of the ecosystems and sustainable management, utilization of natural resources in agriculture, forestry and food processing industry, prevention of climate change and adapting to it; and (3) social and economic development of the rural areas, providing new jobs, decreasing poverty, social inclusion and better quality of life. The RDP was formally adopted by the European Commission on 26 May 2015, outlining Bulgaria's priorities for using € 2.9 billion of public money that is available for the period 2014-2020. The RDP places high importance on farm investments, basic services and village renewal, measures linked to environment and climate, and to business development. The second objective of the RDP deals with the "preservation of ecosystems and sustainable management, use of natural resources in agriculture, forestry and food industry, climate change prevention and adaptation".

The Common Strategy for Management and Development of Hydro-melioration and Protection against Harmful Effects of Water establishes a new framework for legal and institutional reforms. It directs the infrastructure for the provision of irrigation and drainage services should be managed and provides oversight of the infrastructure for flood protection and river corrections that protects agricultural land. A well-performing irrigation and drainage sub-sector offers significant opportunities for promoting the competitiveness and sustainability of agriculture during periods of unfavorable climatic conditions.

3.4.4 On going actions

The Rural Development Program (RDP) measures considered to have the greatest potential for climate mitigation and adaptation and hence, sustainable agriculture are listed in Table 15.

Table 15. The Rural Development Program (RDP) measures impacting climate change and sustainable

Measures	EU support rate	Total public spending in € for 2014-2020 / % of total budget
M10.1: payment for agri-environment-climate commitments	75%	€ 223.346.669/7,7%
M11.1: payment to convert to organic farming practices and methods **M11.2**: payment to maintain organic farming practices and method	75%	€ 151.593.439/5,2%
M8: payments for the establishment and maintenance of agro-forestry systems and for afforestation and creation of woodland	84%	€ 63.527.375/2,2%
M4: investments in physical assets – including non-productive payments to support the agri-environment-climate measure	79%	€ 840.853.118 /28,8%
M16: the cooperation measure – which offers a wide range of potential support for example: developing and piloting new agricultural practices, processes and technologies; and for planning and facilitating landscape scale implementation	79%	€ 32.573.723/1,1%
M1 and M2: training, demonstration activities, information provision and advice	79%	€ 45.286.683/1,6%

Source: RDP 2014-2020

3.4.5 Institutional Framework and stakeholder community in Bulgaria

The institutional framework related to climate change in Bulgaria also is the support base for sustainable agriculture. Currently, the main focus is on mitigation, either by striving to meet the international obligations and agreed targets for reducing GHG emissions, or by participating in mechanisms for international emissions trading, or monitoring, reporting and verification (MRV) of EU ETS emissions. The most important institutions are as follows:

- The Ministry of Environment and Water (MoEW) is responsible for the management, coordination and monitoring of the environmental policy at national, EU and international level. It is also responsible for coordinating the policy-making process in relation to climate change adaptation. The MoEW is assisted by the National Expert Committee on Climate Change. The work in the area of climate change is done within the specialized Directorate for “Climate Change Policy”. MoEW shares the responsibility for integrating climate change adaptation and mitigation actions with various other government ministries and agencies.
- The Ministry of Agriculture, Food and Forests (MAFF) is responsible for the programming of the Rural Development Program (RDP) and operates various schemes supporting agriculture. The State Fund Agriculture (SFA) deals with administrative controls and direct payments to farmers. The Directorate for "Rural Development" is acting as the Managing Authority for the RDP and is responsible for the efficient programming, management and

implementation of the programme, including measures related to soil protection, biodiversity and water resources. The Directorate is also in charge with the monitoring and control of the activity of the National Rural Network.

- In Bulgaria, Agricultural Knowledge and Innovation Systems (AKIS) is represented by different institutions: (i) MAFF with its secondary structures, including the National Agricultural Advisory Service (NAAS); (ii) private advisory sector, independent advisors, international trade organizations, regional suppliers; (iii) farm-based organisations (co-operatives and producer groups), (iv) educational and research organisations and (v) non-government organisations – professional association and foundations. The NAAS is currently the only public organization with expertise in the sector. Through its vocational training centers, the NAAS provides training for farmers mainly on project management, business planning, agro-ecology and climate change adaptation, as well as other relevant agricultural topics. It also provides information campaigns addressed specifically to farmers and the general public. As a beneficiary of Measure 1 "Transfer knowledge and information actions" of the RDP 2014-2020, the NAAS will have a key role for improving the knowledge on CCA. Private advisory companies and individual consultants are, mostly, established by experts, who have worked in the public sector. They provide similar services to farmers like in the NAAS, preparing applications for rural development measures. International and regional trade suppliers provide extension services related to plant protection, machinery and seed use, while professional associations provide knowledge and information to farmers in diverse business activities related to their farming.
- The Bulgarian National Rural Network (NRN) , part of the European Network for Rural Development , aims to promote the exchange of information and knowledge among network members, to support cooperation activities and strengthen the capacity of Local Action Groups (LAGs). NRN is comprised of various stakeholders involved in rural development, including climate change adaptation. It aims to facilitate the exchange of expertise and know-how and to identify transferable practices. The priority of the NRN is to facilitate information exchange and to engage stakeholders in developing the RDP 2014-2020. NRN's activities are coordinated by the Rural Development Directorate of MAFF.
- The Bulgarian Academy of Sciences (BAS) is the leading scientific institution in the country carrying out research and development activities on climate change and sustainable agriculture, examining fluctuations, adaptation of the individual sectors, etc. The Agricultural Academy of Bulgaria is a public research organization, responsible for conducting scientific and applied research in the fields of agriculture, fisheries and aquacultures, as well as the food industry.
- Non-governmental organizations have a direct effect on developing the policy for the agricultural sectors, such as the National Grain Producer Association (NGPA), the Association of Agricultural Producers in Bulgaria (APSB, among others. These organizations are actively involved defining the measures within the Common Agriculture Policy.

3.5 IT in Agriculture

The Bulgarian National Statistical Institute's 2017 survey of internet connectivity showed that 67.3 percent of households were connected, with 99.4 percent having a broadband connection (Figure 9).This compares to 19 percent in 2007, with 66 percent having a

broadband connection. Similarly, the use of computers has risen dramatically from 23.3 percent in 2007 to 63 percent in 2017.

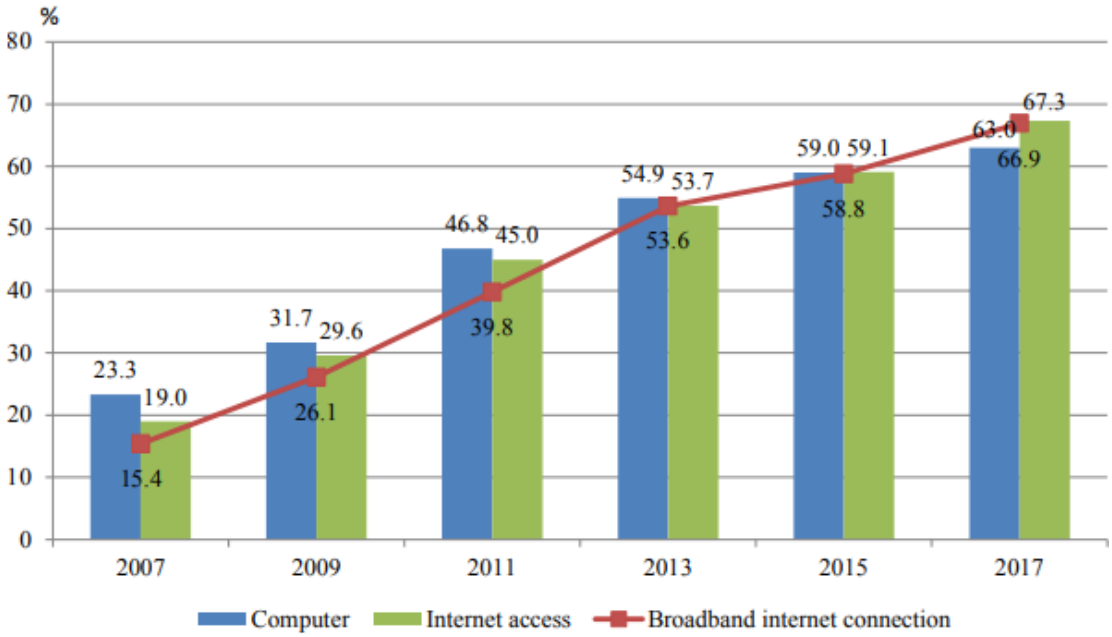

Figure 9. Share of households with computer, internet access and broadband internet connection. (**Source:** National Statistical Institute, Main results of the survey on the information society in households in 2017)

The survey did not distinguish between urban and rural areas. However, it found that individuals with a tertiary education used a computer 89.8 percent of the time in their daily activities and surfed the internet regularly 90.2 percent. On the other hand, only 27.7 percent of individuals with a basic or lower education used a computer and surfed 32.0 percent of the time. Rural computer and internet usage is much lower than in urban areas (1) only 12 percent of rural residents have a higher education versus 32 percent in urban areas,(2) average age of rural residents is significantly higher and with internet connectivity is more restricted (and more expensive for many). Since the different regions of Bulgaria have different combinations of rural and urban populations, connection can be expected to vary by region. Table 16 shows connectivity varied from a low of 57.8 percent to 70.5 percent by region in 2017.

Table 16. Households with Internet Connection at Home and individuals 16-74, 2017

	2017
Total	**67,3**
North-West Region	57,8
North Central region	67,8
North-East Region	68,7
South-East Region	62,1
South-West Region	70,5
South Central Region	70,4
Narrowband connection	**3,5**
- Dial-up or ISDN	1,1
- Mobile narrowband connection (WAP, GPRS)	2,6
Broadband connection	**99,4**
- Fixed broadband connections, e.g. DSL, ADSL, VDSL, cable, optical fibre, satellite, public WiFi connections	87,2
- Mobile broadband connections (via mobile phone network, at least 3G, e.g. 2G+/GPRS, using (SIM) card or USB key, mobile phone or smart phone as modem)	69,0

Note: [1] The percentage is calculated on the basis of households who have internet access.

National Statistical Institute. http://www.nsi.bg/en/content/6099/households-who-have-internet-access-home

There is a significant difference in both computer and internet usage by age. Of those aged 15 to 24, 90.3 percent are connected to the internet. This compares with 25.3 percent for those between 64 and 74. This can be seen in Figure 10 from the NSI survey.

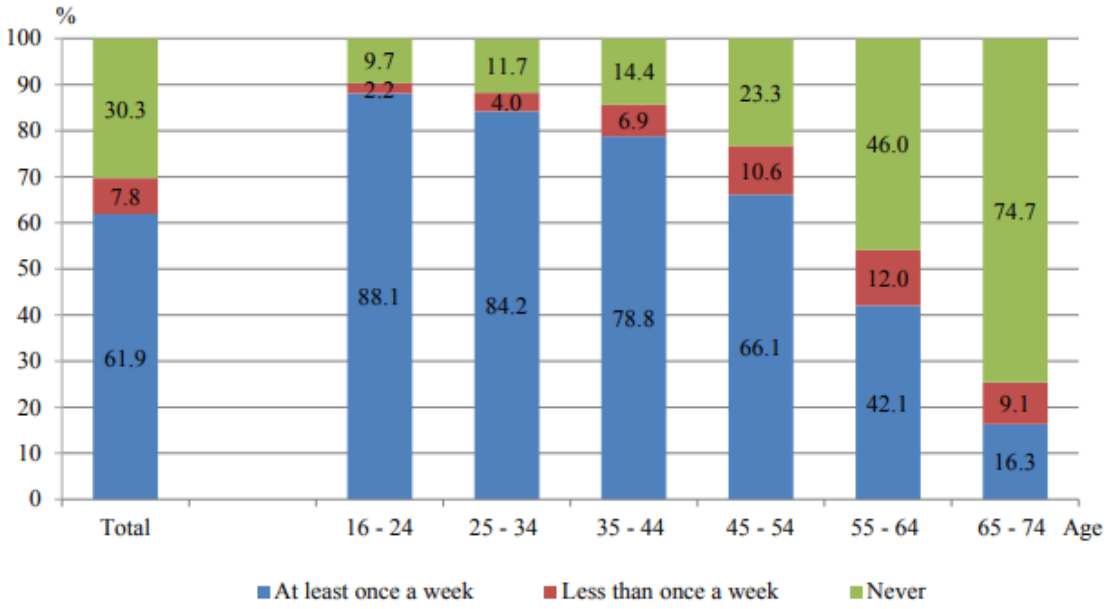

Figure 3. Structure of Internet usage by individuals by frequency and age in 2017

For individuals away from home or work, 85.3 percent are connected to the Internet using a mobile or smart phone. With the combination of home and mobile devices, the internet was used as follows by regular users:

- 97.4% of them carried out phone or video calls, participated in social networks, sent/received e-mails or shared self-created content (text, photos, music, videos) in a website.. Facebook had 38.5 percent regular users who checked their account daily.
- 87.0% of the individuals used the internet to access information, read online newspapers, news, magazines, seek health related information or find information about goods or services.
- 13.0 % used the internet for civic and political participation (posting opinions on civic or political issues via websites, taking part in on-line consultations or voting) and for professional purposes (looking for a job or sending a job application, participating in professional networks).

For farmers who have access to the internet, it can be assumed that the usage level may be similar to the national totals, although the lower level of education likely results in less sophisticated use of the internet.

Currently broadband availability is restricted in many farm villages with mobile devices filling the niche. However, given the EU mandate of 30 Mbps or more for all citizens by 2020 with 50% having 100 Mbps connections, this can be expected to change. By 2025, the mandate calls for 100 Mbps to be upgraded to 1 Gbps for all European households and all to have 5G wireless broadband coverage.

Sources of Farm News and Information. Currently, there is not a good single source of farm news and information. It is spread across the web sites of the various farm associations, the National Agricultural Advisory Service, marketing services, input suppliers, and a few independent sources. In addition, there are many non-Bulgarian web sites with significant and relevant information, such as the EU's Smart Farming Platform (https://smart-akis.com/SFCPPortal/#/app-h/dashboard) and the EU's European Network for Rural Development of the European Commission (ENRD) (https://enrd.ec.europa.eu/smart-and-competitive-rural-areas/smart-villages/smart-villages-portal_en). The Bulgarian National Rural Network website as part of ENRD is still in development (http://www.nsm.bg/).

In Bulgaria, there is a web site for selling farm products online (http://www.farmer.bg/) . Veterinary information is available from www.navet.government.ng. Various government sites are available, such as http://www.prsr.bg/, the MAFF website (www.mzh.government.bg/mzh/NationalServices.asp) has links to various services, and the National Agricultural Advisory Service site (http://www.naas.government.bg/en) contains significant relevant information.

3.6 National targets for Agricultural Sector development

3.6.1 *Priorities and Policy Objectives in the Agrarian Sector for their Fulfillment in 2018*

The Bulgarian state policy in the agrarian sector aims at increasing the competitiveness of Bulgarian agriculture and improving the working conditions and quality of life in the rural areas, while efficiently using the EU funds, sustainable management of the natural resources and high standards for food safety . The priorities and policy objectives in the agricultural sector, measures and actions for their achievement in 2018 are in accordance with the

National Development Programme: Bulgaria 2020 and the Government program for sustainable development of the Republic of Bulgaria 2017 - 2021.

Both European and national funds will be directed to achieving these priorities and targets. This includes the direct payments and market support under Pillar 1 of the Common Agricultural Policy and support of the Rural Development Program (RDP) under Pillar 2 of the CAP funded by the European Agricultural Fund. In total for the program period 2014-2020, Bulgaria is expected to used Euro 7.5 Billion in the agrarian sector, comprising Euro 5 Billion in direct payments and Euro 2.2 Billion for the development of rural areas and investments in agriculture under the RDP.

PRIORITY 1. ACHIEVING SUSTAINABLE, COMPETITIVE AND MARKET-ORIENTED AGRICULTURE

- **TARGET 1:** PROVIDING FINANCIAL AID WITH FOCUS ON THE SMALL AND MEDIUM-SIZED ENTERPRISES AND STIMULATING PROFITABLE AGRICULTURAL PRODUCTION AND EQUALITY IN THE MARKET
  - MEASURE: Optimal utilization of the European funds for assistance
  - MEASURE: Maintaining the existing and introduction of new schemes for state assistance and providing financial resources for the application of schemes for transitional state aid in plant production and in animal breeding
- **TARGET 2:** CONTINUATION OF THE POLICIES OF BALANCED AND DIVERSIFIED AGRICULTURE
  - MEASURE: Prioritization of the intensive sectors in agriculture to overcome the structural unbalance in the branch.
  - MEASURE: Optimization of land regulations to guarantee the efficiency of land use and increase of the income from agricultural activity
  - MEASURE: Establishment of optimum conditions for the development of efficient irrigation farming and prevention of the risk of floods, disasters and accidents.
  - MEASURE: Enhancing the development of organic agriculture
- **TARGET 3:** SUCCESSFUL HOLDING OF THE BULGARIAN PRESIDENCY OF THE EU COUNCIL AND UPHOLDING THE POSITION OF BULGARIA FOR STRONG AND ADEQUATE CAP AFTER 2020
  - MEASURE: Providing continuity of the work performed by the Estonian Presidency
  - MEASURE: Protection of the national interest while observing the principal of neutrality of the Presidency
  - MEASURE: Achieving visibility of the Bulgarian Presidency
- **TARGET 4:** APPLYING A COMPLEX APPROACH FOR THE PREVENTION AND MANAGEMENT OF RISKS AND CRISES
  - MEASURE: Improvement and enhancing the efficiency of the system combating hailstorms
  - MEASURE: Use of the state aid system to compensate for the losses of farmers as a result of unfavorable natural, climatic and economic conditions
- **TARGET 5:** HIGH LEVEL OF PROTECTION OF THE HEALTH OF ANIMALS AND PREVENTION AGAINST DISEASES
  - MEASURE: Strengthening of the official control, guaranteeing the effective application of the normative regulations
  - MEASURE: Establishing conditions for conducting adequate prevention of the commercially important diseases in the animals and more effective organization in order to quickly overcome the sudden outbreaks of diseases

- MEASURE: 220 Motivation and compliance in observing the requirements for humane treatment of animals
- MEASURE Speeding up the introduction of the new requirements towards the means for identification of the animals and the bee families
- MEASURE: Providing an adequate system for collection and disposal of animal by-products

- **TARGET 6:** SCIENCE AND INNOVATION IN AGRICULTURE – AN INSTRUMENT TO GENERATE INNOVATIVE POLICIES IN THE AGRARIAN SECTOR AND AN INTELLECTUAL CENTER OF BULGARIAN AGRICULUTRE ACCESSIBLE FOR BUSINESSES
  - MEASURE: Transforming the national agrarian scientific branches into a driving force for innovations in the agrarian business
  - MEASURE: Restructuring of the Agricultural Academy
  - MEASURE: Increasing the professional qualification and knowledge of the farmers
- **TARGET 7:** CREATION OF CLEAR RULES FOR THE FUNCTIONING OF ORGANIZATIONS IN THE AGRARIAN SECTOR AND THE REGULATION OF THEIR RELATIONS WITH THE STATE BODIES AND LOCAL AUTHORITIES
  - MEASURE: Normative regulation of the relations between the representative organizations of the farmers and the state bodies and local authorities
- **TARGET 8:** PROVIDING INSTITUTIONAL SUPPORT AND ELECRONIZATION OF THE ADMINISTRATION IN THE SECTOR TO MITIGATE THE ADMINISTRATIVE PROCEDURES AND PROVIDE TRANSPARENT, ACCESSIBLE, OBJECTIVE AND EFFICIENT MANAGEMENT OF THE ADMINISTRATIVE PROCESSES.
  - MEASURE: Development of the electronic management and improvement of the administrative services in the system of the Ministry of Agriculture, Food and Forests.

PRIORITY 2: SUSTAINABLE DEVELOPMENT OF THE FOOD SECTOR

- **TARGET 1:** GUARANTEEING THE QUALITY AND SAFETY OF FOOD
  - MEASURES: Simplification of the legal framework for guaranteeing consumer protection by means of offering safe food on the market and reducing the informal (grey) sector in the production, processing and distribution of food
- **TARGET 2:** SUSTAINABLE MARKET DEVELOPMENT OF THE FARMERS
  - MEASURE: Strengthening the role of the producers along the food chain of supply

PRIORITY 3: MULTIFUNCTIONAL AND SUSTAINABLE FOREST MANAGEMENT

PRIORITY 4: DEVELOPMENT OF THE FISHERY AND AQUACULUTRE SECTOR BY MEANS OF SUSTAINABLE USE OF THE NATURAL RESOURCES AND PROTECTION OF THE ECOSYSTEMS FROM OVER-EXPLOITATION WHILE TAKING INTO ACCOUNT THE HIGH SOCIAL FUNCTION OF FISHING IN THE COASTAL REGIONS

PRIORITY 5: MOBILIZING THE POTENTIAL OF THE RURAL AREAS TO ACHIEVE A BALANCED SOCIAL AND TERRITORIAL DEVELOPMENT

- TARGET 1: DIVERSIFICATION OF THE ECONOMY OF THE RURAL AREAS AND HIGH LEVEL OF EMPLOYMENT OF THE LOCAL POPULATION
- TARGET 2: IMPROVEMENT OF THE QUALITY OF LIFE IN THE RURAL AREAS

4 Data Analysis and Discussion

The GAP survey was conducted between March and May 2018. The target groups consisted of (1) managers/heads of farmer cooperatives/agronomists as links between the government and the farmers and individual farmers/producers and (2) policy makers from the agricultural and environmental sectors (see section 2.3.1: Target groups). The questions administered can be seen in Table 1 in section 2.5).

In total, 13 farmers / representatives from the agribusiness and 5 policy makers from Bulgaria participated in the survey by filling in the respective e-questionnaires.

4.1 Description of the interviewees

4.1.1 Agribusiness and individual farmers (TG-1)

The age distribution of the target group consisting of managers/heads of farmer cooperatives, and individual farmers/producers (TG-1), is shown in Fig. 4.1. Of this group, 42% are older than 50, 25% are between 20 and 30 years old, the remaining 33% are between 31 and 50 years old.

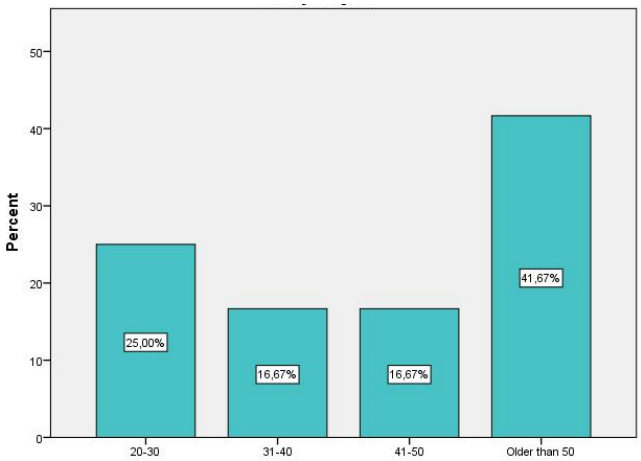

Figure 4.1. Age of the interviewees belonging to TG-1.

The participants of TG-1 include 42% with a higher educational level, 33% with a secondary education and 25% with only a primary education. Fig. 4.2 illustrates the breakdown of the sample into educational categories.

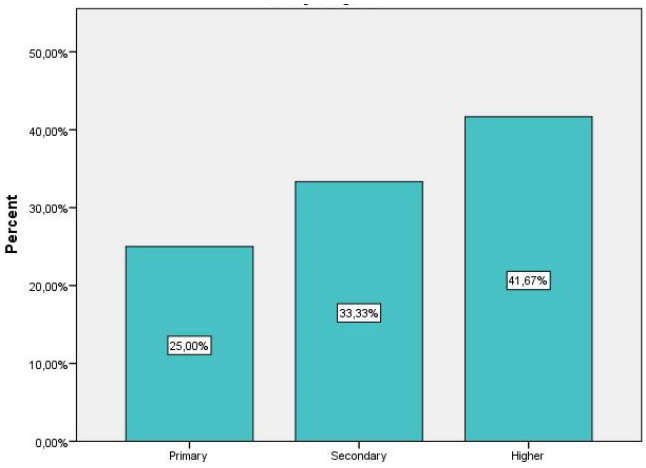

Figure 4.2. Education level of the interviewees belonging to TG-1.

Only one-third (38.5%) of the participants are experienced in agriculture with more than 10 years background in the area, and the majority of them (61,5%) have less than 5 years of experience.

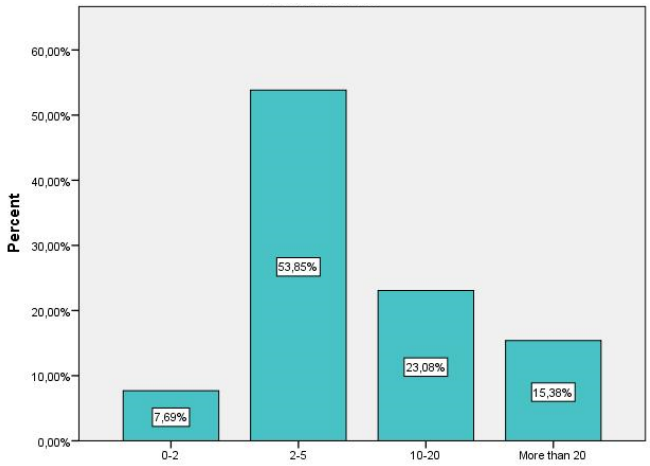

Figure 4.3. Years of experience in agriculture of the interviewees of TG-1 .

Half of the participants are small holders, as Fig. 4.4 illustrates and the other half cultivate more than 5 ha.

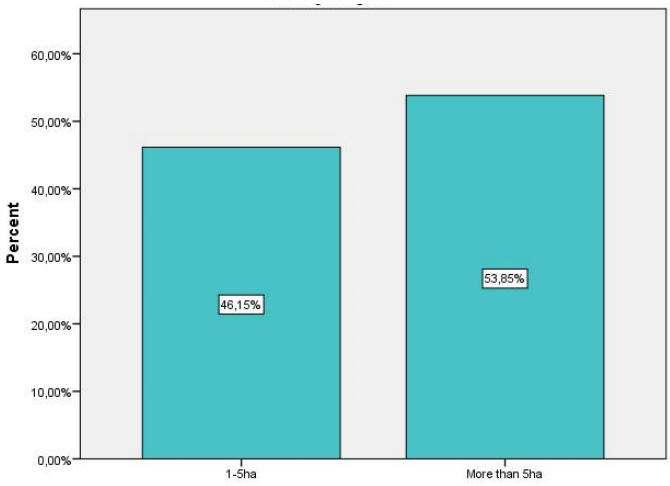

Figure 4.4. Hectares farmed by the interviewees of TG-1.

Interestingly, vegetables were the primary crop grown by the participants. As Figure 4.5 shows, grape vines and pome fruits were well represented with grains only accounting for 8% of the participants.

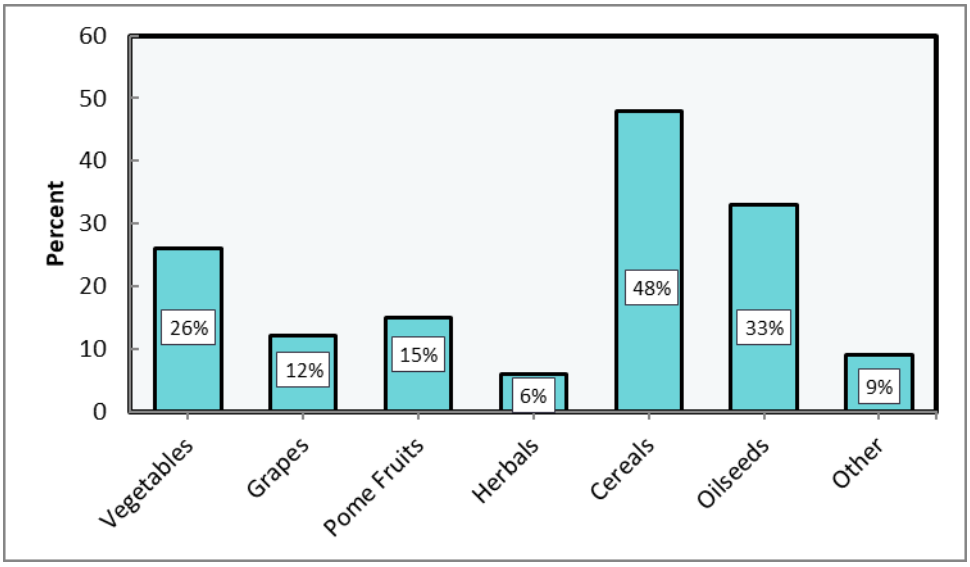

Figure 4.5. Cultivation types by the interviewees of TG-1.

Almost 39% of the participants orient their products to local markets, while only 7,7% supply European markets, and none of the interviewees supply any International market (Fig. 4.6). A majority of the interviewees have established cooperation with the food industry (53,8%) and super markets (15,4%), while the 7,7% sell directly to neighborhood markets.

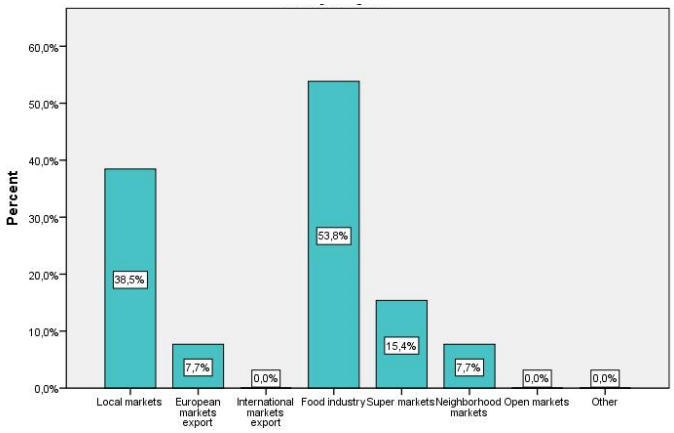

Figure 4.6. Marketing outlets used by the interviewees of TG-1.

Figure 4.7 shows that a high proportion (31%) of the participants were family farms. Participants with 1 to 5 workers comprised another 54% with the remaining 8% employing more than 5 workers. Such small farms are typical of Bulgaria.

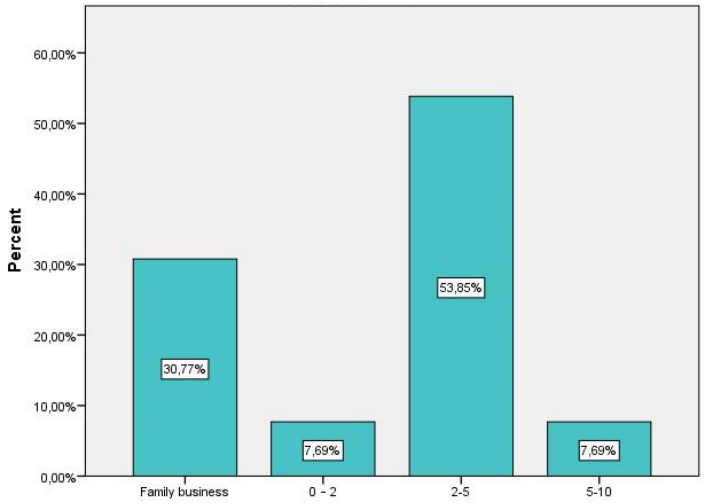

Figure 4.7. Employees occupied by farmers or agribusinesses.

4.1.2 Policy makers (TG-2)

In total, 5 policy makers participated in the survey. Figures 4.8 and 4.9 presents the sectors they serve and their fields of expertise. As can be seen, the majority of participating policy makers serve national authorities (60%), while a smaller share serve regional authorities (40%). The field of expertise of the interviewed policy makers is agriculture (60%), while 40% of them are experts on environment (Fig. 4.9).

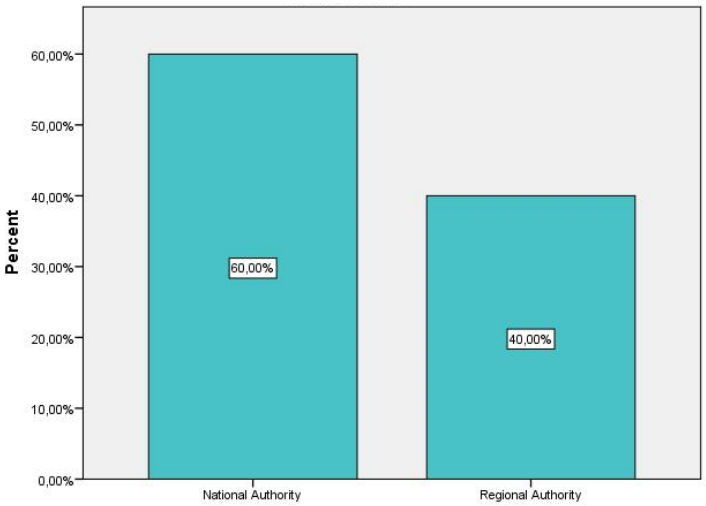

Figure 4.8. Sectors served by the policy makers (TG-2).

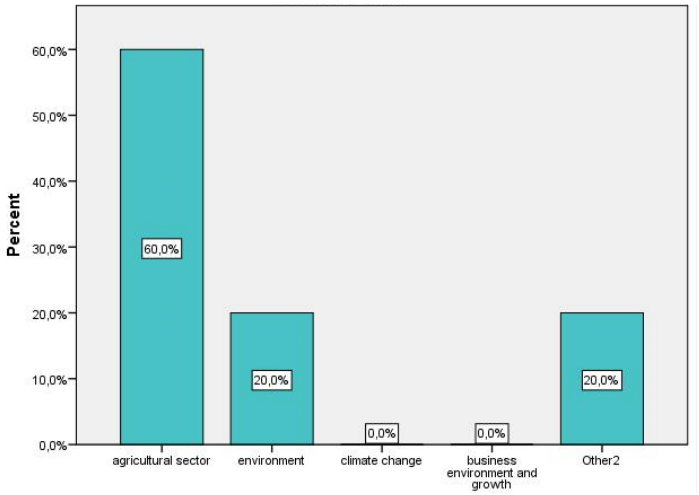

Figure 4.9. Scientific expertise of the policy makers (TG-2).

In terms of their qualifications, policy makers were asked if they have been educated or trained in sustainable farming systems. Figures 4.10 illustrates that 60% of them have received some eduction or training, mainly through educational training programs (60%) and through seminars (40%). Other type of education/training of policy makers is through practical training in the field.

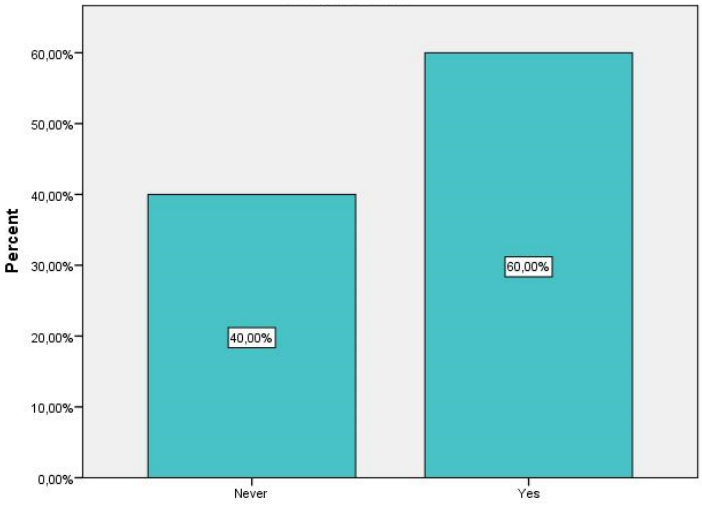

Figure 4.10a). Answers to the question whether the participating policy makers have received education or training in sustainable farming practices.

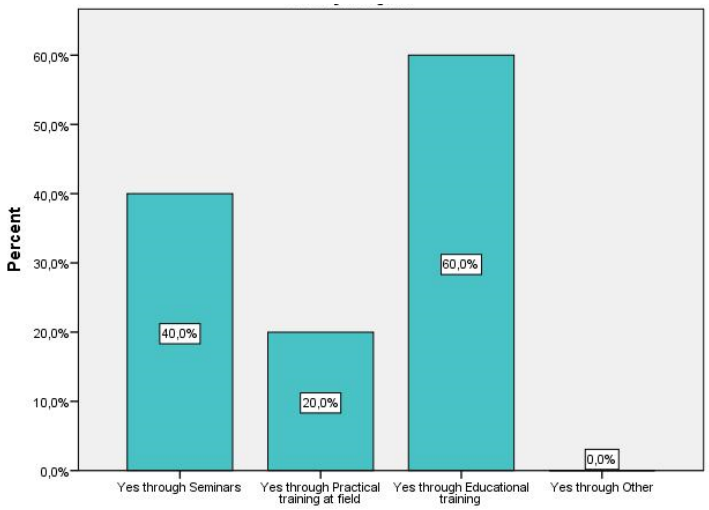

Figure 4.10b). Answers to the question by what means the participating policy makers have received education or training in sustainable farming practices.

4.2 Analysis of the survey's results

4.2.1 Agribusiness and individual farmers (TG-1)

4.2.1.1 Environmental awareness, skills and training

This section analyses skills, training level and the familiarity of the interviewees of TG-1 with global environmental issues including climate change and sustainable agriculture.

A majority (60%) of the interviewees have an awareness of climate change ("yes" in Fig. 4.11). Aware, but not so well informed were 38,5%. An encouraging finding is that all participants have some knowledge, because nobody answered "not at all". It has to be mentioned, however, that the survey didn't focus on what the interviewees know about climate change and therefore, one should take into account that the answers provided to this question are subjective. In other words, the answer "Yes" corresponds to the answer "I believe that I am aware of the reasons for climate change".

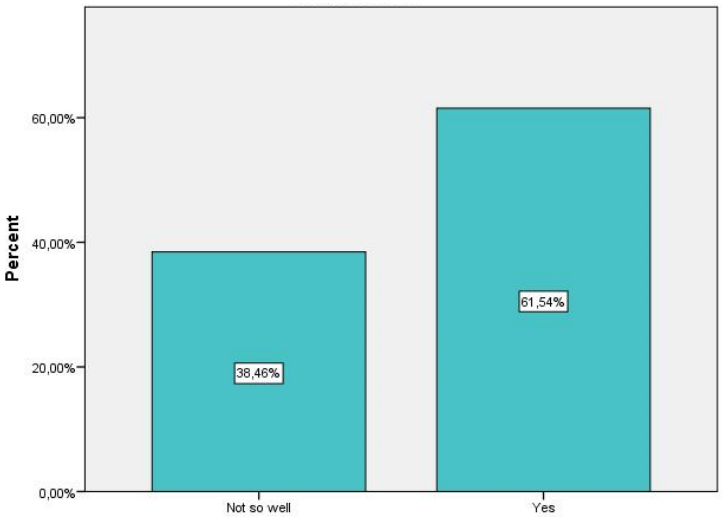

Figure 4.11. Familiarity of the interviewees of TG-1 with reasons of climate change.

Answers regarding familiarity with the circular economy, however, were not so encouraging, considering that 8% of the interviewees are not informed, another 8% do not even know what circular economy is and another 46% are “not much” familiar (Fig.4.12). About one-third of the interviewees (38%) have some knowledge about the circular economy.

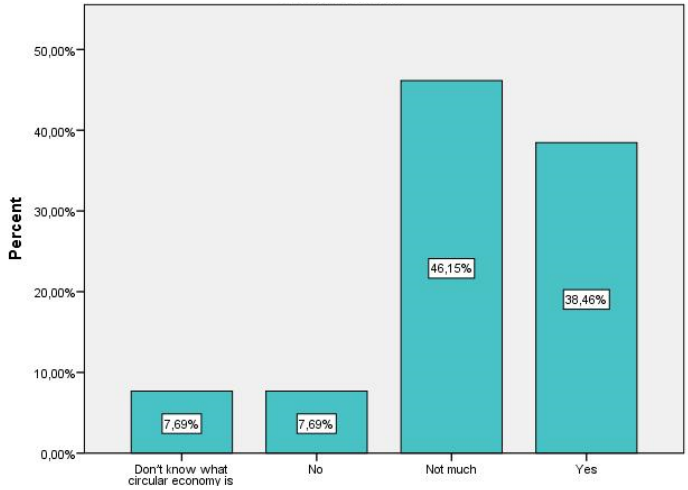

Figure 4.12. Familiarity of the interviewees of TG-1 with circular economy.

Half of the interviewees (54%) declared themselves aware of the environmental impacts of agriculture and the other half (46%) as not aware (Fig.4.13).

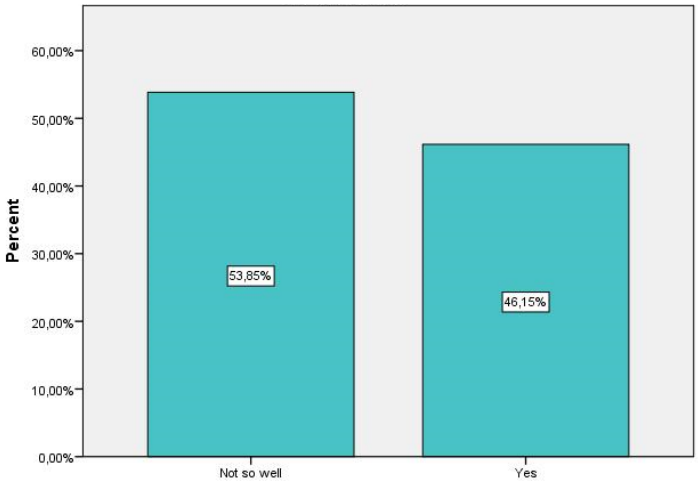

Fig. 4.13. Familiarity of the interviewees of TG-1 with the environmental impact of currently practiced agricultural production.

Almost half (45%) of the participants said that they had received training in sustainable farming practices (Fig. 4.14). By comparing this finding with the answers provided to the same question by the policy makers (Figs. 4.10), we realize that although there are instruments and means for training and educating policy makers, the expertise and qualifications gained have not been exploited for the benefit of farmers/agribusinesses yet.

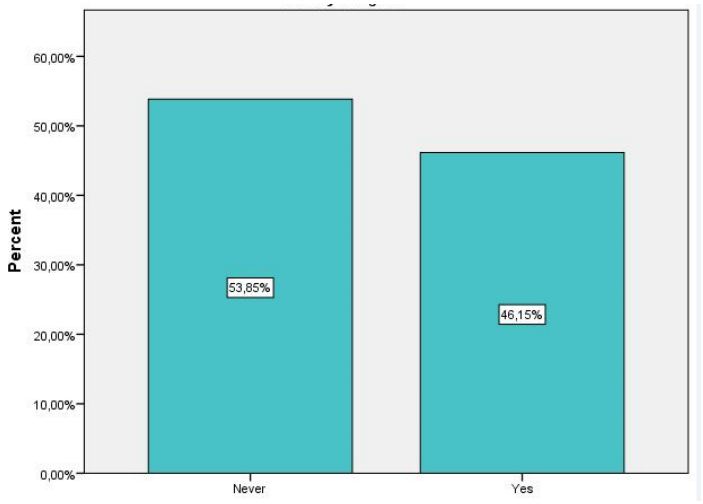

Figure 4.14. Answers of the interviewees about whether they have received training on sustainable practices.

Similarly to the policy makers (Fig. 4.10 seminars are the main means for the training), 46% of the GG-1 participants have been exposed to sustainable farming systems through seminars. (Fig. 4.15). However the substantial difference between policy makers and farmers is that the farmers have not received educational training at all. This highlights the need for policy makers and government to consider the development of more thorough educational courses (not only 1-2 day seminars) for farmers.

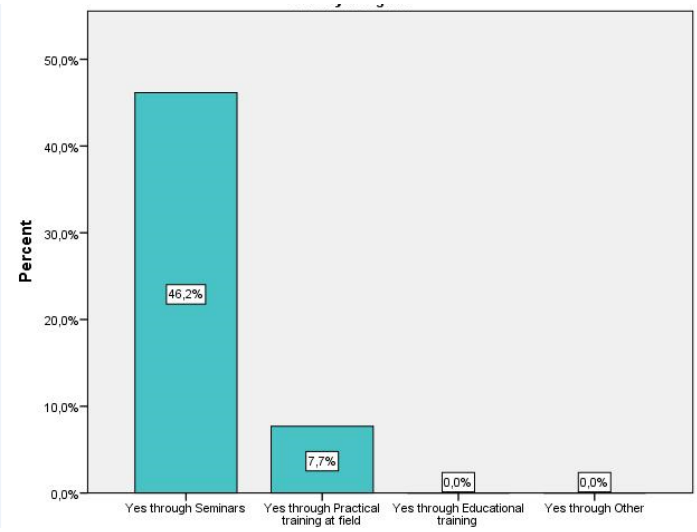

Figure 4.15. Means through which farmers/agribusinesses have received education or training in sustainable farming systems.

In relation to the previous question and as Fig. 4.16 reveals, 38% of the farmers do not even know if there is available know-how in their language or that there is not. This leaves 61% being aware that there is information available to them that may be beneficial to them in learning more about sustainable practices.

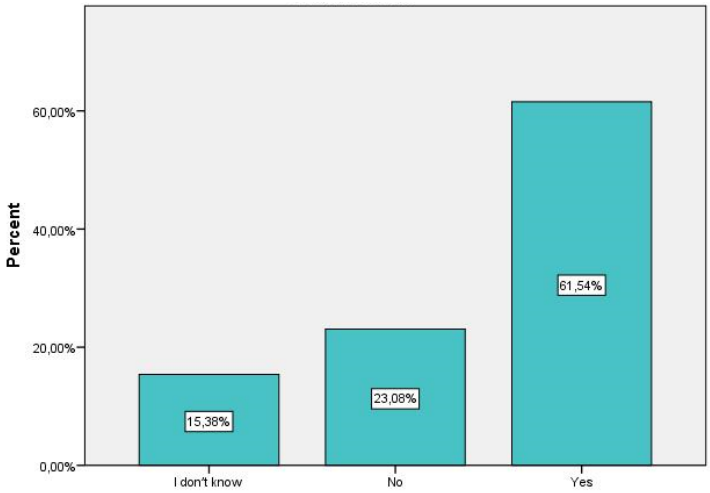

Figure 4.16. Answers of the interviewees about whether they are aware of available know-how in their language.

Responses regarding the willingness of the interviewees to take measures for the protection of the agricultural environment and, in fact, to share global environmental problems such as water scarcity, unsustainable exploitation of natural resources and mismanagement of waste, was very positive. As Figure 4.17 shows, 46% already practice the re-use of water, green energy, decrease of energy use and re-use of organic waste. Another 46% plan to implement such practices in the future.

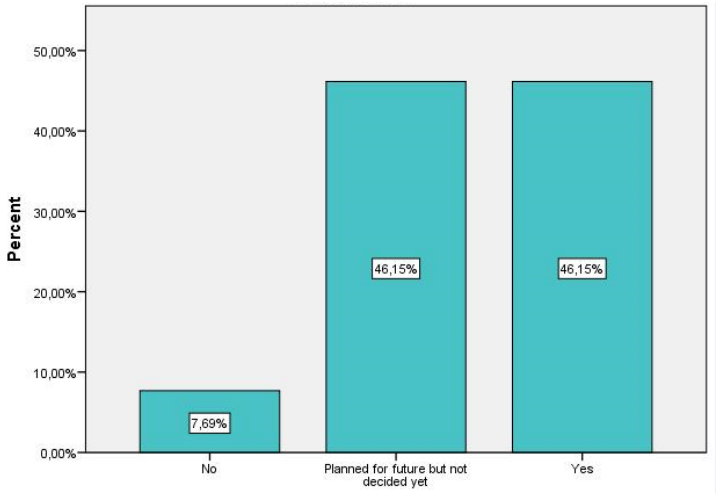

Figure 4.17. Answers provided to the question whether the interviewees plan to introduce re-use of water, green energy, decrease of energy use and re-use of organic waste.

Of those who answered "Yes" to the above question, 31% re-use or plan to re-use water, while the options of re-use of organic waste and decrease of energy use gained accounted for 8% each (Fig. 4.18). Of those who plan to introduce, but have not yet decided when, 31% expect to implement green energy programs and 8% each for the reuse of water and organic waste (Fig. 4.19). Nobody currently uses green energy, but one of three interviewed want to do so. This fact shows that green energy is the main agro-ecological practice which Bulgarian farmers expect to introduce in near future.

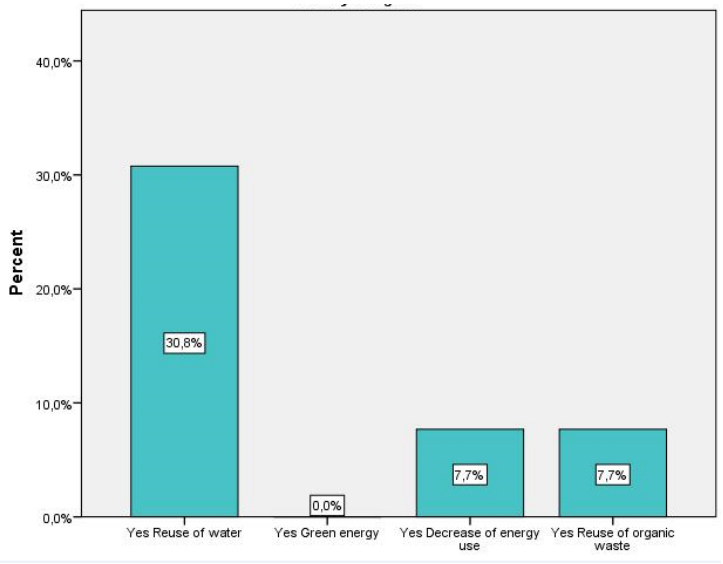

Figure 4.18. Options selected by the interviewees of TG-1 who introduce reuse of organic waste, water re-use, green energy and decrease of energy use.

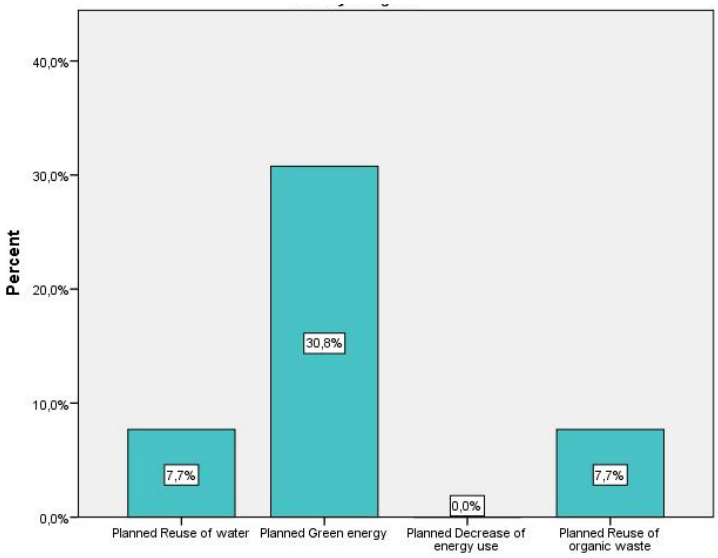

Figure 4.19. Options selected by the interviewees of TG-1 who are positive to introduce reuse of organic waste, water reuse, green energy and decrease of energy use, but they have not decided it yet.

Finally, and as regards the familiarity of the interviewees of TG-1 with Information and Communication Technologies (ICT), it was an encouraging finding that one of two interviewees (54%) is very well skilled and another 31% characterize themselves as skilled. Only 15% of the participants define themselves as not skilled at all or not knowing what ICT is (Fig. 4.20).

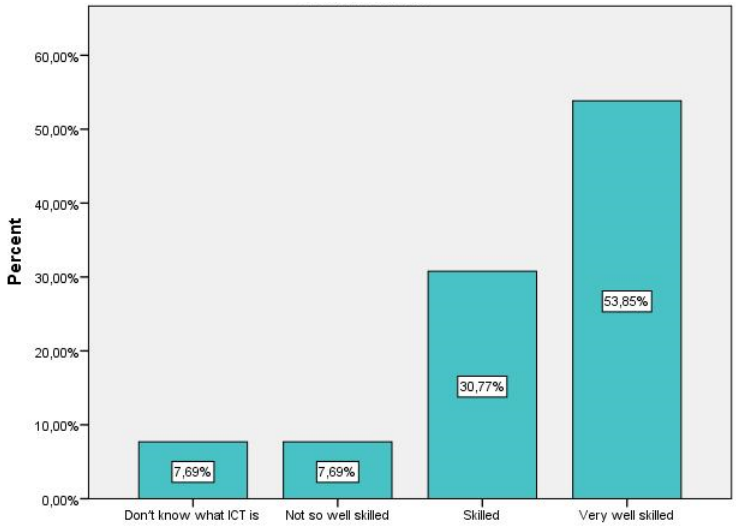

Figure 4.20. Familiarity of the interviewees of TG-1 with Information and Communication Technologies.

4.2.1.2 Professional profile (TG-1)

Questions were posed to the TG-1 participants in order to assess their acceptability of introducing sustainable practices in their farms/enterprises and of adopting behavioral change. As Figure 4.21 shows, 85% were aware of national and European laws and regulations The highest percentage of them (39%) replied "yes" that they actively kept up to date and another 23% replied "often". Only 15% did not put effort into understanding national and European laws and regulations related to agriculture.

When the interviewees were requested to define whether they comply with national and European laws and regulations (Fig. 4.22), almost half of the interviewees (46%) replied positively with 'yes' with another 38 % "often" or "sometimes" complying with the regulations. Only 15 % said that they do not knowingly or unknowingly comply at all.

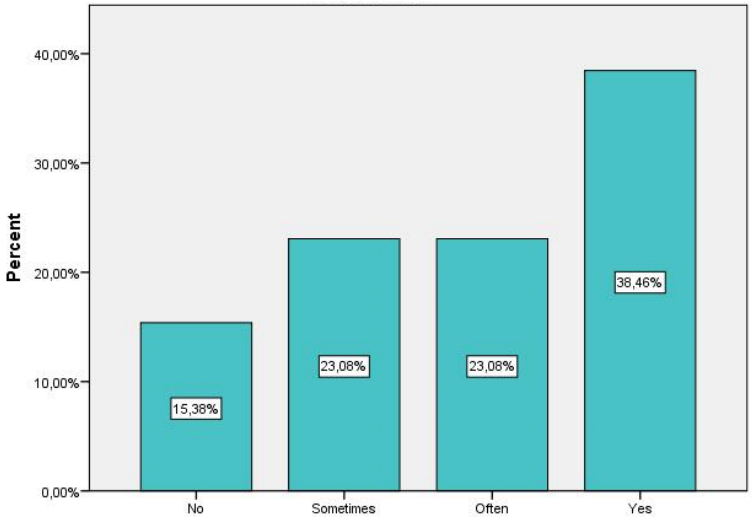

Figure 4.21. Answers of the interviewees of TG-1 about whether they keep themselves up to date with national and European laws and regulations.

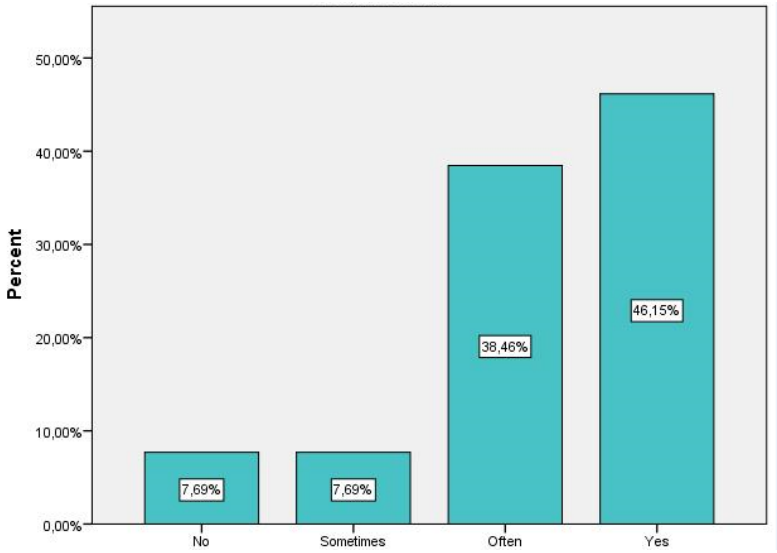

Figure 4.22. Answers of the interviewees about whether they comply with national and European laws and regulations.

Most participants (85%), actively monitor their farms/enterprises in terms of yield, inputs, costs, income and profitability of their enterprises (Fig. 4.23). Of these, 38% have always maintained records and the other 46% have only keep records during the last five years. It is however, encouraging that half of the remaining 15 % who do not keep records at the time of survey, plan to do so.

As it can be seen in Fig. 4.24, 46% of respondents said that they maintain a business plan for their farm. Of the remainder, 8% of the participants state that do not know what long term viability and a business plan are, while 46% answered that they do not have a business plan. Considering the prevailing conditions of European and international market competition, this big share of farmers/entrerpises who/that do not have a business plan is without doubt a significant weakness of the sector, although the share of 46% of the farmers who declare that have adopted a business plan for the long-term viability of their farms/enterprises could be considered encouraging.

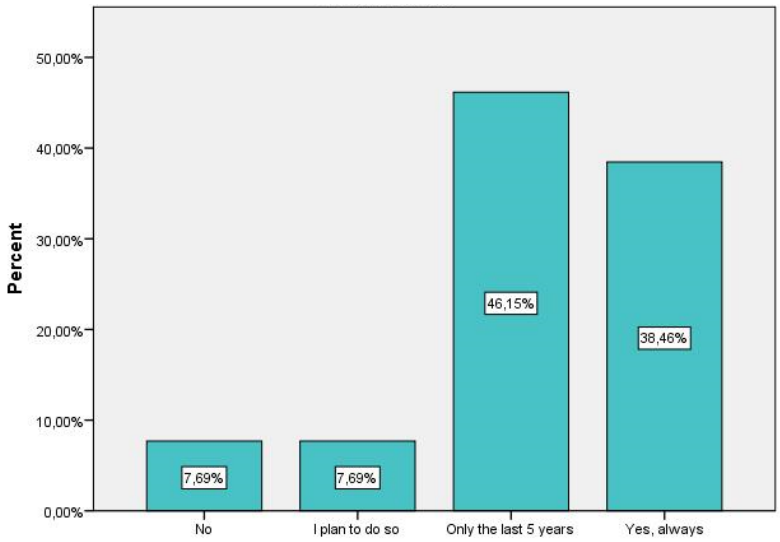

Figure 4.23. Answers regarding monitoring of the farms/enterprises (i.e. recording of yield, inputs, costs, income and profitability of the enterprise).

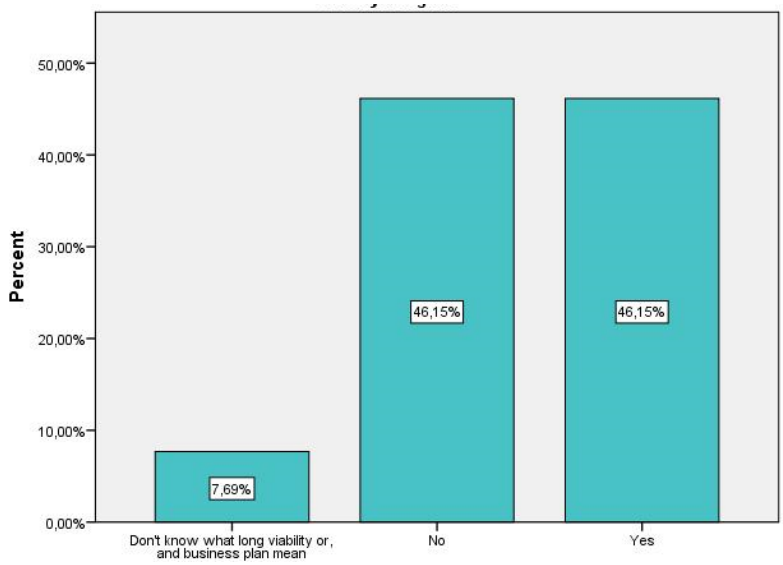

Figure 4.24. Answers regarding the existence of business plan for the long-term viability of farms and enterprises.

Another significant aspect for the assessment of the professional level of the interviewees is whether they evaluate land suitability prior cultivation (Fig. 4.25). Very encouraging is the fact, that more than half (54%) answered positively, and while another 31% do not evaluate land suitability at the moment theyplan to do so. Only 15% do not evaluate land suitability prior cultivation and don't have any plans in this regard.

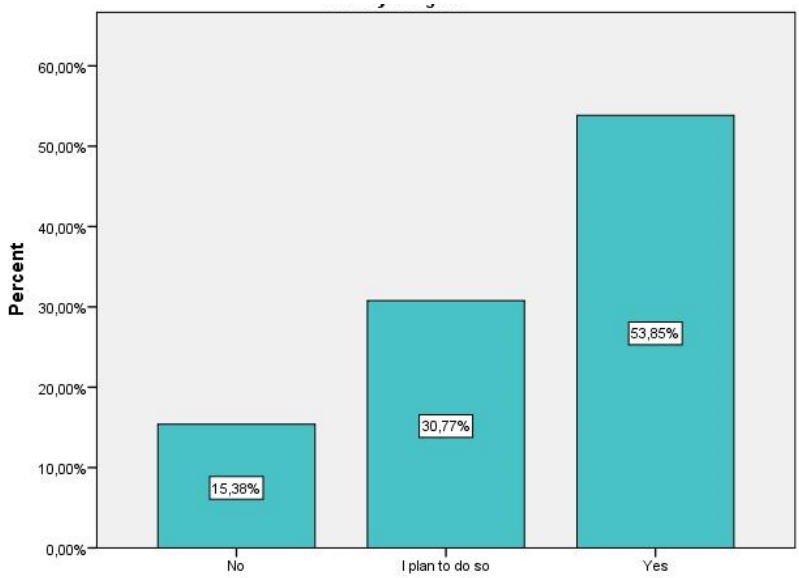

Figure 4.25. Answers on the question whether the interviewees evaluate land suitability of their property prior cultivation.

4.2.1.3 Balkan farmers/enterprises and Sustainable Agriculture

The purpose of this set of questions was to record the opinion of the interviewees on sustainable agriculture, as well as the factors that boost or even prevent them from adopting sustainable practices.

The first question in this part (Fig. 4.26) concerned the opinion of the interviewees regarding Sustainability Best Practices.I It was encouraging to observe that almost all participants recognize that such practices are environment friendly and could be effective. Still 15% stated that it is not as effective as conventional practices, another 8% considered such practices as difficult to be implemented and another 8% did not have knowledge about these practices. The fact that 69% of the interviewees, thought that sustainable agricultural practices are effective and easy to implement is highly encouraging.

This shows that the efforts made so far by local, regional and national/governmental authorities as well as from the European Commission to convince farmers and stakeholders from the agricultural sector regarding the environmental, economical and societal advantages of Sustainable Agriculture are having a positive result, although there is still a very significant gap in what is required.

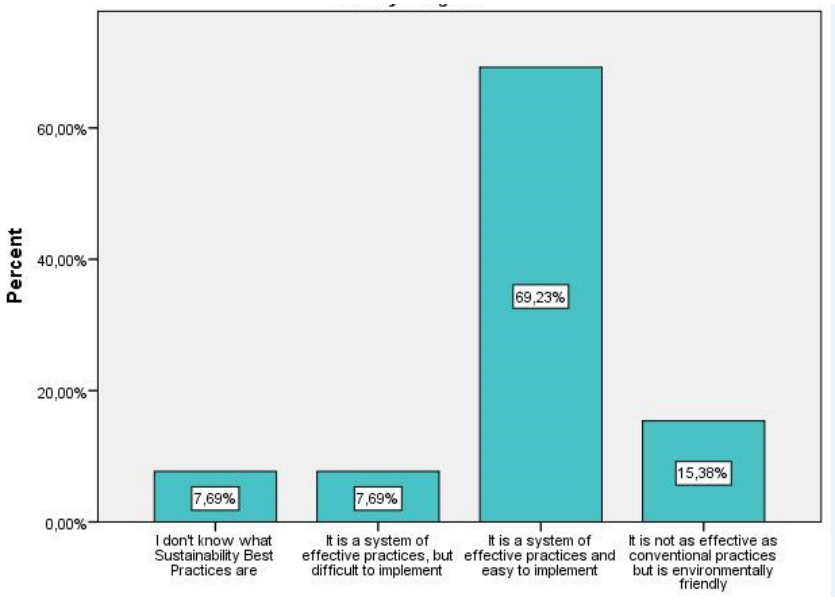

Figure 4.26. The opinion of the interviewees regarding Sustainability Best Practices.

The response regarding the importance of sustainable agricultural practices is very encouraging. As Figure 4.27 shows, 39% thought that it is very important and another 54% considered it important. This positive result indicates that farmers who understand the importance and necessity of adopting sustainable practices could become, through a targeted information and education campaign, major information carries and behavioral change and boost the adoption of sustainable practices. Targeted educational and training campaigns are therefore considered very important in order to change, first of all, the opinion of farmers /enterprises which was expressed in the previous question (Fig. 4.26) that sustainable practices, although environment friendly, are difficult to implement or are not as effective as conventional farming. Comparing the results in Bulgaria against those in other countries surveys, the Bulgarian farmers / enterprises have the highest percent with a positive attitude towards applying sustainable best practices.

Positive opinions have also been expressed regarding the importance of sustainable practices at the local level (Fig. 4.27), with only 8% of the interviewees considering them as not so important and 92% considering them as important or very important.

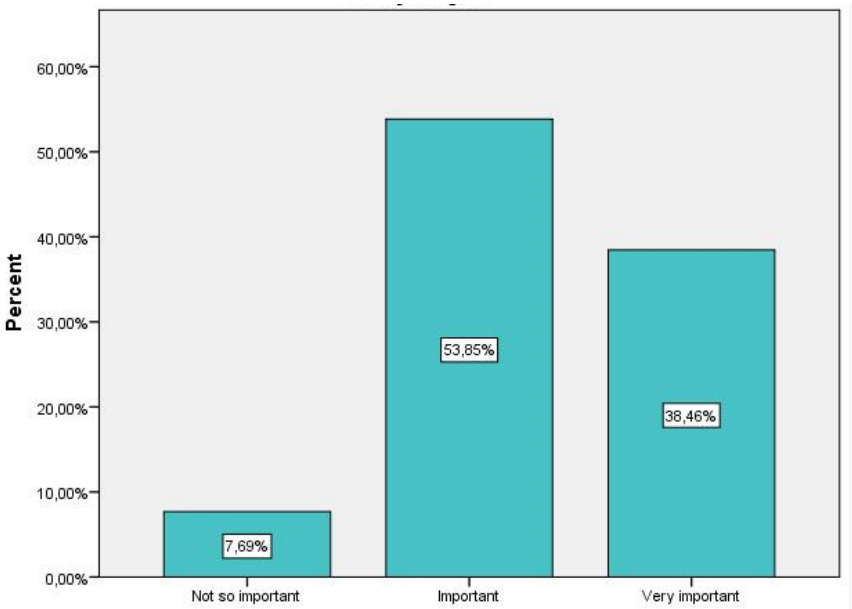

Figure 4.27. The opinion of the interviewees regarding the importance of farm sustainability at their regions.

When the interviewees were asked to express their opinion regarding the challenges they face in improving production and product marketing, economic recession was selected by almost the half of the participants (46%), while poor vocational training of human resources (15%), high costs (15%) and the absence of mechanisms for transferring knowledge (15%) were also considered important(Fig. 4.28).

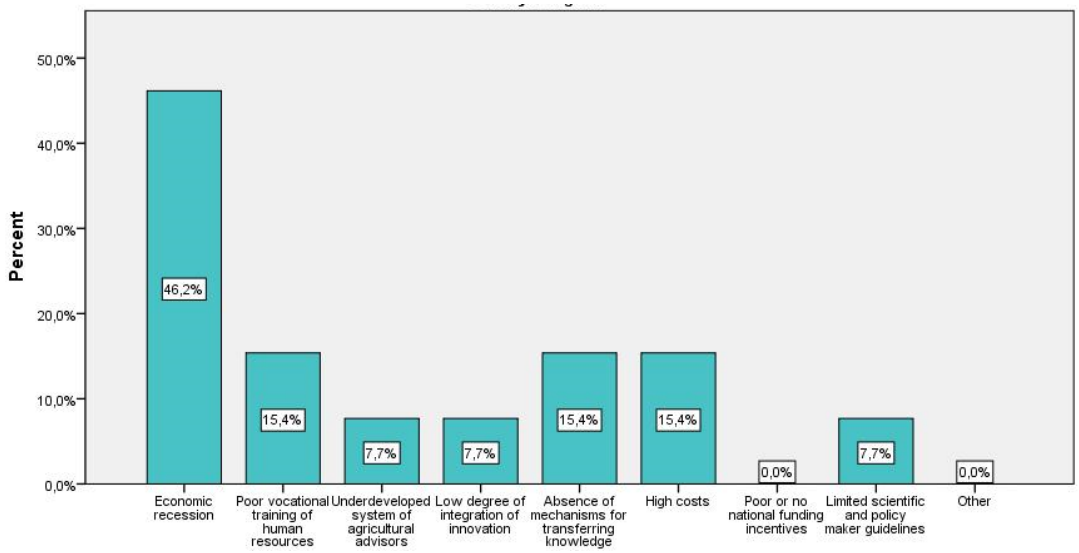

Figure 4.28. Challenges that the interviewees of TG-1 face in improving production and product marketing in total answers.

Although economic reasons were defined as the main factor that affects productivity improvement and marketing, however, 15% of the interviewees do not know if there are any governmental subsides or favorable financial instruments available which agri-businesses can exploit to switch to sustainable production and high value products for the market (Fig. 4.29). Another 38% of the interviewees definitely consider that there aren't such favorable instruments or subsides available, making a total of 53% of the interviewees of TG-1, who do not know the existence of such instruments and therefore are not in position to exploit them. 46% of participants are aware of such programs.

In Fig. 4.30 it can be seen that 69% of the interviewees have never exploited bank, national, EU, IFI or other subsidy funding to become more environmentally friendly. However, this record includes not only those who do not know the existence of such instruments, but also those who know but choose not to exploit them. On the other hand, 31% of the responders have already exploited available subsides or fundings while another 39% (Fig. 4.29) who know the availability of these insrtruments, but haven't exploited them.

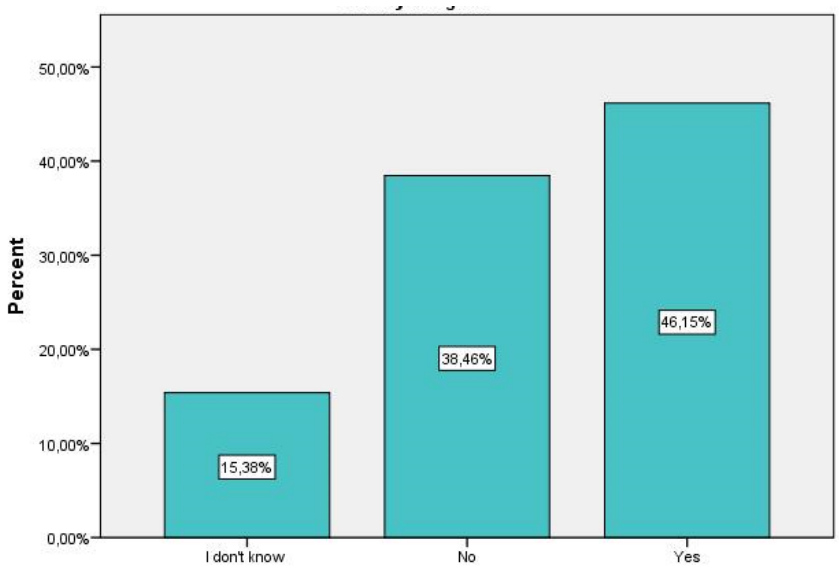

Figure 4.29 Answers to the question whether the interviewees of TG-1 know if there are any available governmental subsides or favorable financial instruments, which agribusinesses can exploit to switch to sustainable production.

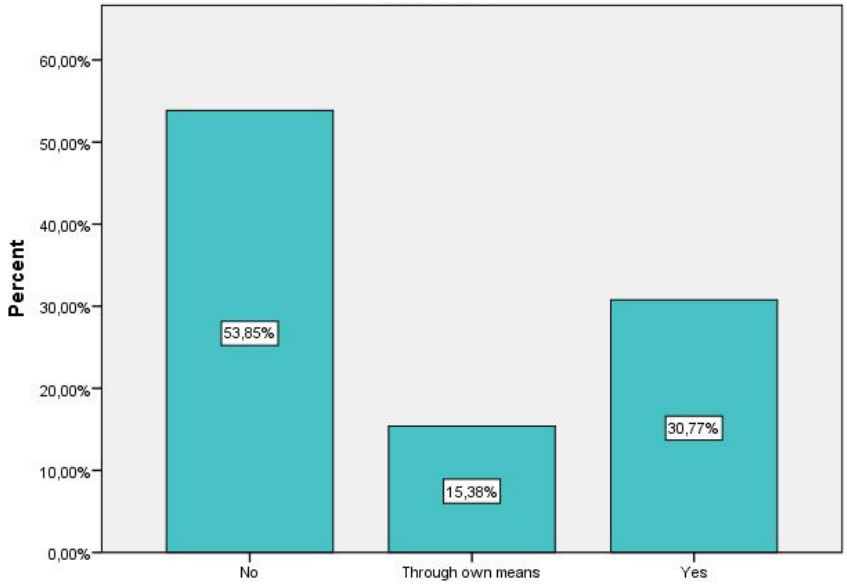

Figure 4.30. Answers to the question whether the interviewees of TG-1 have exploited bank, national, EU, IFI or other subsidy funding to become more environment friendly.

Poor cultivation practices by 62% of the interviewees as to the reason for poor sustainability practices. This was followed by poor irrigation practices (31%), and poor packaging practices (5%). Other reasons given were poor fertilization practices, poor harvesting and post-harvesting practices (Fig.4.31).

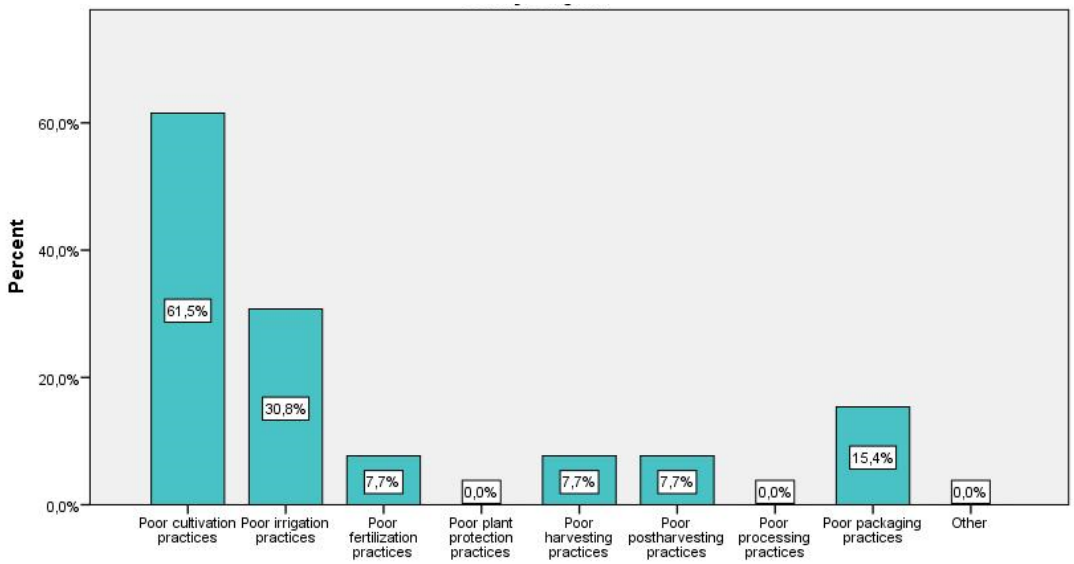

Figure 4.31. Challenges that the interviewees of TG-1 face in preserving farm sustainability in their regions.

When the interviewees were asked to rate, using grades from 1 to 5, the factors that they consider as obstacles for producers to implement sustainable practices, all the predetermined responses were similarly selected (Fig. 4.32). There is little difference between the increased costs required, the difficulties in promoting products to the market, the lack of support from local agronomists and government agencies and the lack of information on sustainable practices. An important conclusion of this question regarding interviewees choices is the big share of lack of information flow from the competent authorities to producers (e.g. complexity of sustainable practices, demand for natural

resource management), lack of support from governmental agencies, poor support from local agronomists and weak support for introducing sustainable agriculture products to the markets. It should be also noted, that farmers find complexity in sustainable practices.

The lack of adequate information and know-how communiced to farmers/agri-businesses can be also seen in Fig. 4.33. When the interviewees were asked if they consider that there is a favorable environment to stimulate adoption of more sustainable production practices, 31% answered that there is not a favorable environment, while 8% answered that they don't know. It is encouraging, however, that the 62% of the interviewees believe that there is a favorable environment, meaning that there is a critical mass of positive attitude that should be exploited by the policy makers in Bulgaria.

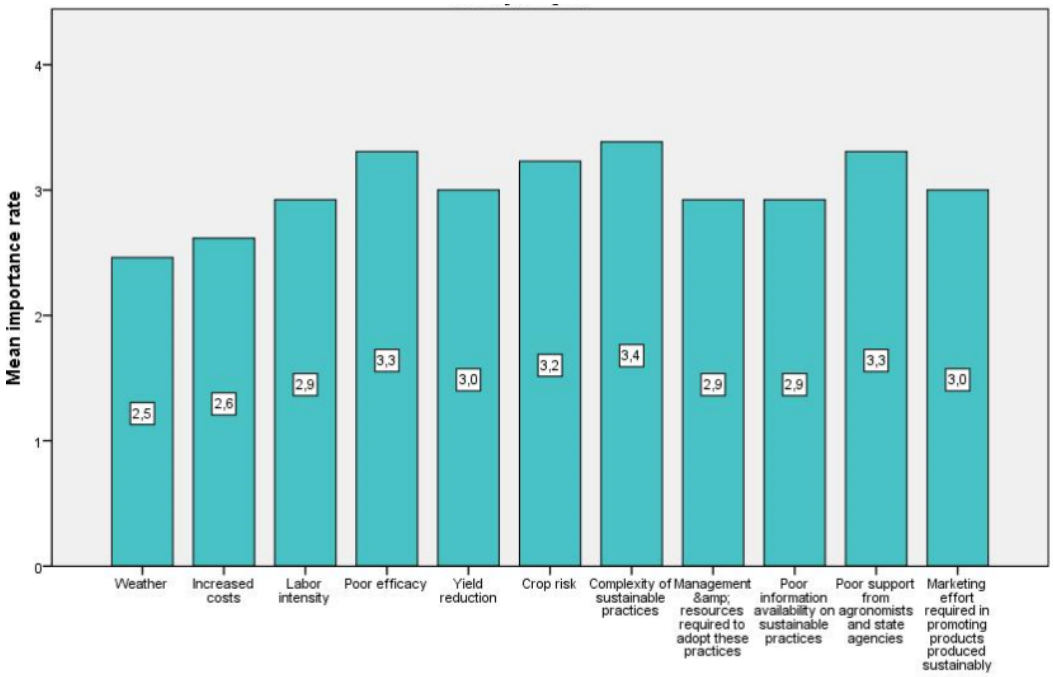

Figure 4.32. Answers regarding the factors that the interviewees of TG-1 consider as obstacles for producers to implement sustainable practices.

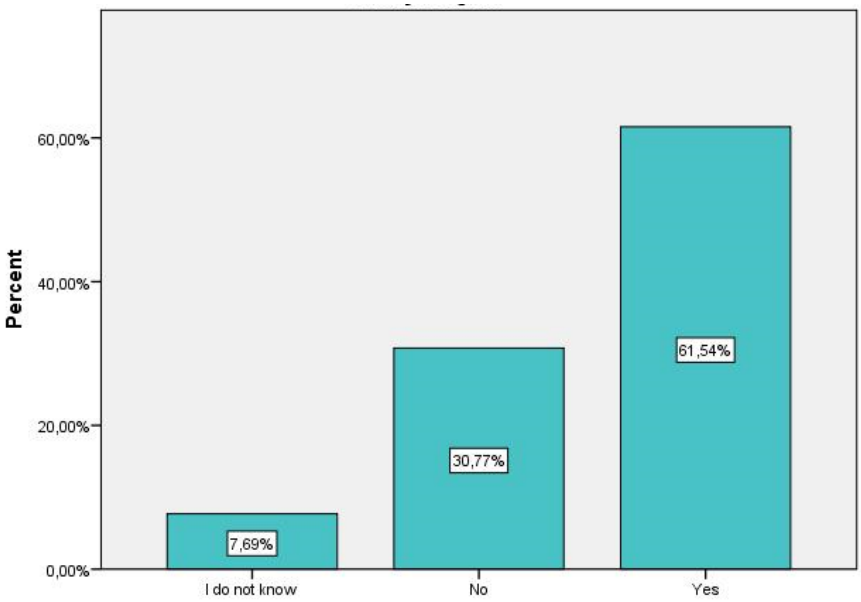

Figure 4.33. Answers provided to the questrion if there is currently a favorable environment to stimulate adoption of more sustainable production practices

Another significant conclusion concerns the opinions recorded on the question "what hinders the development of sustainability best practices in your region". Predefined answers, for rating between 1 and 5, were provided to the interviewees with the option to write their own answer in a free text box (Fig. 4.34).
The interviewees chose with almost the same degree of preference the following answers:

- ✓ Limited funding for Sustainability Best Practices research
- ✓ National policy without clear and quantified objectives

The other most rated answers were:

- ✓ Lack of significant economic and other incentives from the State to producers
- ✓ Insufficient education and training of producers
- ✓ Low level of education on the topic of local counselors and agronomists

As a first necessity, farmers pointed the need of financial incentives and national policy with clear and quantified objectives and at the second place education and training, including at local level. The answers given clearly indicate also, that from the producers' side, there is lack of an effective plan by the governmental agencies to train and educate producers on sustainable agriculture issues and also to communicate effectively (1) the measures taken and implemented so far to support the transition to sustainable production systems and (2) the currently existed instruments for the financial support of the producers.

Considering that a significant proportion of policy makers have received training on sustainable agriculture (Fig 4.10a) and also that a very large proportion of producers are not aware of the availability of financial support instruments (Figs. 4.29 and 4.30), we conclude that the establishment of intermediate well-informed and trained bodies/agencies/departments (preferably with a local or regional character), which will be able to communicate national and regional policies on the adoption of sustainable practices in Bulgarian agriculture effectively, is of significant importance. Another option is strengthening or expanding the functions of the National Agricultural Advisory Service in the Ministry of Agriculture and its 27 territorial regional local offices. Targeted actions to inform producers/agribusinesses and communicate support measures and funding instruments should be designed and implemented by these services.

In accordance to the previous results, when the interviewees were asked to be more specific and define which incentives they consider beneficial in order to shift to sustainable farming, 'additional points in scoring when I apply under the Rural Development Programe' attracted 69% of the interviewees (Fig. 4.35).

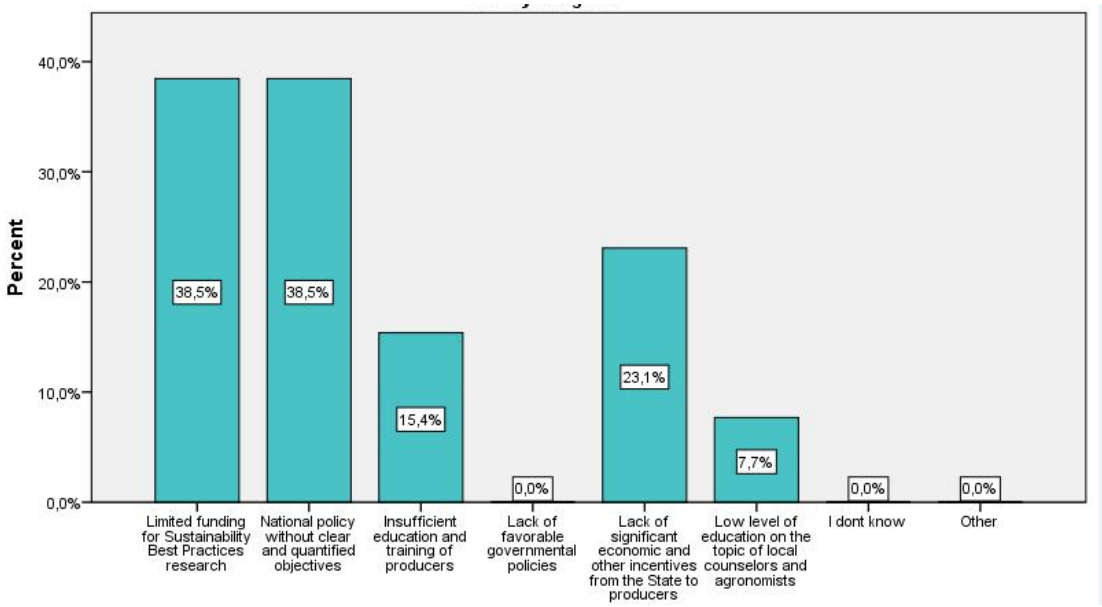

Figure 4.34. Answers provided by the interviewees of TG-1 to the question **"**what hinders the development of sustainability best practices at your region".

This confirms one previously known fact, that Bulgarian farmers rely a lot on EU funding and the Programme Rural Development 2014-2020. The next most important incentive is expert advice at field level (31%). Bureaucracy is also a problem for farmers, which means that public structures responsible for agriculture should improve their communication with agribusiness. Provision of incentives to consumers in order to be willing to pay higher price for labeled goods produced by sustainable farming would be a significant incentive, according to farmers.

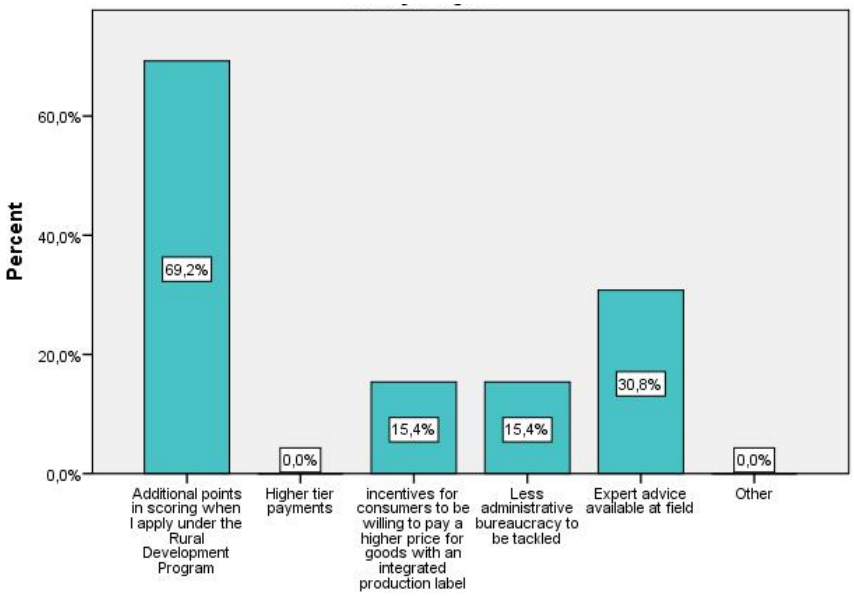

Figure 4.35. Incentives that the interviewees of TG-1 may consider beneficial in order to shift to sustainable farming.

4.2.2 Policy makers (TG-2)

The participation of policy makers in this research was very important for two reasons. First of all, to capture and evaluate the view of those who plan and decide and secondly, to outline how well their views and perspective match with those of the producers, who, at the end of the day, will implement their decisions at the field level. For this reason, some of the questions were common between the two target groups, while there were also some questions specific for this target group.

As regards the availability of know-how in the language of the policy makers and farmers, 60% of the policy makers provided positive answers (Fig. 4.36). A very discouraging finding is that the 40% of the interviewees do not know if there is available know-how or answered that there is no such know-how. This 40% nescience about know-how in the native language is a very high share considering the role that these interviewees have to play.

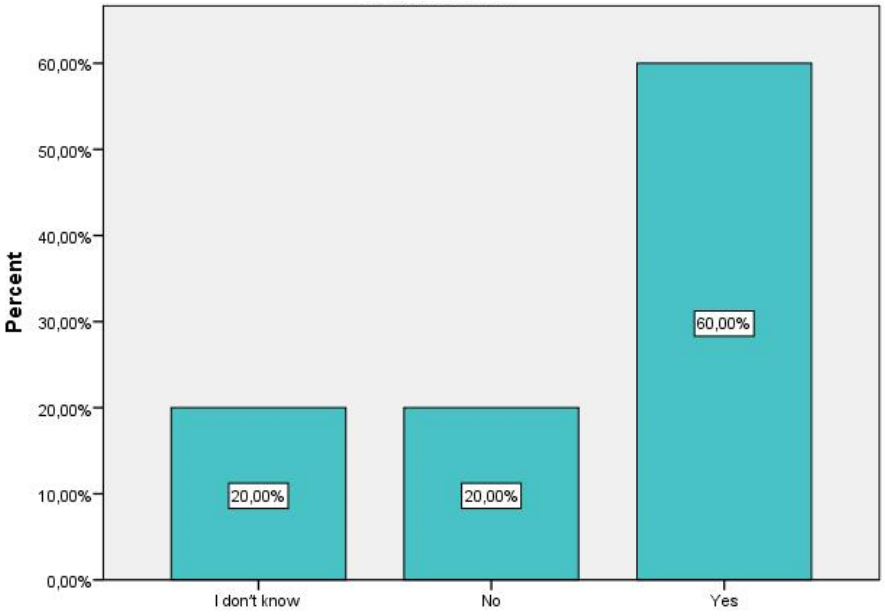

Figure 4.36. Answers of policy maker about whether they are aware of available know-how in their language.

Despite the above stated nescience, hopefully policy makers consider farm sustainability as being important (40%) and very important (60%) for their regions (Fig.4.37).

As can be seen in Fig. 4.38, policy makers are well acquainted (80%) with financial instruments and governmental subsides which agri-businesses can exploit to switch to sustainable production. The gap between the farm group (TG-1) and the policy makers, (Fig. 4.29 and 4.30) regarding financial incentives and subsidies, confirms the finding that communication between both groups should be strengthened and agricultural public services provided to help farmers find a way to use the available funds.

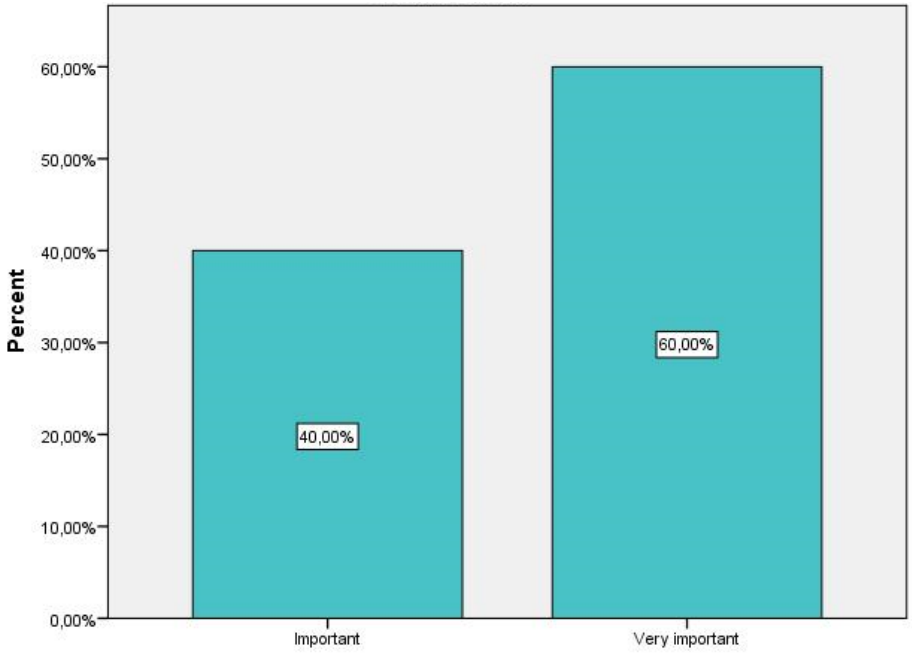

Figure 4.37. The opinion of the interviewees of TG-2 regarding the importance of farm sustainability at their regions.

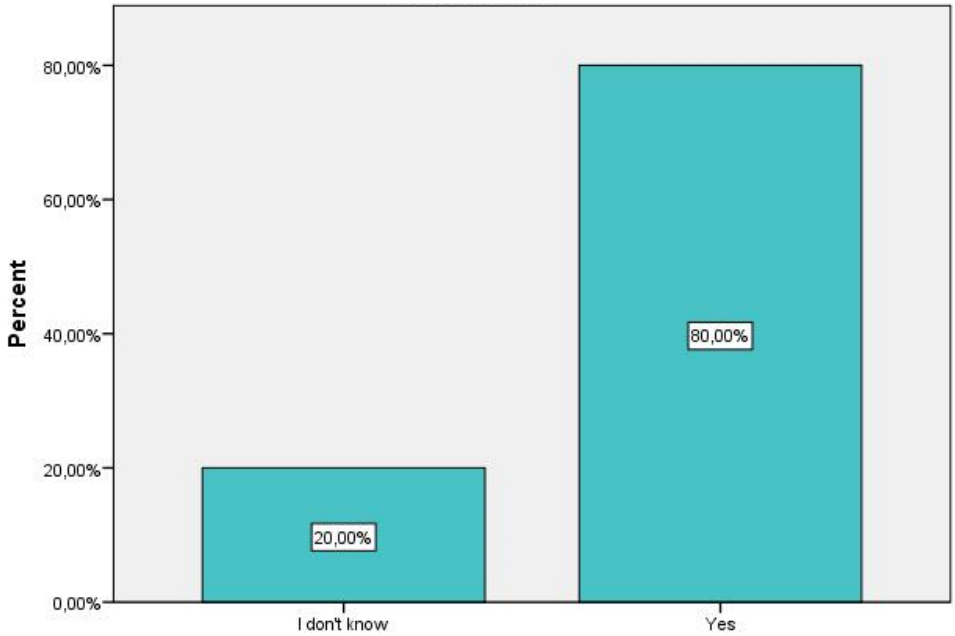

Figure 4.38. Answers to the question whether the interviewees of TG-2 know if there are any available governmental subsides or favorable financial instruments, which agribusinesses can exploit to switch to sustainable production.

The answers to the multi-choice question about what are the main challenges in terms of agricultural practices for preserving sustainability (Fig. 4.39), the opinion of the policy makers is different from that of farmers/agri-businesses as regards the prioritization of the parameters (Fig. 4.31). All policy makers (100%) of them define poor irrigation practices as the first challenge, instead of poor cultivation practices defined by the TG-1. The second place according to policy makers belongs to poor fertilization practices, poor cultivation practices and poor plant protection practices.

The useful finding is that policy makers see problems with plant protection, which at the same time is not considered as a problem by farmers at all. This may come from the fact, that many farmers apply for EU subsidies for perished crops, which countervail their losses, but according to policy makers this could be avoided by proper plant protection activities.
Another useful finding is that policy makers, as opposed to farmers, haven't realized the poor packaging practices, as a challenge in terms of targeting sustainability. Packaging practices are an issue which should be targeted at the policy level and actions in this regard are needed.

As regard the factors that the policy makers consider as obstacles for producers to implement sustainable practices, the answers provided are in agreement with those provided by farmers/agribusinesses (Fig. 4.32), i.e all the predetermined responses in the questionnaire gained similar preferences (Fig. 4.40). The encouraging fact is that policy makers realize (rated with 4 of 5 points), that producers lack information on sustainable practices.

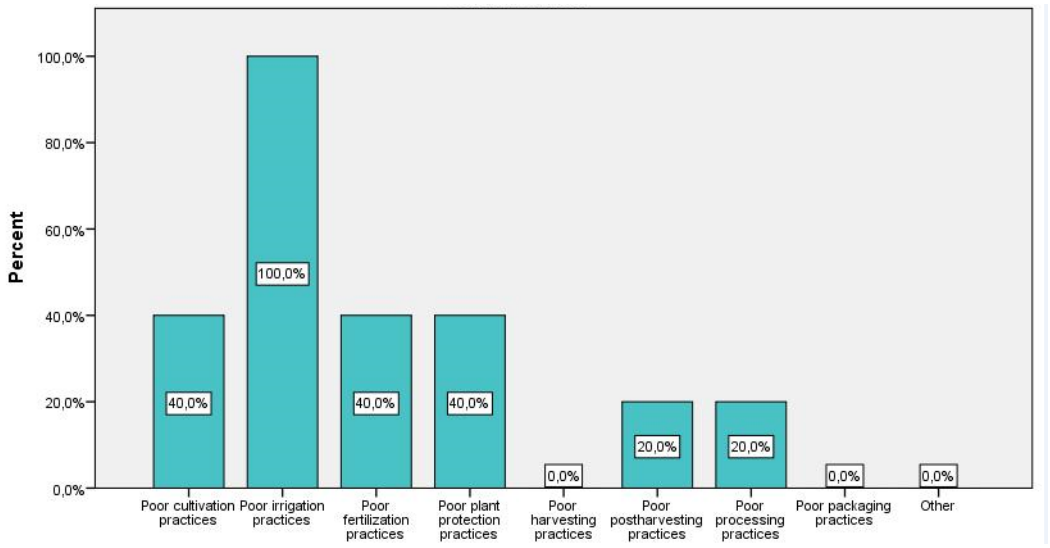

Figure 4.39. Answers to the question about what are the main challenges in terms of agricultural practices for preserving sustainability.

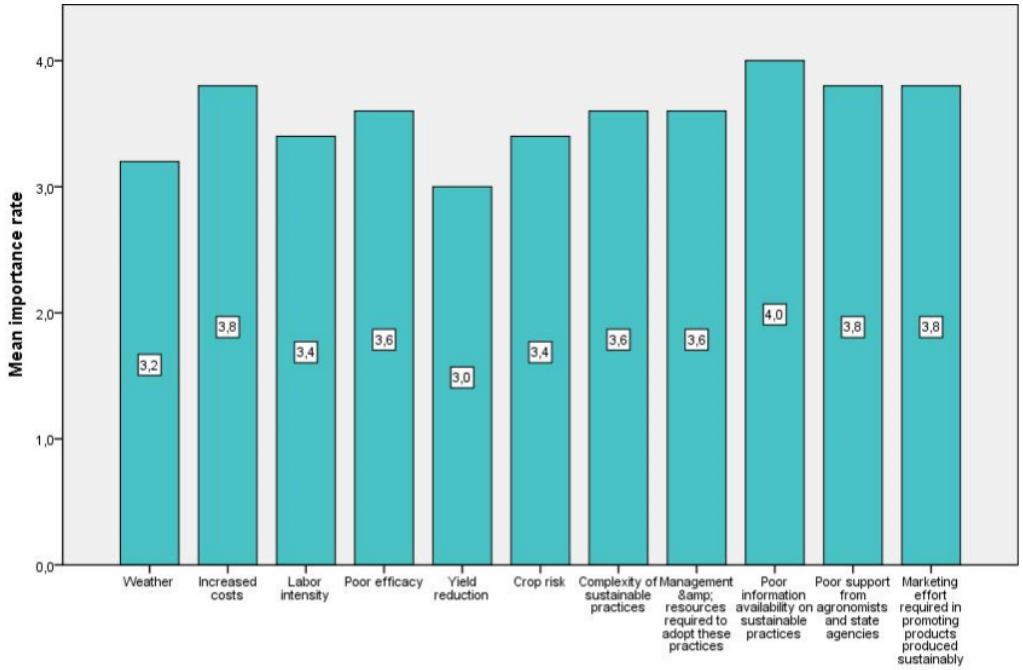

Figure 4.40. Answers regarding the factors that the interviewees of TG-2 consider as obstacles for producers to implement sustainable practices.

Policy makers and farmers have similar opinions towards the existence of a favorable environment to stimulate the adoption of more sustainable production practices (Fig. 4.41). Only 60% think that it is favorable.

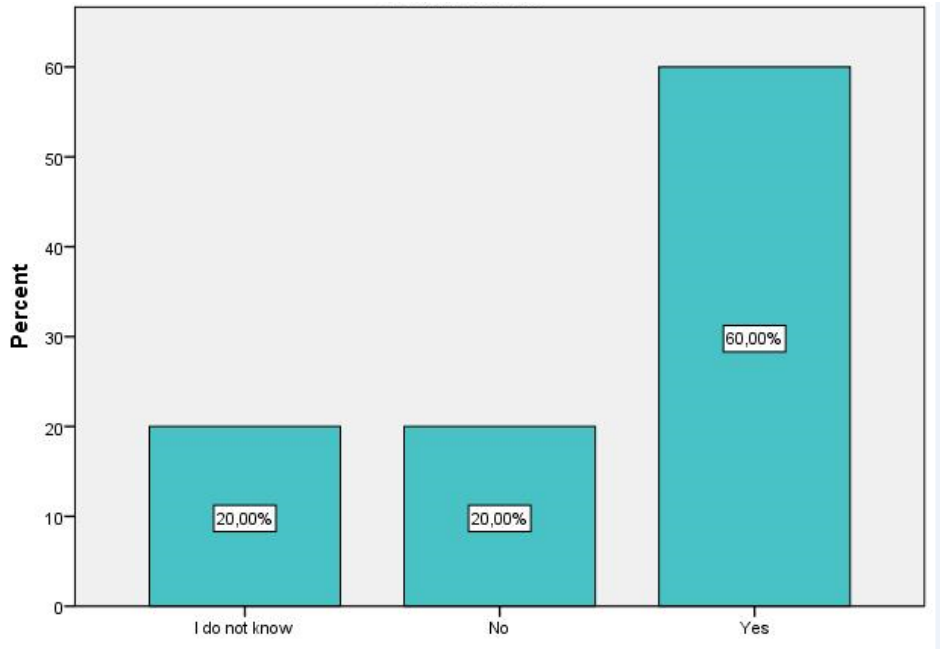

Figure 4.41. Answers provided to the question if there is currently a favorable environment to stimulate adoption of more sustainable production practices

For the question "what hinders the development of sustainability best practices in your region", policy makers are quite profound in stating that the national policy is missing the clear and quantified objectives, and education and training of producers is insufficient. Policy makers define the following factors, in the following order of importance (Fig. 4.42):

- national policy without clear and quantified objectives
- insufficient education and training of producers
- lack of significant economic and other incentives from the State to producers
- limited funding for sustainable best practices research
- lack of favorable governmental policies
- low level of education on the topic of local counselors and agronomists.

It is also important that policy makers consider the lack of favorable governmental policies as one of the top priorities, while no one of the producers ranked this factor, perhaps due to their limited knowledge about processes and policies that must be decided and implemented before incentives and favorable instruments reach them.

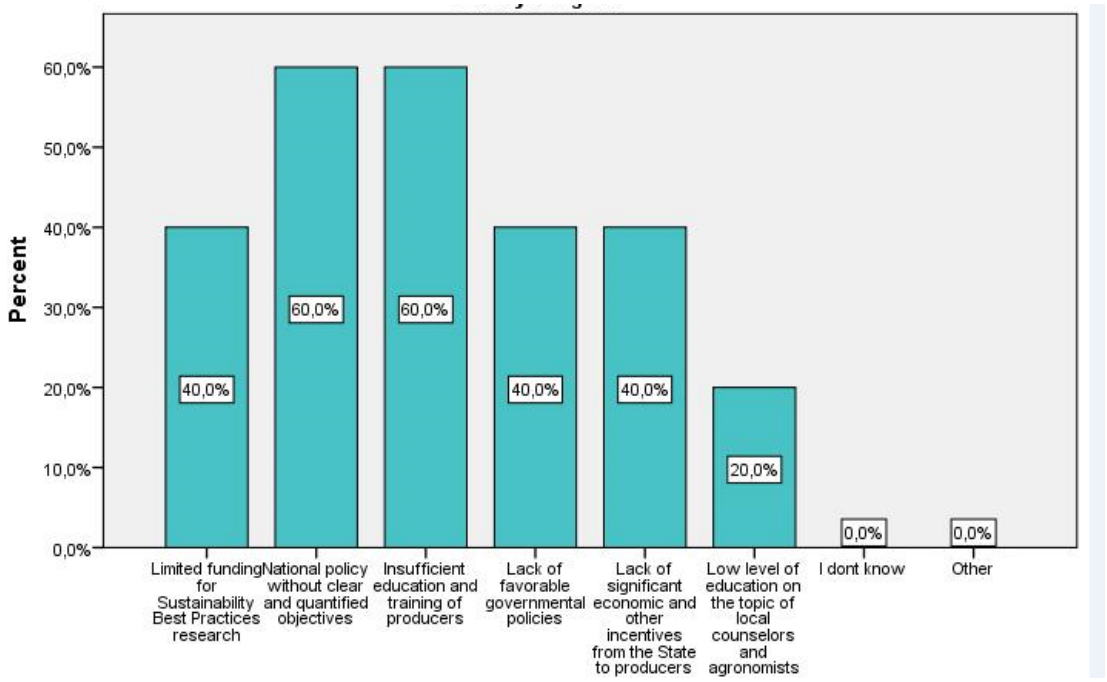

Figure 4.42. Answers provided by the interviewees of TG-2 to the question **"**what hinders the development of sustainability best practices at your region".

As regard the incentives that the interviewees of TG-2 consider beneficial in order for farmers/agri-businesses to shift to sustainable farming, it seems that policy makers understand quite well their crucial role and impact on TG-1, thus 80% of them answering that bureaucracy should be tackled and 80% considering expert advice should be provided at the field level. All interviewees of TG-2 consider that consumers should be motivated to buy products with integrated production labels (Fig. 4.43). Analyzing simultaneously the answers of the TG-1 and TG-2 and considering also that the predefined answers for farmers and agribusinesses to shift to sustainable practices, one concludes that a reforming of the current policy is required. In order for the reforming to be effective and reach the anticipated targets, policy makers should take into consideration the weaknesses of the TG-1, as these were recorded in this GAP analysis.

According to Fig. 4.44, 60% of the policy makers were involved in discussions in their sector or participated in decision making on sustainable agriculture and its adoption by producers. However, considering the importance of the subject, the limited adoption of the current policies and the limited information that producers have about current policies and practices of sustainable agriculture, this share could be characterized as low. In other words the processes at the level of policy making do not provide policy makers with the appropriate qualifications to cope with the specific issues.

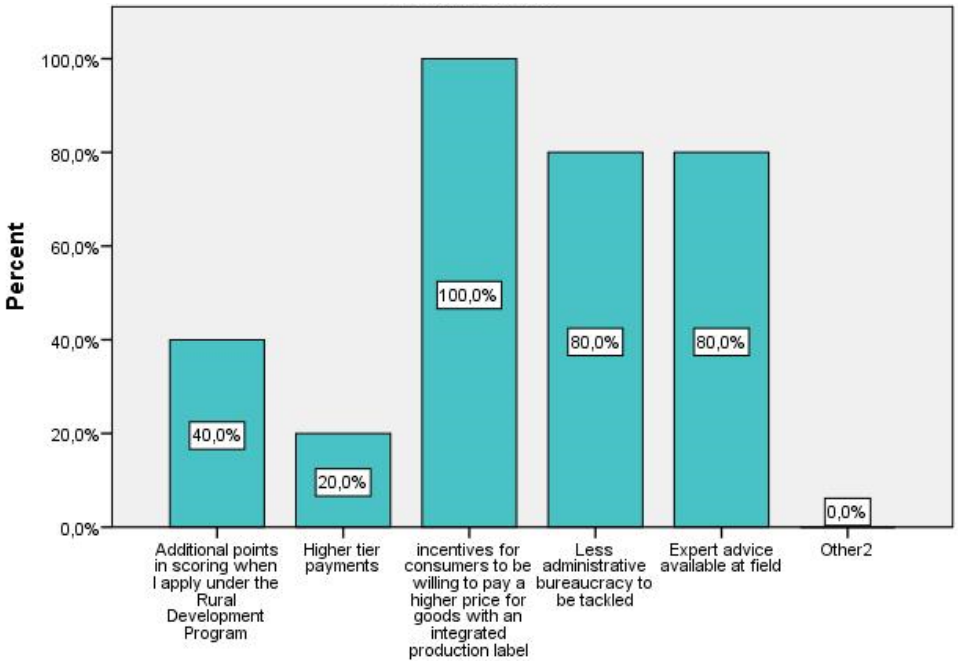

Figure 4.43. Incentives that the interviewees of TG-2 may consider beneficial in order farmers/agribusinesses to shift to sustainable farming.

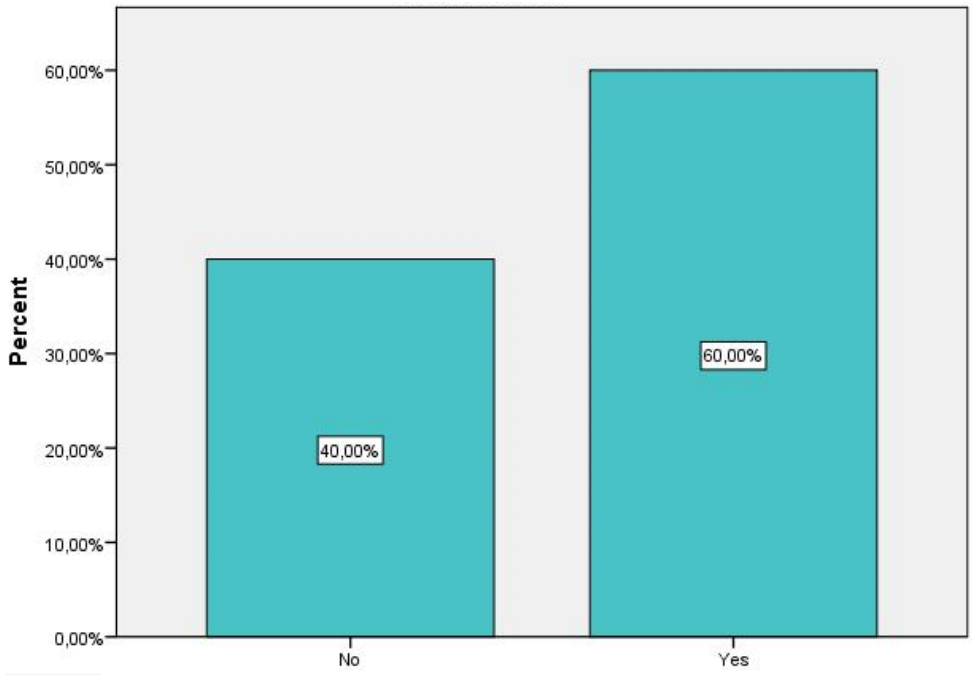

Figure 4.44. Answers provided by the interviewees of TG-2 regarding their involvement in discussions in their sector or participation in decision making on sustainable agriculture and its adoption by producers.

5 Conclusions

This GAP analysis targeted two groups of stakeholders. The first target group (TG-1) was composed of managers/heads of farmers cooperatives/agronomists as links between the government and the farmers. Part of the first target group were also individual farmers/producers of different agricultural products. The second target group (TG-2) consisted of policy makers, such as leaders and heads of public authorities, decision makers, state agencies and other stakeholders. Depending on each target group assessed, a series of 47 and 28 key questions were used during an e-survey for farmers and policy makers, respectively, which took place between March and May 2018.

Significant conclusions were obtained from the e-survey, which are anticipated to contribute to the definition of the appropriate strategies for boosting the adoption of sustainability best practices by the Bulgarian agricultural sector. The main findings and gaps as regard sustainability best practices and their current and future adoption by the Bulgarian agricultural sector, are:

- ✓ Formalize and promote a clear national policy on the importance of and support for sustainable agricultural and communicate this broadly to farmers/agri-businesses
- ✓ Provide “effective” training programs for farmers on sustainable agricultural practices, including formal education and support through the National Agricultural Advisory Services. Complexity must be removed from the training on sustainable practices
- ✓ Broaden the training of policy makers, government officials and others supporting the farm sector in terms of sustainable agriculture. The survey of policy makers showed that too many are not adequately informed and not adequately supportive

- ✓ Educate farmers on the benefits of business planning and how sustainable practices can be successfully included in such plans
- ✓ The survey showed that the need for training and information by farmers extends beyond sustainable practices and should be addressed at the same time. This includes improved production practices, marketing, and the benefits and costs of different types of mechanization
- ✓ Enhance the link between farmers and the competent authorities, including policy makers, governmental authorities and local agronomists. Reduce the bureaucratic barriers
- ✓ While policy makers see problems with plant protection, farmers are less concerned. This needs to be investigated further, including the role of subsidies related to crop losses
- ✓ Provide a favorable environment where sustainable agricultural practices are accepted and encouraged, including through financial incentives and subsidies
- ✓ While policy makers and agri-businesses had a good understanding of current financial programs available to farmers, a significant number of farmers did not. Hence, there is a need for further education regarding the existing programs
- ✓ Review existing practices and research regarding sustainable agricultural practices and make these available to farmers at a level where they are understood and can be implemented
- ✓ Review how the existing and future government programs might be used to direct farmers into more sustainable practices, including the adoption of practices as a condition of eligibility
- ✓ Invest further in the infrastructure used by farmers, including irrigation, roads, communications, markets, and so on
- ✓ Green energy is the favored sustainable method at this time and can be used as a basis for encouraging the implementation of a broader range of practices
- ✓ Since 92% of Bulgarian farmers consider farm sustainability as important or very important (Figure 4.27), the basis is there to draw on this support for the implementation of sustainable practices
- ✓ Select and use leading farmers to promote sustainable practices and encourage behavioral change at the “grass roots” level
- ✓ Promote the use of product packaging and labeling that indicates that produce has been grown sustainably
- ✓ Consider providing price (subsidy) or market incentives in support of the marketing and acceptance of sustainably grown products
- ✓ Educate the public on the increased value of foods produced using sustainable agricultural method

The survey showed that a significant proportion of policy makers have received training on sustainable agriculture while at the same time a large proportion of farmers are not aware of the availability of financial support instruments and lack information and know-how. Hence, we conclude that the establishment of intermediate well-informed and trained bodies/agencies/departments (preferably with a local or regional character) that is able to communicate national and regional policies on the effective adoption of sustainable practices in Bulgarian agriculture is required. Another option is the strengthening or expanding of the functions of the National Agricultural Advisory Service of the Ministry of Agriculture and its 27 territorial regional local offices. Targeted actions to inform

producers/agribusinesses and communicate support measures and funding instruments should be designed and implemented by these services.

By comparing and analyzing the answers of TG-1 and TG-2 regarding the support of farmers and agri-businesses to shift to sustainable practices, one concludes that current policy needs to be reformed and better defined. For the reforms to be effective and reach the anticipated targets, policy makers should take into consideration the weaknesses of TG-1, as recorded in the GAP analysis. At the same time, policy makers need to be better educated regarding sustainable agriculture in order to be better qualified to define and lead the adoption of such practices.

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Methodology

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