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

PROJECT DELIVERABLE

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Extended Summary

In the line of the INTERREG BalkanROAD project, an in-depth GAP analysis was conducted to define and evaluate the gaps for adoption of sustainable agricultural and products processing practices in the five Balkan participating countries, Greece, Cyprus, Bulgaria, Albania and FYROM. Within the scope of this analysis, the most crucial gaps were 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

The analysis started with literature review (step 1) followed by in-depth survey (step 2). In the 3rd methodological step (Gap assessment), the gaps identified in steps 1 and 2 are assessed in terms of 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 Balkan agricultural sector. The first target group was composed of agricultural producers e.g. individual farmers and agribusinesses representatives. The second target group consisted of representatives of policy making institutions and representatives of regional authorities.

After the completion of the literature review, an e-survey took place between March and May 2018. In total, 16 farmers and 4 policy makers participated in the survey by filling in the respective e-questionnaires.

The main findings of this survey indicate the urgent need for education and training of agricultural producers. Many of the obstacles for agricultural producers to implement sustainable practices, were owed to: 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 markets.

A discouraging finding, that requires measures for its reversal, is that the majority of agricultural producers believe that there is currently no favorable environment to stimulate adoption of more sustainable production practices, in contrast to the belief of policy makers. Governmental structures that will support producers during training as well as with problems in the implementation of practices, could also be a very effective measure.

Better education of policy makers to provide them qualifications to design the appropriate strategies for convincing the agricultural producers regarding the necessity of implementing sustainable best practices for the benefit of farmers, of economic and societal growth and the general environment is also of high importance

1 Introduction

1.1 Current status – Purpose of GAP analysis

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 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 Balkan countries i.e. Greece and Bulgaria along with Cyprus are struggling to recover and regain economic credibility and existence. 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 at last, 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 products processing practices, which will improve not only its outward looking i.e. export of agri- products but it will also open up employment opportunities.

Gap Analysis offers a scientific-based approach for evaluating current status of businesses and their actual performance and in turn identifying the necessary improvement efforts to close the gap that require attention and reach the desired, future performance in terms of optimization. Briefly, 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 will be conducted in the frame 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, farmers associations, private agribusinesses, educational sector, consumers and environmental associations. 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 implemented during BalkanROAD in order to finally meet its objectives.

1.2 Scope of the deliverable

Within **the scope of the present GAP analysis**, the most crucial **gaps** for adoption of sustainable agricultural and products processing practices in the 5 countries 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 Hawai 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 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 GPA

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 28 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), legal that should be considered when attempting to identify the sources of change. In the case of an environmental-based, for example, factors arising from concerns about the natural (or Ecological) are primarily evaluated such as environment, in other words the 'green' issues, including increasing concerns about packaging, the increase of pollution and other related ones.

2.3 Methodology adopted in BalkanROAD for GAP analysis

In the line of BalkanROAD, an in-depth Gap analysis was conducted to define and evaluate the gaps for adoption of sustainable agricultural & products processing practices. In this context, current status of the existing under study agricultural & products processing practices are evaluated based on a three-step study i.e. literature review (step 1) followed by in-depth survey (step 2). The flowchart that represents the various methodological steps of the integrated GAP analysis adopted in BalkanROAD is shown in **Figure 1**.

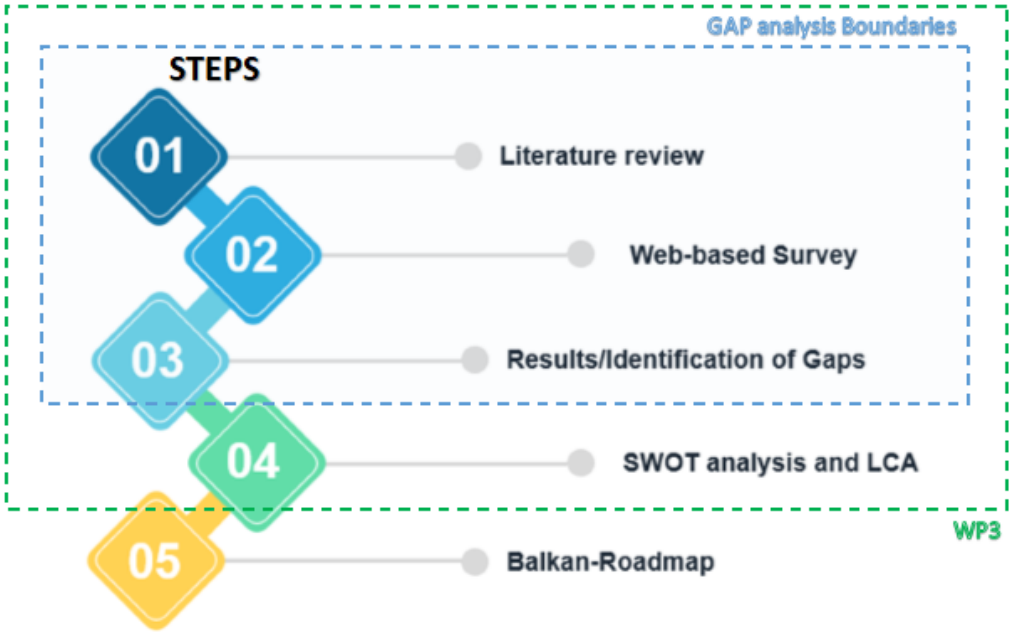


Figure 1. Methodological steps of GAP analysis adopted in BalkanROAD.

In the 3rd methodological step (Gap assessment), the gaps identified in steps 1 and 2 are assessed in terms of relevance and/or impact to Gap objectives. The obtained GAP results will provide the knowledge background for both SWOT analysis and LCA that are implemented in the WP3. In all WP3 activities, issues of current research and of future needs of research are extracted for the 5 countries under study, which 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 (step 1), a focused literature review was performed to obtain the current status (baseline) of the 5 studied countries in terms of statistical and economic data, information regarding climate change and agriculture, penetration/impact of IT in agriculture and setting of national targets for agriculture.

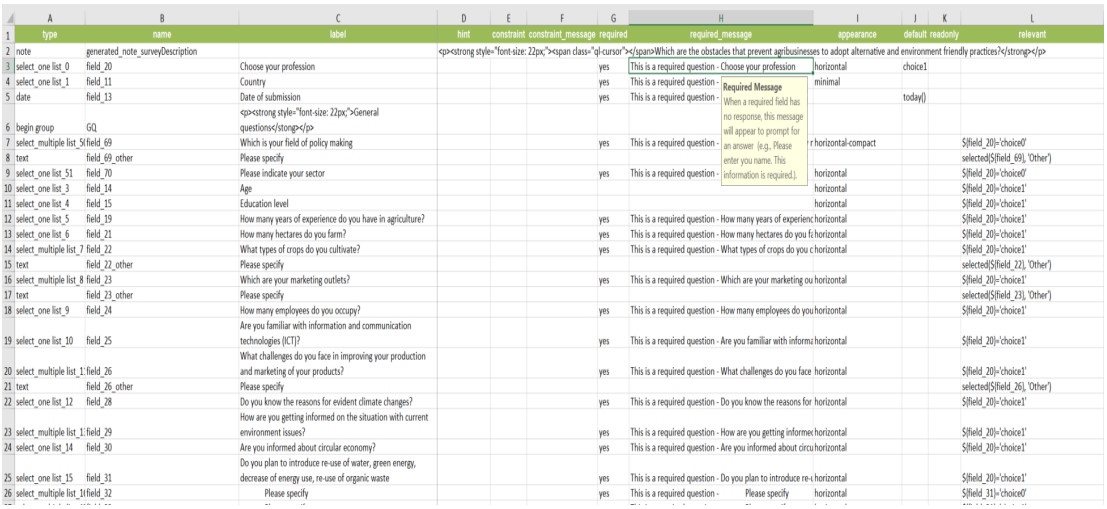
In this context, a variety of web- and hard copy-based resources were examined, including academic sources, peer-reviewed journal articles along with publications of central and provisional governments and related organizations. As a result, a substantial bibliography was compiled, focusing on Balkan-based sources but mostly including ones of particular relevance for BalkanROAD.

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 available in 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

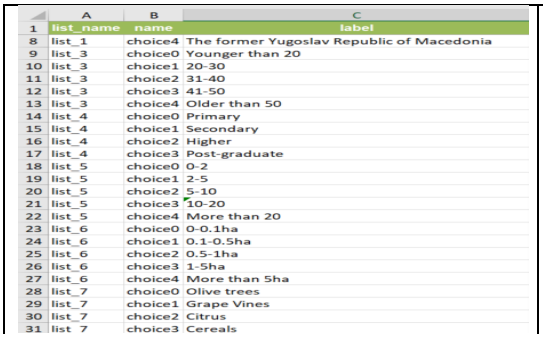
The GAP analysis survey questions and answers organized in proper form in order to develop a web-based application using XLS Forms and Survey123 for ArcGIS, hosted in BPI's ArcGIS online for Organizations. The questions divided in those which are addressed to policy makers and those to producers and agribusiness. The answers of each question become predefined values for XLS Forms (Figure 2). The resulting schema preview of the XLSForm (Figure 3) is shown in the Figure 4. An ArcGIS account created in ArcGIS online with user



	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-	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'

level credentials for submitting and analyzing data.

Figure 2. GAP analysis survey XLSform.



	A	B	C
1	list_name	name	label
8	list_1	choice4	The former Yugoslav Republic of Macedonia
9	list_3	choice0	Younger than 20
10	list_3	choice1	20-30
11	list_3	choice2	31-40
12	list_3	choice3	41-50
13	list_3	choice4	Older than 50
14	list_4	choice0	Primary
15	list_4	choice1	Secondary
16	list_4	choice2	Higher
17	list_4	choice3	Post-graduate
18	list_5	choice0	0-2
19	list_5	choice1	2-5
20	list_5	choice2	5-10
21	list_5	choice3	10-20
22	list_5	choice4	More than 20
23	list_6	choice0	0-0.1ha
24	list_6	choice1	0.1-0.5ha
25	list_6	choice2	0.5-1ha
26	list_6	choice3	1-5ha
27	list_6	choice4	More than 5ha
28	list_7	choice0	Olive trees
29	list_7	choice1	Grape Vines
30	list_7	choice2	Citrus
31	list_7	choice3	Cereals

Figure 3. GAP analysis survey XLSForm predefined values.

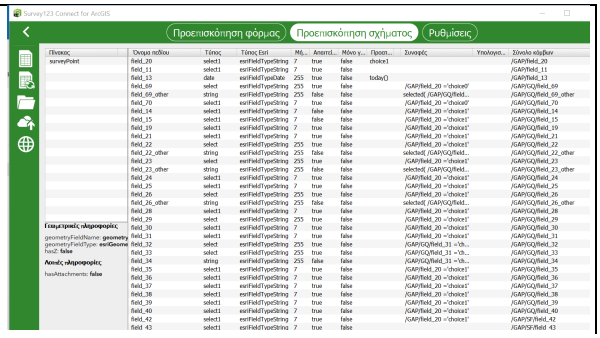


Figure 4. GAP analysis survey XLSForm predefined values.

A user friendly App occurred containing single, multiple choice and Likert scale questions and provided in Figure 5.

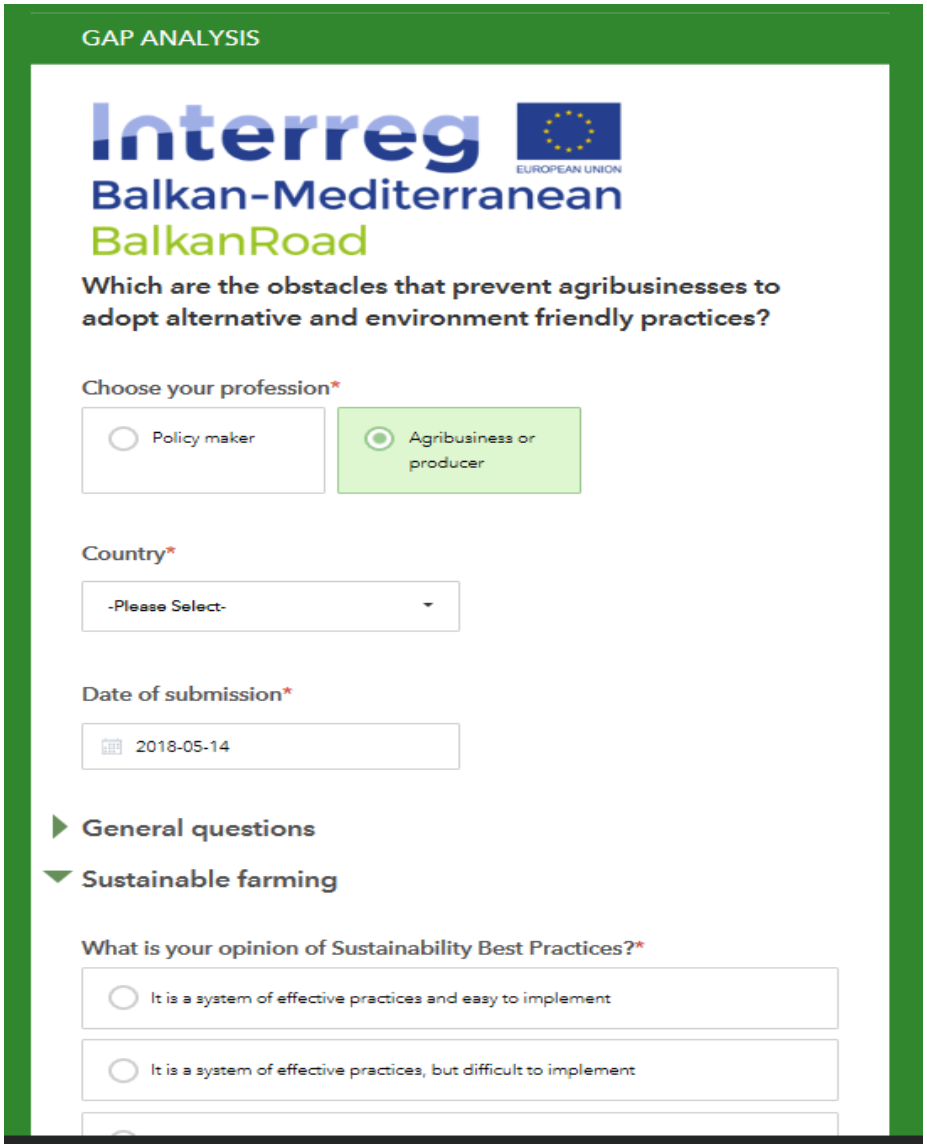


Figure 5. GAP Analysis survey App.

The collected answers data can be analysed either online through the web based survey 123 tools (Figure 6) or using statistical software (SPSS, Excel, e.tc) by exporting data in proper form (Figure 7).

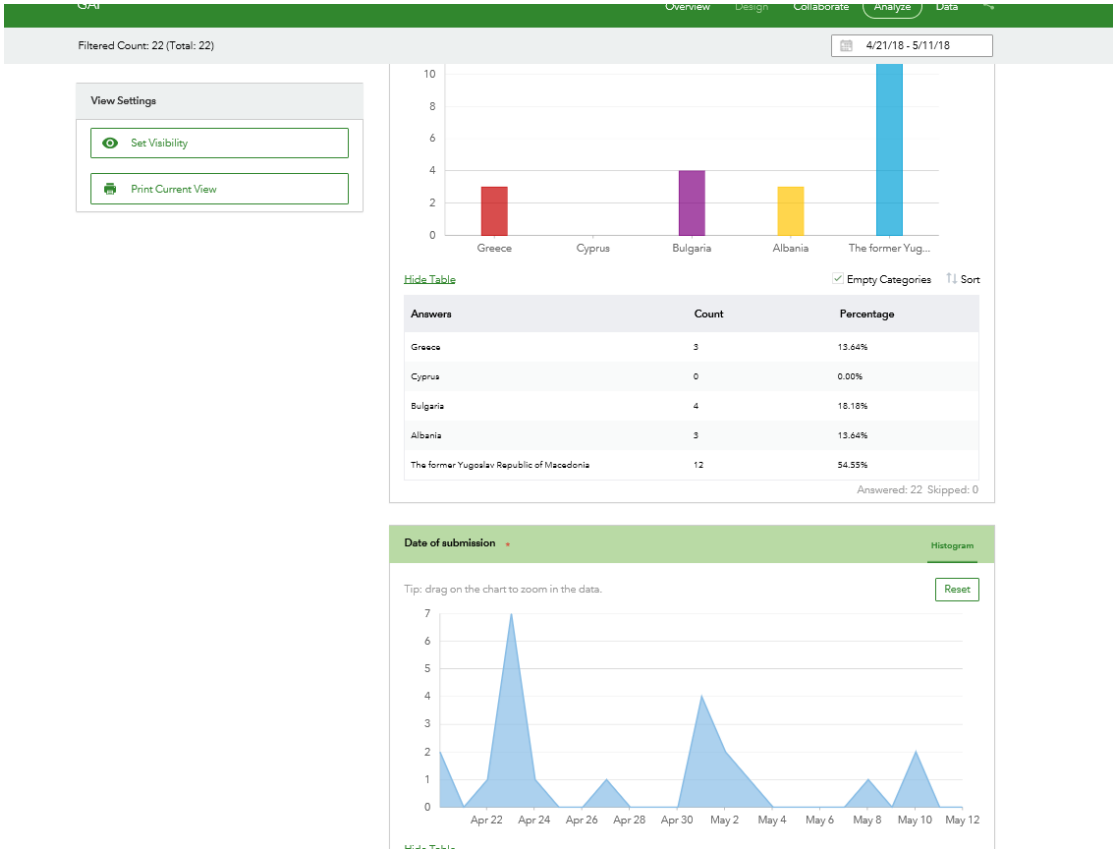


Figure 6. GAP analysis data analysis on web

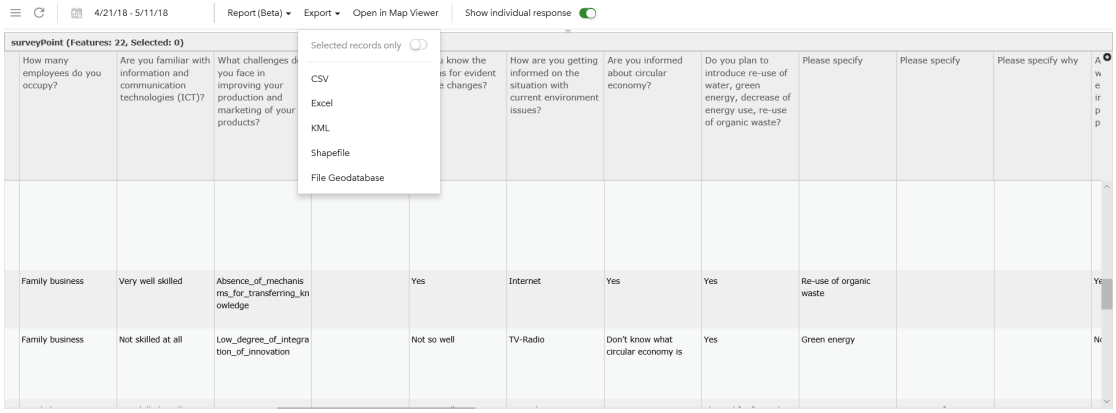


Figure 7. GAP analysis data export.

2.4 Target groups

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 Balkan agricultural sector.

The first target group consisted of policy makers and regional authorities such as leaders and heads of local authorities, representatives of the Ministries of Agriculture and Food, decision makers, state agencies and other stakeholders while the second target group was composed of managers/head of farmers cooperatives/agronomists as persons/links between the

government and the farmers. Finally, part of the second target group were also individual farmers/producers of different agricultural products.

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	- Very well skilled	- Not skilled at all

information and communication technologies (ICT)?	- Skilled - Not so well skilled	- Don't know what ICT is
12**. What challenges do you face in improving your production and marketing of your products?	- Economic recession - 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	- Yes - No

a more sustainable production practices by agri-businesses?	- I don't know	
42/23. What hinders the development of Sustainability Best Practices in your region?	- Limited funding for Sustainability Best Practices 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 FYRo Macedonia

FYRo Macedonia is a European country located in the south western part of the Balkan Peninsula extending between 40°50' and 42°20' North Latitude, and between 20°27'30" and 23°05' East Longitude. The country shares borders with two EU member states (Greece to the south and Bulgaria to the east), and with Serbia and Kosovo in the North and Albania to the West. The total length of the border is 849 km, of which the western border is 191 km, the southern 262 km, the eastern 165 km and the northern 231 km. Although landlocked, FYROM is at the crossroads of two major pan-European transport corridors (number 8 and 10) which link Central Europe to the Adriatic, Aegean and Black Seas.

The total territory of the country is 25.713 km^2, of which 857 km^2 are water surface.

It is predominantly mountainous terrain with mountains comprising 79% of the total territory, and the rest is lowlands with 19% and natural lakes 2%.

About half of the total territory is agricultural land, and about 44% are land under forests.

Total land 2.46198,0

Agricultural land 1.26150,1

Forest land 1.09244,3

Other 1084.4

Watercourses including lakes 562.0

Total territory 2.517100,0

As a result of geographical location and topography, the climate falls into three groups: Mediterranean, Mountain and Continental.

Dominant continental climate is characterized by relatively cold and wet winters and hot and dry summers.

Precipitation is irregular and in small quantities throughout the country, i.e. on average annual precipitation is 733 mm. The Mediterranean climate is characteristic in the southern parts of the country. The average annual rainfall in areas with a Mediterranean climate is fairly low, i.e. less than 500 mm. The mountain climate is characteristic for the areas above the forest zone where temperature is reducing with the increase of the altitude. This climate is characteristic for mountain areas.

About one third of arable agricultural land (173 thousand ha) is under irrigation systems and about 80 thousand ha under drainage systems.

Agricultural holdings have a total area of 369.270 ha agricultural land. The total utilized agricultural area of agricultural holdings is 315.863 ha. Average size of arable land per agricultural holding is 1.85 ha of agricultural land.

However, over 58% of agricultural households are in the category of agricultural holdings that cultivate less than 1 ha of agricultural land, and about 20% are in the category of agricultural holdings with 1-2 ha as opposed to the European with average of 50 ha.

Small agricultural holdings and the fragmentation of agricultural land are the major problem as they contribute to agricultural inefficiency. Unused and abandoned land is also a serious problem for the further development of the sector.

According to the latest population census in 2002, the total population of the country is 2,022,547, with a relatively small average density of 80 inhabitants / km^2 compared to 115 inhabitants per km^2 in the EU. The highest concentration of the population is in the urban centers.

About 44% of the total population lives in rural areas. Almost all rural municipalities have a declining and aging population and high emigration of young people.

About 98% of the total population aged over 10 years is literate.

Most of the illiterate population is located in the rural areas, which are also most affected by a highest poverty rate (48%), compared to the other urban areas (40%) and the city of Skopje, with the lowest poverty rate (12%).The lower education rate in rural areas is due to: migration of young and work capable population, lack or small number of educational institutions, isolation of undeveloped villages, etc. In addition to the developed system of formal secondary and university education, there is a lack of additional (informal) education and training especially in the direction of re-qualification of the workforce and further qualification.

3.1 Statistical data for agricultural production

The agriculture sector plays a significant role in the country economy. 17.3% of the total employed are in agriculture. The number of active enterprises in agriculture (including forestry and fisheries) participates with about 4%. Out of the total number of agricultural holdings 99% are individual agricultural holdings and 2% are agricultural enterprises. About half of the agricultural holdings are specialized in plant or mixed production (plant and animal husbandry). Crop production value accounts for a share of 75% of the total value. Vegetable production accounts for 38% and has the largest share in the total value of agricultural production. 20% of the total area agricultural land is under vegetable crops. The second most important group of agricultural products is vegetable production. After vegetable it is fruit. In the last seven-year period as a result of the increased investments co-financed by the state in raising new orchards, there is an increase in the area and produced quantity of fruits, with an average of about 200 thousand tons per year. The value of cereals production of is around 9% of the total production value.

Tobacco covers over 80% of the total area under industrial crops. In terms of export value, after tobacco, wine is the second most important. However, the vineyards in the country have an unfavorable age structure, mostly due to fragmentation of the plots and low investments. More than 60% of vineyards are older than 15 years and need to be renewed.

Around 80% of cultivable lands (463,000 ha) is owned or leased by around 180 thousand private farms. The balance is made up of state owned lands which are rented to 136 agricultural enterprises.

Table 2. Agricultural area by categories of use (in 10^3 ha)

Year	Agricultural area	Cultivable area					Pastures
		Total	Arable land and gardens	Orchards	Vineyards	Meadows	
2012	1268	510	414	15	21	60	757
2013	1261	509	413	15	22	59	751
2014	1263	511	413	15	23	60	751
2015	1264	513	415	16	23	59	750
2016	1267	516	417	16	24	59	750

Source: *State Statistical Office*

There are more than 200 registered farmer associations across the country, most of which are based on one particular commodity. The vast majority of these associations, however, are registered in name only and do not have any significant function in the sector or the economy. The State Farmers' Federation (FFRM) has the role of voice for famers in the country.

Cultivated land shows a decreasing trend, mainly due to rural-to-urban population migration and urban/industrial developments which occur at the expense of agricultural lands.

3.2 Economic data

At the commodity level, grapes, cow milk, tobacco, chilies and peppers, wheat, apples and tomatoes make the most significant contribution to the average value of agricultural production. While field crops like wheat, barley and maize are grown extensively and occupy a large percentage of total cropland, their contribution by value is significantly less than the contribution made by grapes, tobacco and the combined value of various fruits and vegetables, which garner a higher price. However, when the agricultural sector is combined with the agro-processing sector, the overall contribution of agriculture to economy increases to 16% of GDP and it is clear that there is potential for greater value-adding in this sector.

In accordance with the Free Trade Agreement with the EU and the CEFTA Agreement there is a free trade regime in the region and with the EU. The export of agro-food products reaches a value of over half a billion euros. However, the net trade balance with an average value of EUR 120 million per year remains negative as a result of the importation of high-cost products from livestock production, primarily meat, cereals and products from continental field crops such as cooking oil and sugar. The export of agricultural products includes tobacco, fruits and vegetables, wine, lamb with 14.1-18.6% in the total export of the country.

The EU is the most important trade partner with 50% share of the total agro-food products exports and imports. Next are CEFTA countries from the region that participated in the total export of agro-food and fish products by 37% and the share of total imports by 24.7%.

About two-thirds of total exports account for agricultural products, while processed agricultural products account for about a quarter.

3.3 Climate change and Agriculture

Currently no agri-environment policy exists. Legislation harmonization in a number of fields is ongoing but not complete. There is lack of capable dedicated human resources in the competent authorities for planning and implementation of agri-environmental measures. The delineation of competences between different ministries is unclear, and there is a lack of cooperation between competent authorities (mostly ministry for agriculture and ministry for environment). There is no ongoing environmental monitoring processes and consequent lack of appropriate data on agricultural-related environmental issues (soils, water, biodiversity, landscape) on national level, as well as lack of data on farm-level.

Knowledge within the national advisory service on agri-environment is non-existent, as there is lack of expertise on the field of agri-environment. There are no targeted training for farmers and knowledge on agri-environment issues/practices are very low or missing.

3.3.1 Impacts of Agriculture on Greenhouse Gas Emissions (GHG)

Agriculture is the third sector in the share of total emissions of Greenhouse gases, right after the energy and industry sectors. Thus, agriculture can play an important role in mitigating GHG emissions. The agricultural sector accounts for approximately 7% of total GHG emissions, half of the global average of 14%. However, in years of extensive forest fires, the sector becomes a net-emitter of GHGs. Agriculture accounts for 32.4% and 66.4% of the emissions of the powerful GHGs methane and nitrous oxide. Nitrous oxide emissions from the agricultural sector are predominantly a result of the inefficient application of nitric fertilizers and associated soil fertility management, although poor land and manure management practices, as well as the burning of agricultural residues, also contribute. From the total Ammonia (NH3) emissions the major part is generated by agriculture while 17% are from nature. The next tables illustrate the past and future tendencies of emissions of GHGs.

Table 3. Total emission of GHG by sector [(1)] (in CO_2 kt)

Year	*Total*	*Energy*	*Industrial Processes*	*Agriculture*	*LULUCF*	*Waste*
2000	*12.741.86*	*9.983.75*	*800.11*	*706.45*	*230.85*	*1.020.70*
2003	*11.687.26*	*8.886.86*	*755.41*	*692.03*	*225.79*	*1.127.17*
2004	*11.530.77*	*8.800.59*	*683.92*	*696.69*	*252.05*	*1.097.52*
2005	*12.201.48*	*9.353.34*	*739.12*	*662.51*	*260.03*	*1.186.49*
2006	*11.311.10*	*8.456.70*	*741.49*	*676.37*	*256.96*	*1.179.57*
2007	*11.891.78*	*8.926.39*	*772.48*	*657.68*	*261.48*	*1.273.75*
2008	*11.998.70*	*9.026.69*	*742.08*	*650.64*	*261.16*	*1.318.31*
2009	*11.459.35*	*8.650.85*	*506.57*	*652.86*	*254.31*	*1.395.29*
2010	*11.594.89*	*8.561.21*	*633.64*	*665.95*	*274.15*	*1.459.41*
2011	*12.863.67*	*9.558.96*	*854.75*	*645.92*	*265.43*	*1.538.61*

2012	*12.223.37*	*9.132.18*	*679.74*	*603.93*	*247.21*	*1.560.30*

Source: Ministry of Environment and Physical Planning

Table 4. Projections of total GHG emissions by sector in CO_2 - equivalent [kt] (baseline scenario)

Year	*Energy*	*Heat*	*Transport*	*Industrial Processes*	*Waste*	*Agriculture*	*Total*
2008	8,196	1,328	906	1,390	844	1,376	14,040
2009	8,268	1,375	937	1,432	847	1,517	14,376
2010	9,584	1,423	970	1,475	850	1,553	15,855
2011	9,836	1,472	1,004	1,520	853	1,595	16,280
2012	10,025	1,524	1,039	1,566	856	1,637	16,647
2013	10,154	1,577	1,076	1,614	859	1,679	16,959
2014	10,246	1,632	1,113	1,664	862	1,722	17,239
2015	11,388	1,690	1,152	1,715	865	1,764	18,574
2016	11,719	1,740	1,187	1,775	868	1,807	19,096
2017	12,006	1,792	1,222	1,838	871	1,851	19,580
2018	12,261	1,846	1,259	1,902	875	1,894	20,037
2019	12,199	1,902	1,297	1,970	878	1,937	20,183
2020	13,26	1,959	1,336	2,039	881	1,981	21,456
2021	13,628	2,017	1,376	2,112	884	2,025	22,042
2022	13,954	2,078	1,417	2,186	887	2,070	22,592
2023	14,241	2,140	1,459	2,264	891	2,114	23,109
2024	14,463	2,205	1,503	2,344	894	2,159	23,568
2025	14,600	2,271	1,548	2,427	897	2,204	23,947

Source: Ministry of Environment and Physical Planning

The total energy consumption in 2016 the sector agriculture had the smallest share with 1.2% or 22 ktoe.

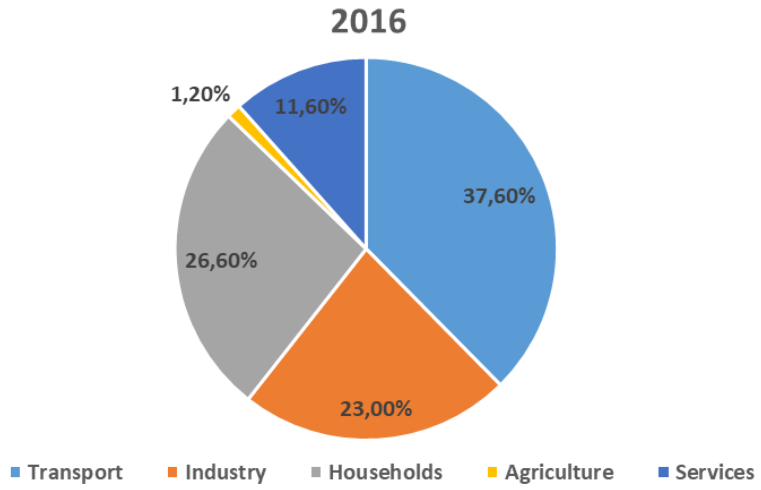


Figure 8. Total energy consumption in 2016

Table 5. Final energy consumption by sectors

Year	*Industry*	*Transport*	*Households*	*Agriculture*	*Services*	*Total*
2012	*579*	*462*	*558*	*24*	*230*	*1.855*
2013	*554*	*526*	*519*	*23*	*201*	*1.822*
2014	*515*	*551*	*525*	*22*	*195*	*1.808*
2015	*474*	*612*	*531*	*22*	*211*	*1.851*
2016	*426*	*697*	*493*	*22*	*217*	*1.855*

Source: *State Statistical Office*

The most significant environmental impacts of agriculture is associated with soil degradation and water-logging and salinization as a result of unsustainable agricultural practices.

Soil erosion is a significant problem across vast areas of the country, primarily as a result of poor land management. Approximately 38% of the country is impacted by severe or very severe rates of erosion. Although erosion results from steep slopes, climate, land cover patterns, soil properties and other natural processes, human factors like poor cultivation practices, overgrazing and deforestation have all combined to accelerate the rate of erosion Poor agricultural practices at the farm level (e.g., improper crop rotations, burning of crop residues, and poor water and nutrient management) also combine with the impacts of soil erosion and result in significant soil degradation. High rates of erosion have also created pollution of waterways and have negatively impacted the function of reservoirs and irrigation infrastructure.

Presently, agriculture constitutes approximately 40% of water demand and is the number one water consumer in the country. In the irrigation sector, poor on-farm irrigation system design, inefficient application practices and inadequately maintained irrigation system infrastructure have created widespread water-logging and salinization, which negatively

impact both short- and long-term agricultural productivity on affected lands and waste precious water resources that could otherwise be utilized.

Diffuse pollution of ground and surface waters by nitrates and phosphates, pesticides and organic manures, caused by agricultural sources are reported especially in areas where there are many intensive farms. According to the latest data, mineral fertilisers use is at around 104kg NPK per ha of arable land or 12kg NPK/ha agriculture land. It is expected that agricultural pollution will increase with the modernization and intensification of agriculture.

Biodiversity loss due to intensification of agriculture (associated with higher fertiliser and pesticide use) is reported in localized high production potential areas.

Agricultural generated air pollution has not been given appropriate attention as the majority of national monitoring initiatives focus on emissions from industrial plants and transport. Methane and ammonia emissions originating from inadequate storage and application of slurry and manure occur in regions where there are significant numbers of livestock farms.

A detailed study undertaken in the context of the preparation of the National Waste Management Plan reported a total of 26 million tons of waste 19% came from agriculture.

3.4 Sustainable Agriculture

Agricultural activity has a major impact on the environment. However, implementation of minimum requirements for good agricultural practice and environmental protection in the agricultural activities is not on a satisfactory level.

In terms of cultivation practices, most of the producers practice intensive and in many ways unsustainable production. Most of the farmers use large quantities of chemicals, often without a real need or justification for the use. In general, farmers are aware of the health hazardous effects of chemicals, but are unaware of the overall environmental damage caused. Producers often do not make informed choices about the use of chemicals, but relay on the advice from local agriculture input providers. On the other hand it is often that agriculture input providers are profit driven and have interest in selling the chemicals that bring them the most earnings, rather than the ones with the lowest environmental impact. This abuse of chemicals is contributing to eradication of beneficial insects and pollinators. It is also a source of health problems for farmers and consumers, and a pollution hazard to soil and water.

In terms of fertilizers, it is often the case that producers use excess of chemical fertilizers in their production efforts. This is mainly because producers often neglect to make soil analyses before fertilization and use the same NPK fertilizers for years. All due farmers are aware of the compost numerous benefits over mineral fertilizers, seems that they lack the knowledge and will to produce and use compost. It is frequent that farmers use sheep and cow manure for fertilization, but this use is quite small compared to the use of mineral fertilizers.

In addition, many of the producers are in a habit of burning crop residues after harvest, even if this practice is punishable by law. Minimal soil disturbance is another method, which is alien to producers, so often deep plowing is used to stimulate crop growth, which in return has a negative effect. Mono cropping is not frequent practice, and is only evident in large agricultural holdings.

Irrigation is essential to agriculture production, as in most of the agricultural land there is generally a moisture deficit during the cropping period of about 480 mm. Especially for high value fruits and vegetables, such as tomatoes, peppers, and table grapes, irrigation is a pre-requisite for successful production.

There are no reliable data on consumed irrigation water. Most of the irrigation schemes have no measuring devices on irrigation intakes. Farmers pay a fixed price per area and/or per crop for the water they use for irrigation. Thus, the producers are not really considered about the quantity of water they spend for irrigation. Drip irrigation is implemented on a larger scale in the last 10 years, but there are still many producers not using water conserving irrigation systems. Beside the water runoff, this is also contributing to topsoil erosion.

An estimated 38% of the agricultural land is experiencing medium to severe erosion processes. The combination of natural vulnerability (sloping terrain, vulnerable soil structures and occurrence of intensive rains), inappropriate land use (destruction of natural flora, conversion of grasslands for cash crop cultivation, establishment of large fields involving the destruction of former shelterbelts, landscape elements and field margins) and farming practices (overgrazing, use of monocultures, limited application of organic materials, ploughing of steep slopes, lack of soil conservation tillage techniques, insufficient land use for winter cover crops) contribute to the acceleration of erosion processes.

Water erosion combined with the intensive usage of inorganic fertilizers is resulting in poor soil fertility. This is leading to low crop productivity and low farm yields. Thus, farmers are often caught in a vicious cycle of decreasing soil fertility that necessitates the buying of expensive chemical fertilizer to improve crop yields.

Waste recycling on a farm level or in the agriculture sector as a whole, has not been implemented. In general, all agricultural producers are acting on their best judgment and environmental conciseness in terms of recycling of waste, organic matter or nutrients in their production activities.

In general, it can be stated that farmers and agricultural companies are to a great part unaware of the consequences of their present production methods and land use practices and underestimate the severity of the problem. Even the ones, which are more aware of the problem, have limited access to knowledge, financial means and appropriate technologies to enhance their operations sustainability. Farmers continue to be one of the poorest population groups and their financial insecurity leads to short planning horizons and reduced ability to invest in sustainability improvements. State interventions may address much of the ongoing unsustainable farming practices as many of the agro environmental aspects are regulated with existing legislation on Good Agriculture Practice. Starting from 2013, even the payment of agriculture subsidies is conditioned with the fulfillment of minimum requirements for good agricultural practice and environmental protection in the agricultural activities. This covers issues related to:

- Maintenance of the content of organic matter and biological activity of the soil and application of agro technical measures,
- Soil protection from erosion,
- Application of fertilizers,
- Maintenance the appropriate soil pH. value.

- Selection and application of plant protection products,
- Monitoring of plant diseases
- Protection of human health in the application of plant protection products.

However, there are severe policy distortions in implementing these requirements, and so far, little effort is made by the competent authorities to implement, support or enforce sustainable farming practices.

There is also an existing plan to introduce agro-environment subsidies which will motivate producers to change their farming practices. However, since defining the measures, priorities and areas of intervention, nothing has been done in this regard.

Currently the only noticeable support to implementing sustainable farming methods are made through the state support for organic production. However, outside of the organic production context, agriculture sustainability is really a topic both for the producers and policy makers on national or local level.

3.5 IT in Agriculture

Use of information Technology is becoming more and more evident in the agricultural sector. Currently there is a widespread use of mobile phones and computers for communication and access to the internet by producers. Most of the agricultural companies have their own web sites, while most of the individual producers are using basic smart phone communication apps like Skype, Viber and some social media e.g. Facebook. However, beside for communication and general information transfer purposes, only small number of individual producers uses these tools for marketing, trade or business purposes. Most of the producers have computers in their homes and are able to look at information placed on websites. However, the lack of foreign languages understanding is a limiting factor to accessing data, which are not localized. Currently most of the farmers are interested in using the IT in getting up to-date market information and current data on the weather, in order to make appropriate decisions. The use of more advanced IT solutions such as precision farming, remote sensing, traceability of agricultural products, GIS and other solutions for maximizing crops productivity is quite limited and only used by the well-established companies. A number of factors influence the slow integration of IT in agricultural sector. Most of the advanced and customized IT solutions come at a price which is not affordable to most of the producers. The producers lack of awareness about the existence and benefits of these technologies and lack the knowledge and skills in order to effectively use them.

So far there is a complete absence of organized efforts by the competent authorities, national extension services, universities and research institutions to support and initiate the implementation of IT in agriculture. The national agriculture extension service has no capacity to transfer this information to the agricultural sector. Education and research institutions also have a quite marginal role and it seems that they also have lack of initiative and interest in taking an active role in this process. Recently some efforts have been made by private companies and donor projects to develop web based tools for the agricultural producers. However, the dissemination efforts about these tools has been limited, and the vast majority of producers are not acquainted with the tools. In addition, the tools are scattered on different websites, making them difficult to be found and utilized by producers. As a general coordinated approach for implementing IT in agriculture seem to be missing on

a national level, currently the organization of trainings, seminars and workshops aimed at transfer of IT information depends largely on donor project as well as on initiatives of private companies seeking to sell their technologies to the agricultural producers.

Recently the IT chamber (MASIT) has initiated discussions about use of IT in the agriculture. The topic attracted a lot of attention, but no noticeable results are so far evident.

3.6 National targets for Agricultural Sector development

Little attention has been given in the past to the subject of agro-environment. However, in 2014 the Government adopted a six-year National Strategy for Agriculture and Rural Development 2014 - 2020 as a leading long-term strategic document on implementation of goals, policies and measures for the development of agricultural sector. The document firmly recognizes that restructuring of the sector is one of the key strategic objectives till 2020. Thus, the government has already started with creating the institutional, legal and policy setup for sector restructuring. By addressing the key constraints to the development of the sector, the overall objective is to contribute to make the agricultural sector more profitable and sustainable. Besides raising the ability of farmers to meet the opportunities for sustainably competitive agriculture, the proposed interventions include actions to improve farmers responsiveness to climatic changes and take advantage of new opportunities. As well as elements that address sector management weaknesses and improve the effectiveness of Government's technical and financial support measures, the programme will support improvements in water management, the selection and availability of crop and breed varieties, the management of pastures and broader land use.

However, MAFWE administrative capacity is still insufficient for upgrading current the ongoing pilot phase into full implementation mode.

To mitigate agricultural emissions, an additional range of measures is outlined in various action plans for both the agriculture and forestry sectors. The measures outlined in the respective action plans include:

- Training of farmers in the application of tools, practices and technologies to mitigate GHGs;
- Support to farmers to implement agricultural technologies that also reduce GHGs;
- Development of legislation and systems for the application of good agricultural practices;
- Establish agri-environmental capacity within the MAFWE Rural Development Department.
- Establish an agri-environmental information system within AIS. This system should be the (information decision-making support) source for policy development and implementation of baseline data collection for AE policy planning (soils, water, biodiversity), GIS system for AE mapping, training material development, advisory system background, monitoring).
- Raising farmers' awareness of the need to take steps to prevent pollution from nitrates, through the implementation of certain measures or through the implementation of good agricultural practices.
- Prepare comprehensive legislation on soil protection in order to substitute existing laws and to define respective responsibilities clearly. The law should contain provisions on protecting the soil and remediation measures for contaminated soils,

compulsory measures against erosion and compaction, and provisions for the use of the best agricultural practices.

- Initiate a programme analyzing and monitoring soils for heavy metal and pesticide contamination and develop a comprehensive programme for prevention and clean-up.
- Develop and strengthen agricultural extension services with comprehensive information programmes based on the principles of integrated and organic farming.

4 Data Analysis and Discussion of GAP assessment Results

The GAP syrvey was conducted between March and May 2018. A total of 20 participants contributed with their answers to this e-survey, by filling in the respective equestionnaires. The structure of the interviewed group included 16 agricultural producers (agribusiness and individual farmers) and 4 policy makers from local and central government.

4.1 Farmers

4.1.1 General characteristics of respondents

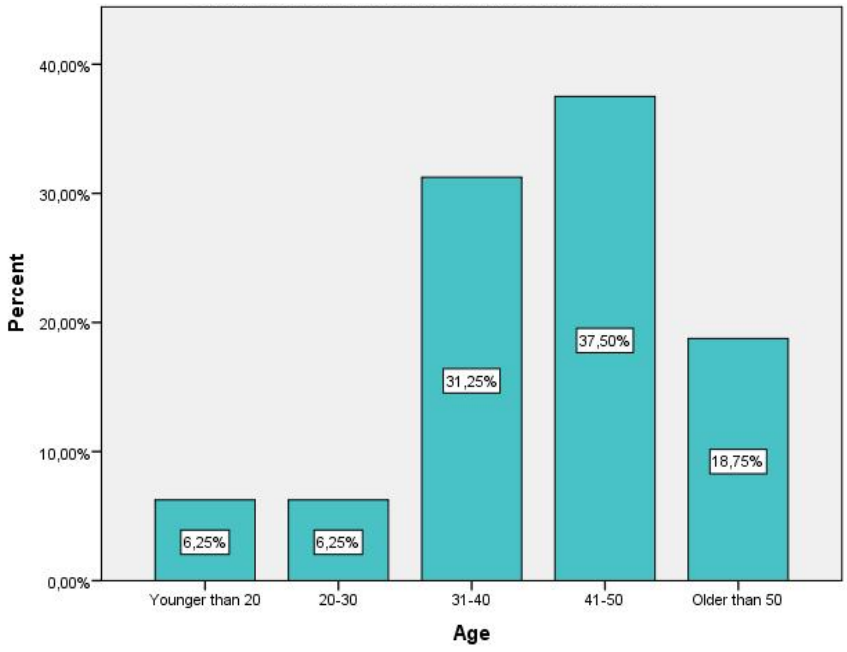


Figure 9 Age(years) of the target group (TG) in the survey

As regards the target group (TG) consisting of managers of agribusiness and individual farmers/producers, the majority or 37,50% of the participants are between 41 and 50 years old. 18,75% are older than 50, the 31,5% between 31 and 40 years old. A small percentage of 12,50% of the total participants in the survey are younger than 30 **(Fig. 9)**.

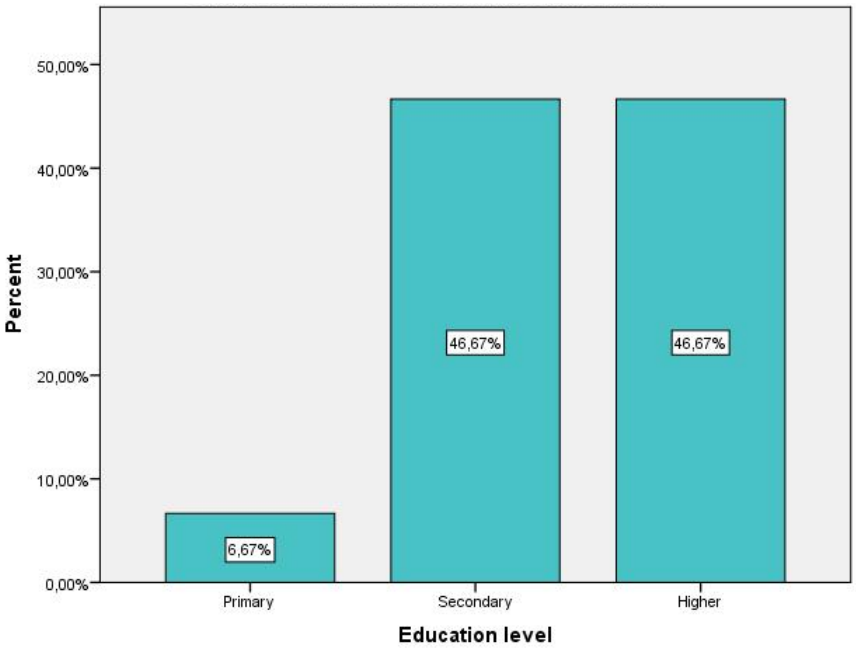


Figure 10 Educational level of the participants in the survey

The number of interviewed participants with primary and secondary educational level is at a same level 46,67%. Only 6,67% answered that they have primary education. None of the participants has post graduate education level **(Fig. 10)**.

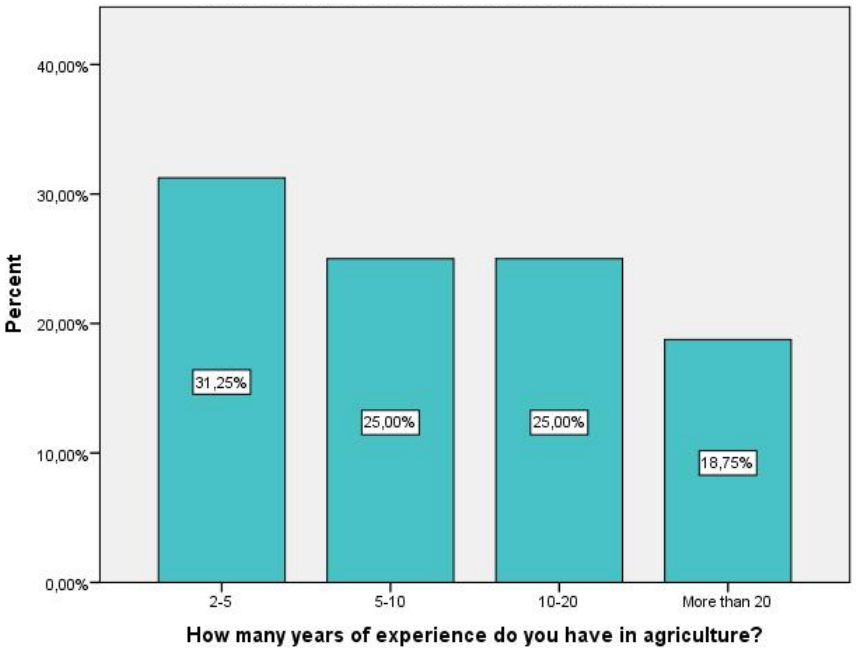
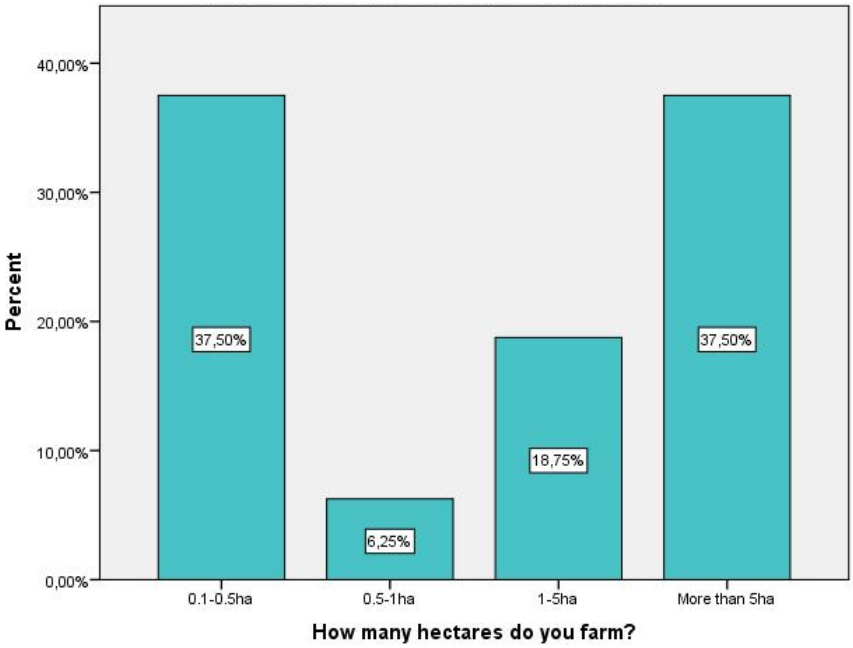


Figure 11 Level of experience in agriculture of the interviewed group

31,25% of the participants have moderate experience in agriculture, positioning their experience between 2 and 5 years. **(Fig. 11)** The number of participants with 5 to 10 and 10 to 20 years of experience is equal, 25% each. 18,75% answered that they have more than 20

years' experience in agriculture. Thus, the majority of the interviewed group has a solid experience of more than 5 years.

Figure 12 How many hectares the respondents farm



An equal number of participants declared that they are small farmers with less than 0,5ha and more than 5ha cultivation. 18.75% declared that they cultivate 1 to 5ha and 6,25% declared that they cultivate 0,5% **(Fig. 12)**.

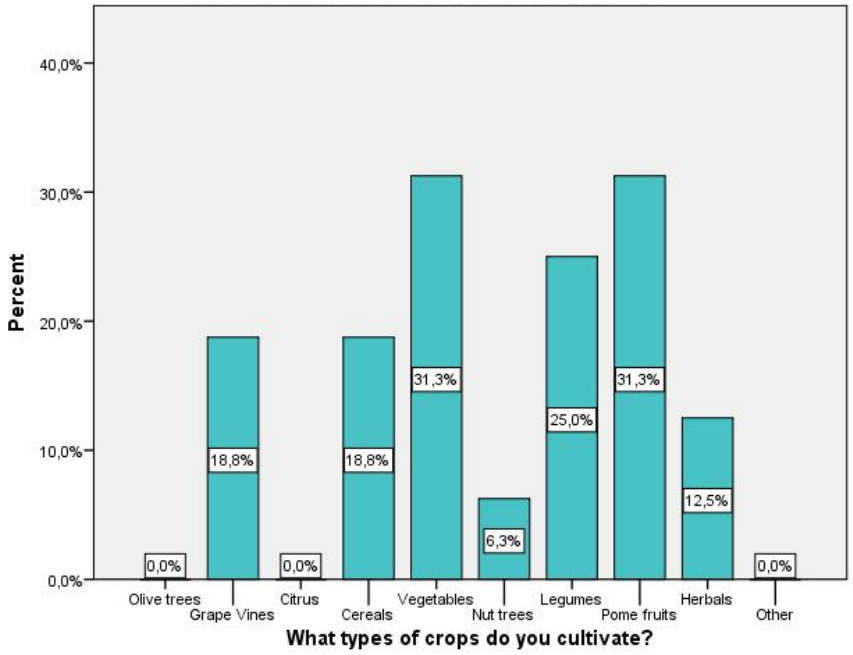


Figure 13 Types of crops cultivated by respondents

Vegetables and pome fruits are grown by the majority of participants. There is an equal share of 31,3% reported for both categories. **(Fig.13)** Third most important crop is legumes, followed by grape vines and cereals. A smaller percentage nut trees and herbals are

reported as cultivated. No olive trees or citrus trees were reported as cultivated as they do not grow well in the Tikvesh region.

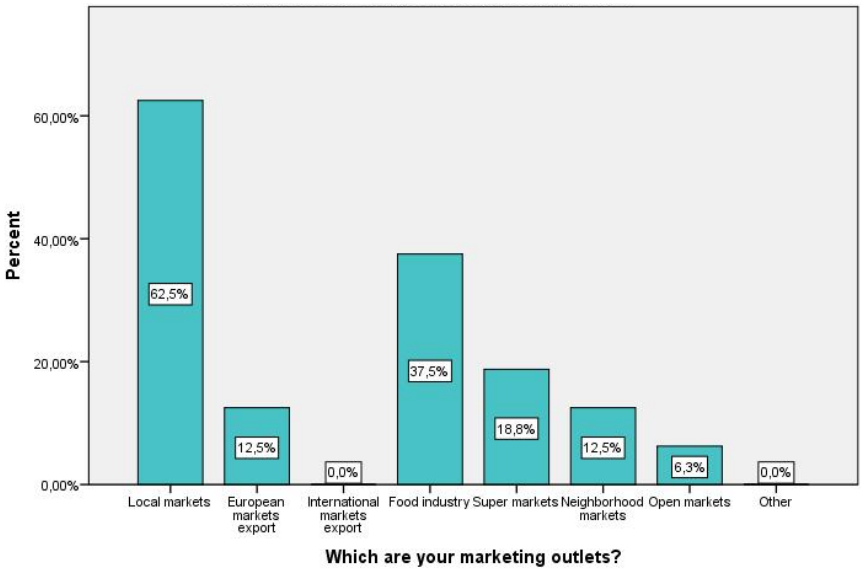


Figure 14 . Marketing outlets used by farmers

Majority of the participant place their products on the local markets over 60%, on the other hand we can notice that second choice was the food industry with over 30%, while others survey participants direct products to European market export (12,5%), to the super markets (18,8%),to the Neighborhood markets with 12,5% and very small number of them are oriented to the open market only 6,3% **(Fig.14)**.

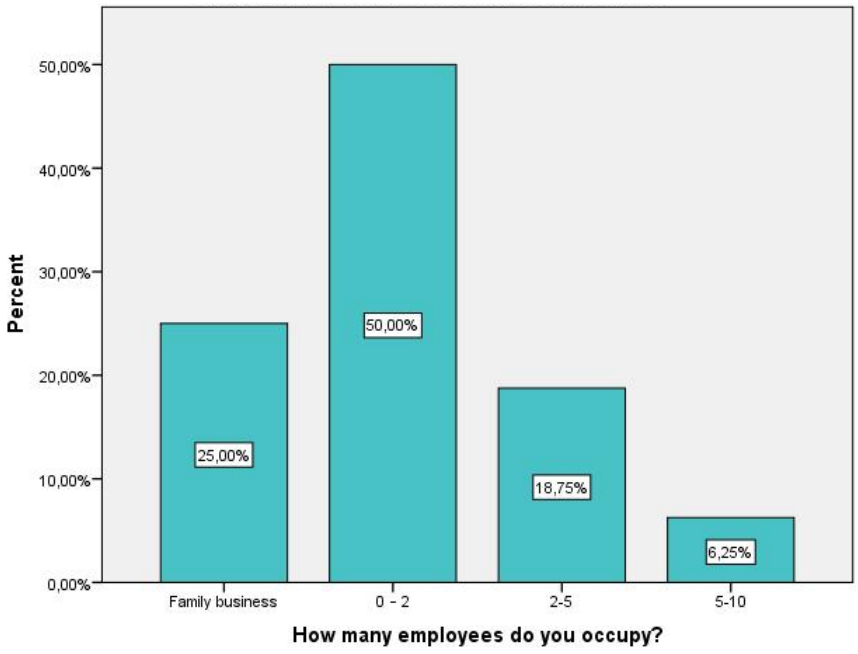


Figure 15 Types of business models and number of employees

The survey shows that family business are represented with only 25%, while the non-family business with only 0-2 employees have a higher percentage (50%). **(Fig.15)**The other two models are followed by a smaller percentage, enterprises or farms that employs more than 5 workers correspond to 6,25% in contras business with 2-5 employees are represented with 18,75%.

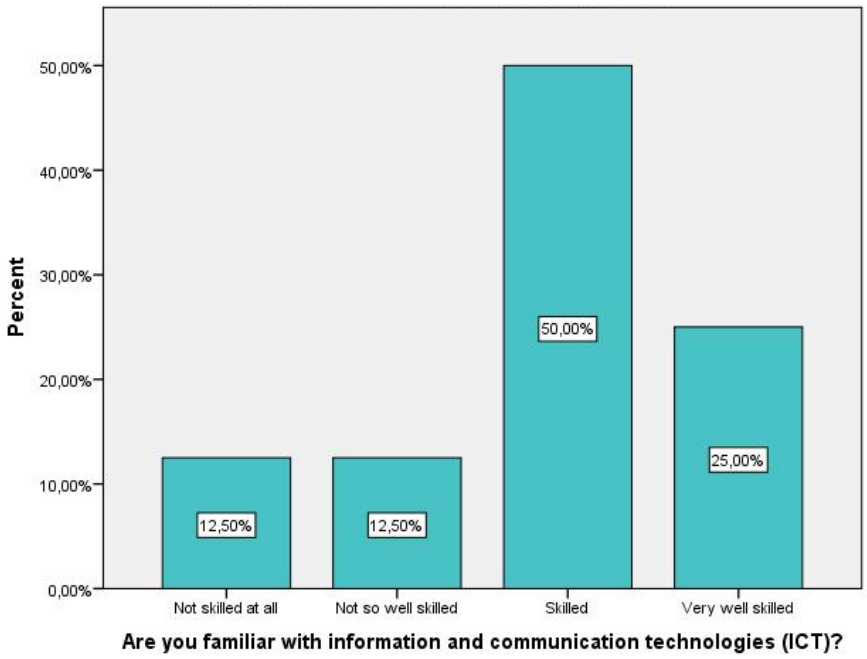


Figure 16 Skills of the participants for information and communication technologies

50% of the participants are skilled for information and communication technologies, additionally only 25 % are very well skilled **(Fig. 16)**. However we can see that there is a number of 25% of the surveys that are not skilled at all or not so well skilled.

4.1.2 Current state of opinion - Climate change and agriculture

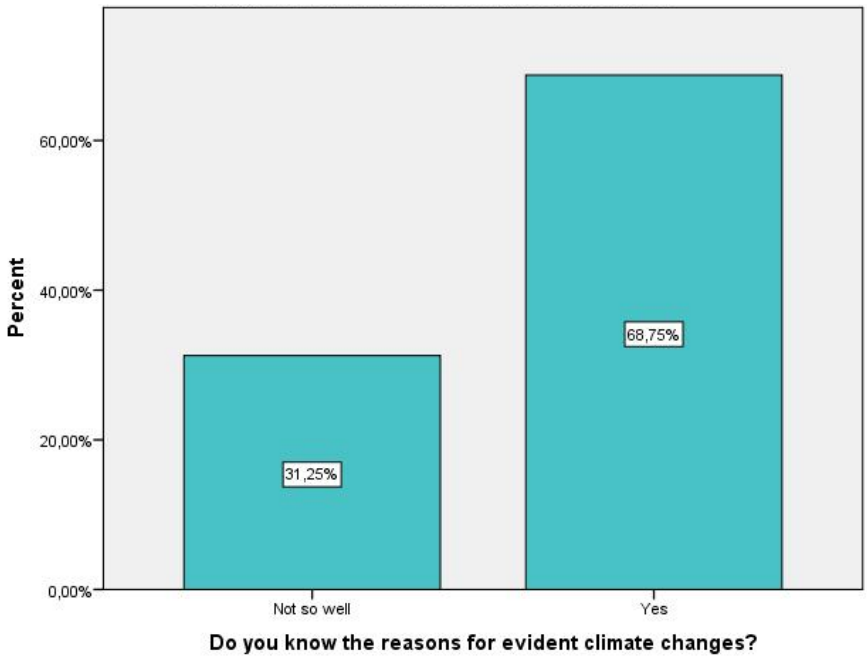


Figure 17 Reasons for evident climate change

Most of the farmers over 60% of them knows the reasons for evident climate changes, while the other 31,25% are not so well informed **(Fig. 17)**.

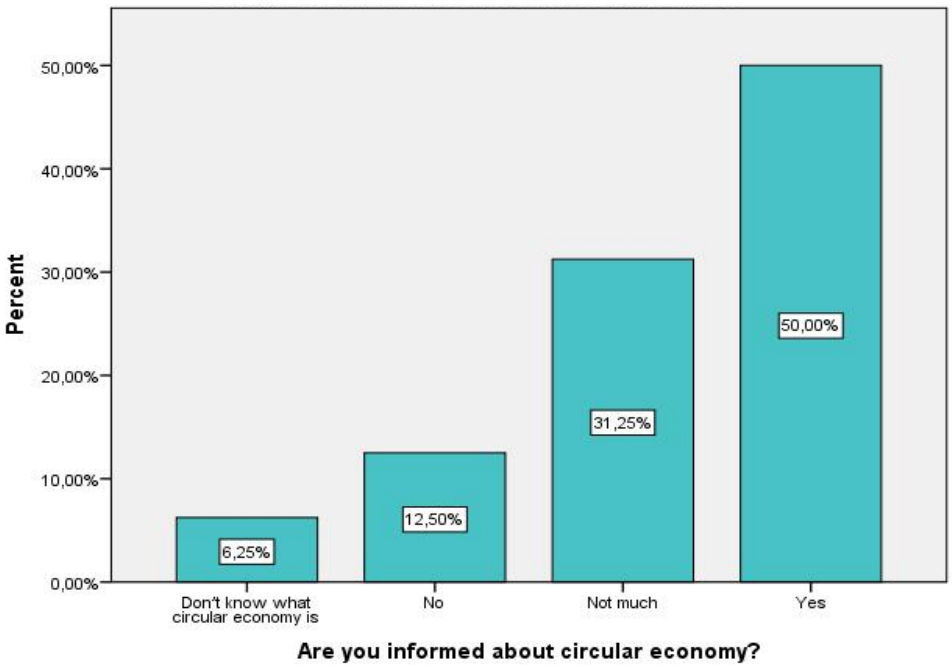


Figure 18 Farmers' Information regarding circular economy

The answers about circular economy are optimistic 50% of the farmers gave positive answers, on the other hand there are very few 6,25% participants that do not know what

circular economy is, furthermore they are followed with farmers that are not informed 12,5% and maybe they heard something 31,25% **(Fig. 18)**.

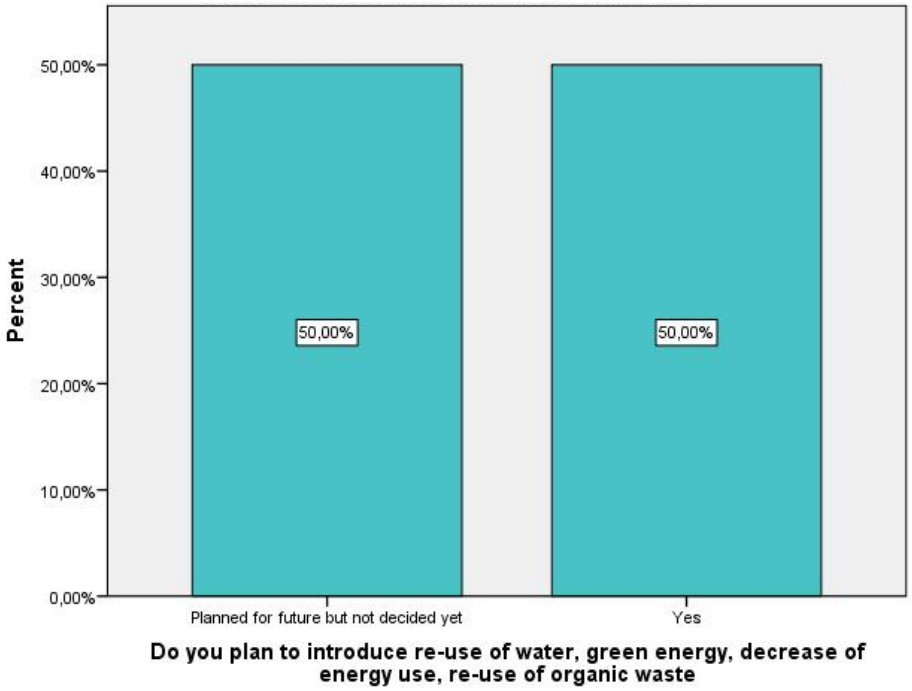
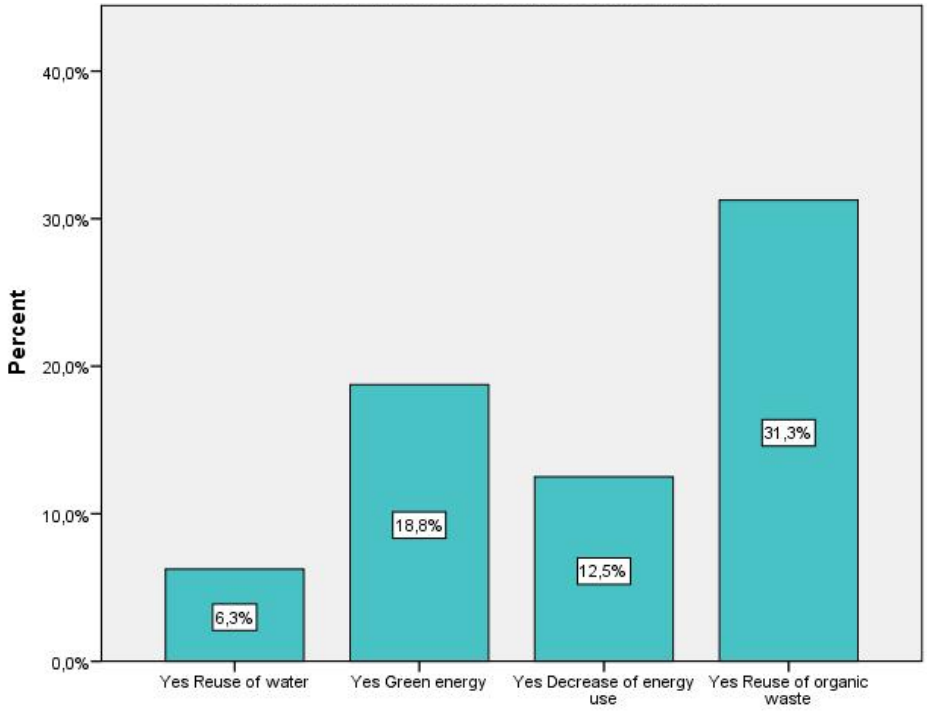


Figure 19 Farmers' plans for introducing environmental friendly practices in the field

Half of the respondents (50%) answered planned for future but not decided yet and the other half have positive answer (50%) **(Fig. 19)**. Those who answered positive majority of them will introduce the reuse of organic waste (31,3%),and green energy (18,8%), than the decrease of energy use (12,5%) and in the end the reuse of water only 6,3% **(Fig. 19.1**).

Figure 19.1 Farmers' plans for those given positive answer about introducing environmental friendly practices in the field



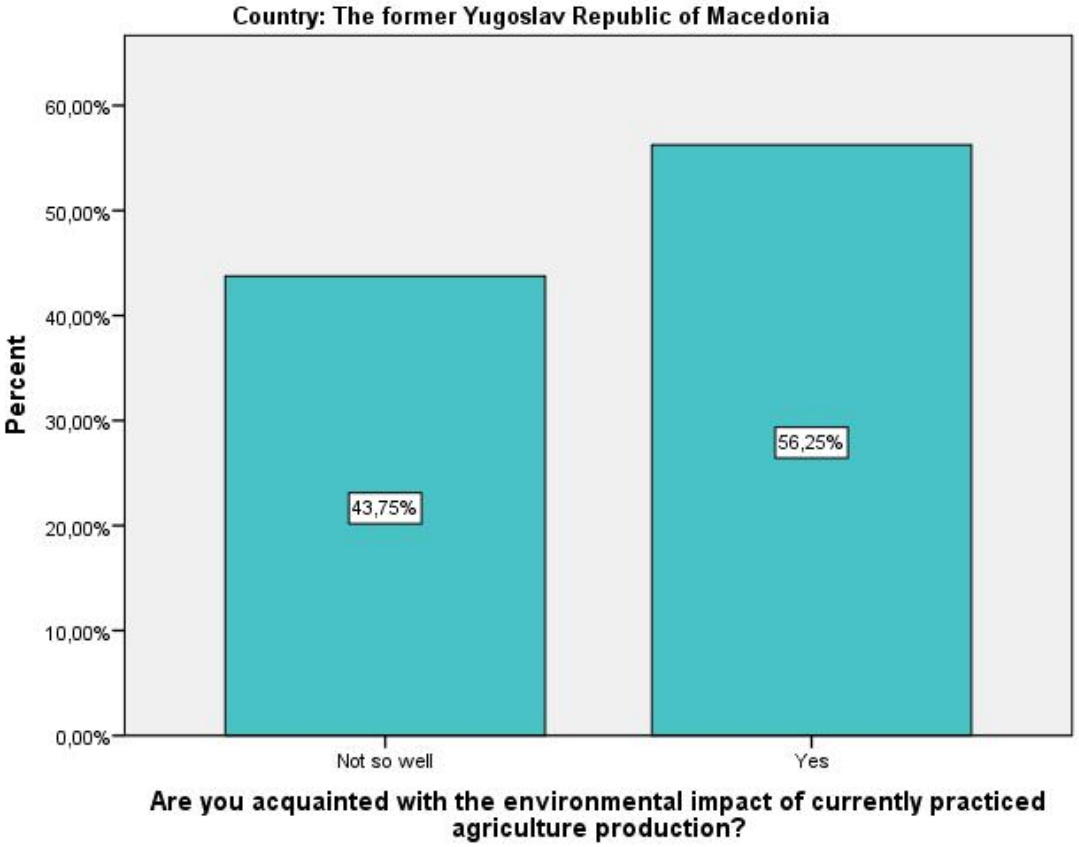


Figure 20 Farmers' awareness with the environmental impact of currently practiced agriculture production

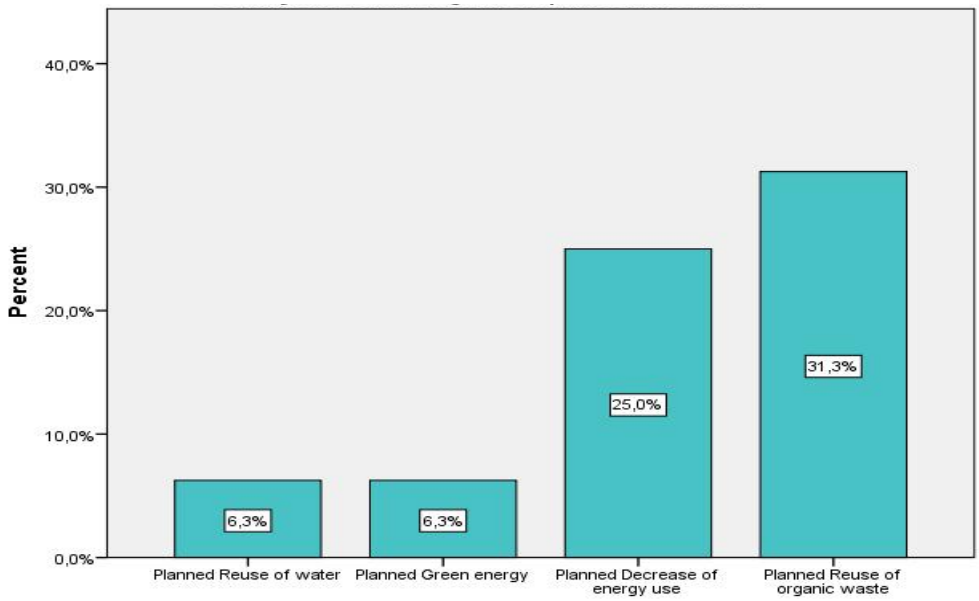


Figure 21 Plans of the farmers of reusing environmentally friendly practices in the field

Those who planned to introduce, but they have not decided it yet, 31,3% of them will deal with reuse of organic waste as first choice, on their second will be the decrease of energy use with 25% and last but also important reuse of water and green energy (6,3%) **(Fig.21)**.

43,75% of the farmers answered that are not acquainted with the environmental impact of currently practiced agriculture production, meanwhile the positive answer is much bigger and it is over 50 % from the respondents farmers **(Fig. 20)**.

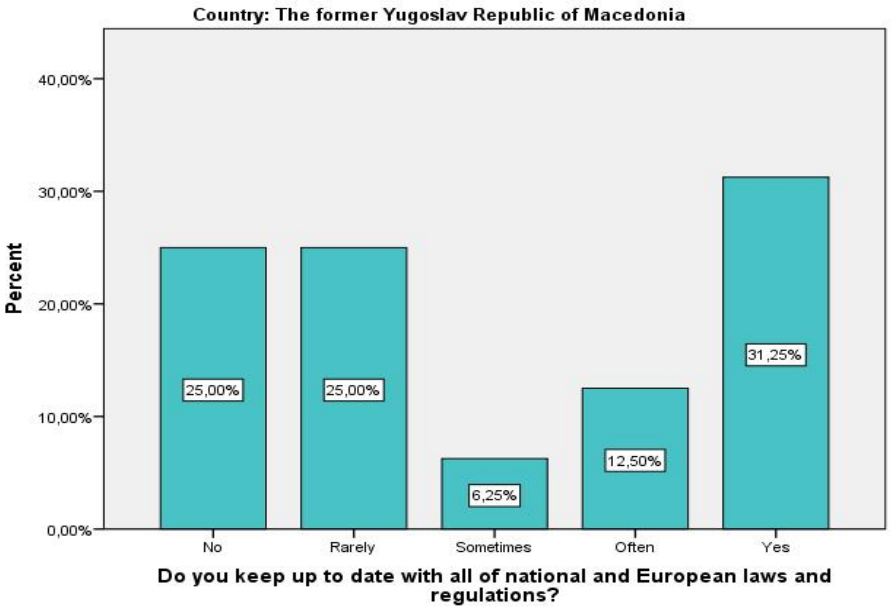


Figure 22 . Farmers' awareness with all national and European laws and regulations

The interviewers answered positively "yes" -31,25% and "often"- 12,50%, on the other hand negative answers of "no" and "rarely " share the same percent of 25 of the surveys, the other ones who answered "sometimes"**(Fig.22)** shares the smallest percent of respondents.

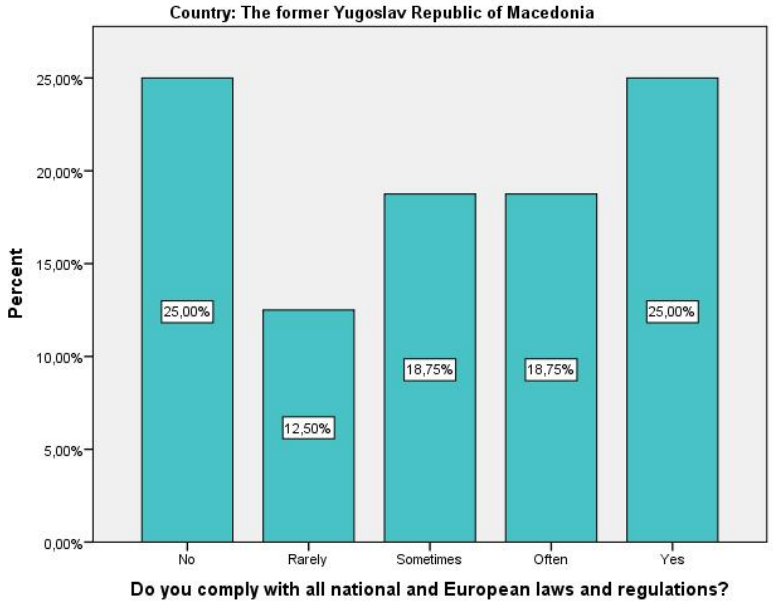


Figure 23 Farmers' compliance with all national and European laws and regulations

For this question do they comply with all national and European laws and regulations we can notice that many of the surveys have matching answers 25% of the farmers said that they comply also 25 % of them said that they do not **(Fig.23).** Farmers that sometimes and often

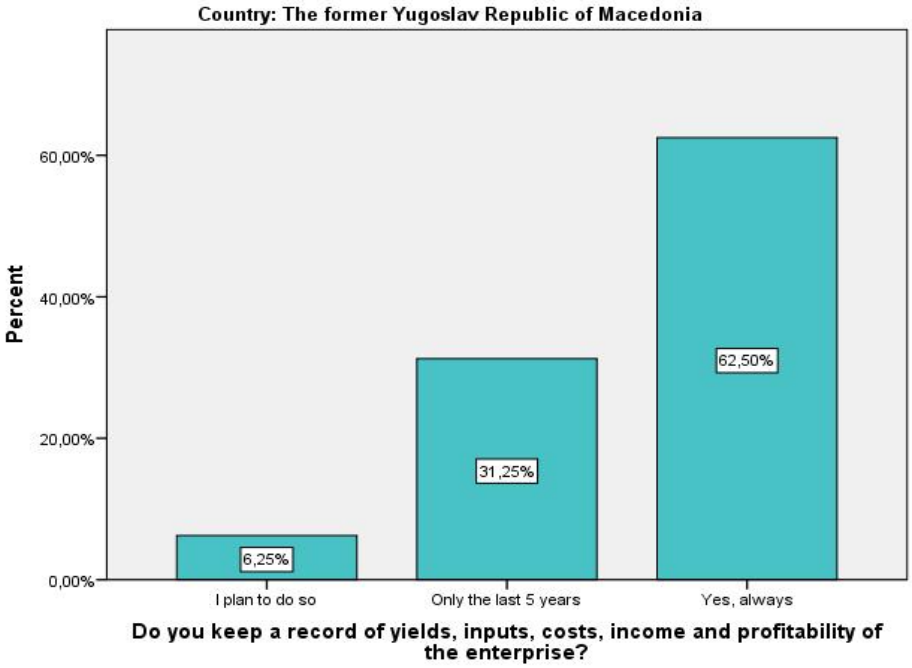
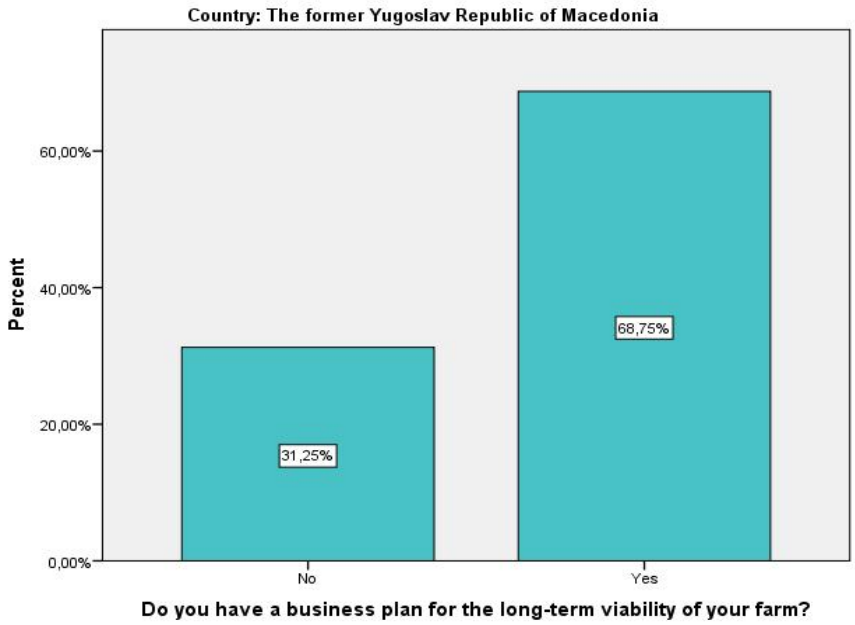


Figure 24 Farmers' reply in keeping records of yields, costs, income and profitability of their



enterprise

Figure 25 Do Farmers have a business plan for a long-term viability on their farms

comply with all national and European laws and regulations are only 18,75% and the ones who rarely comply are 12,50% of the survey.

It's favorable that the farmers 68,75% **(Fig.25)** of them have a business plan for the long-term viability of their farms by comparison only small part of the surveys do not have 31,25%.

Over 60% of the farmers keep their terms of yield, inputs, costs, income and profit, which is encouraging although the other 31,25% keep the records only from the last 5 years and a very little number of them only 6,25% plan to do so **(Fig.24).**

4.1.3 *Current state of opinion - Sustainable farming*

It's important to evaluate the land suitability properly prior cultivation and 65,50% of the surveys answered positively which is significant aspect, while 37,50% of the interviewers are not doing it at the moment but they plan to do so . (Fig. 26)

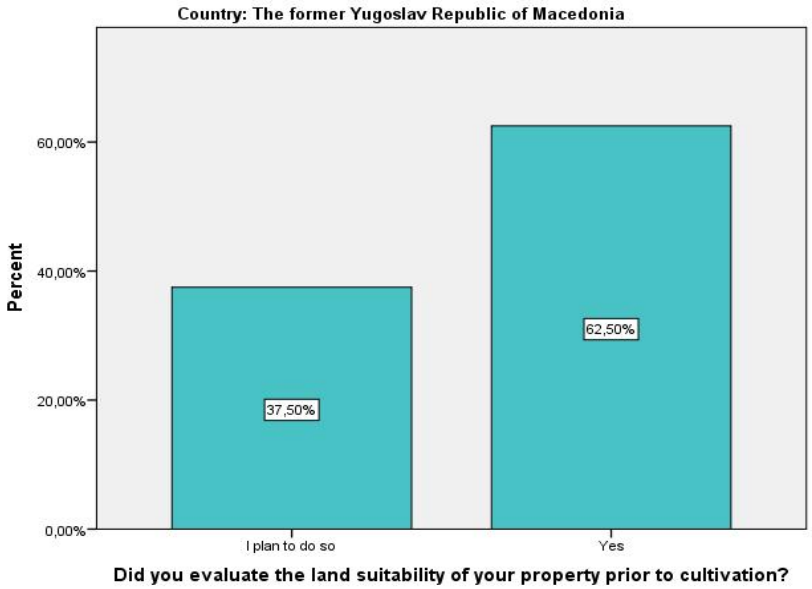


Figure 26 Farmers' reply in evaluating the land suitability of their property prior to cultivation.

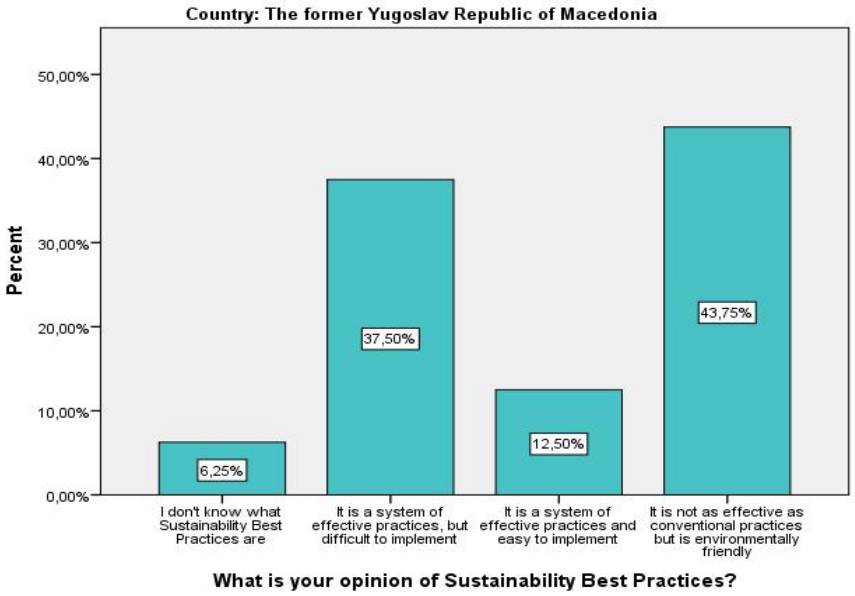


Figure 27 Farmers' opinion regarding Sustainable Best Practices

This question concerns sustainability Best Practices and different answers were presented **(Fig.27)**, all in all we can see that the most of them have the same opinion "it is not effective as conventional practices but is environmentally friendly " (43,75%). 37,50% said that it is a system of effective practices, but difficult to implement others 12,50% think that it is a system of effective practices and easy to implement and surveys that do not know what Sustainability Best Practices are.

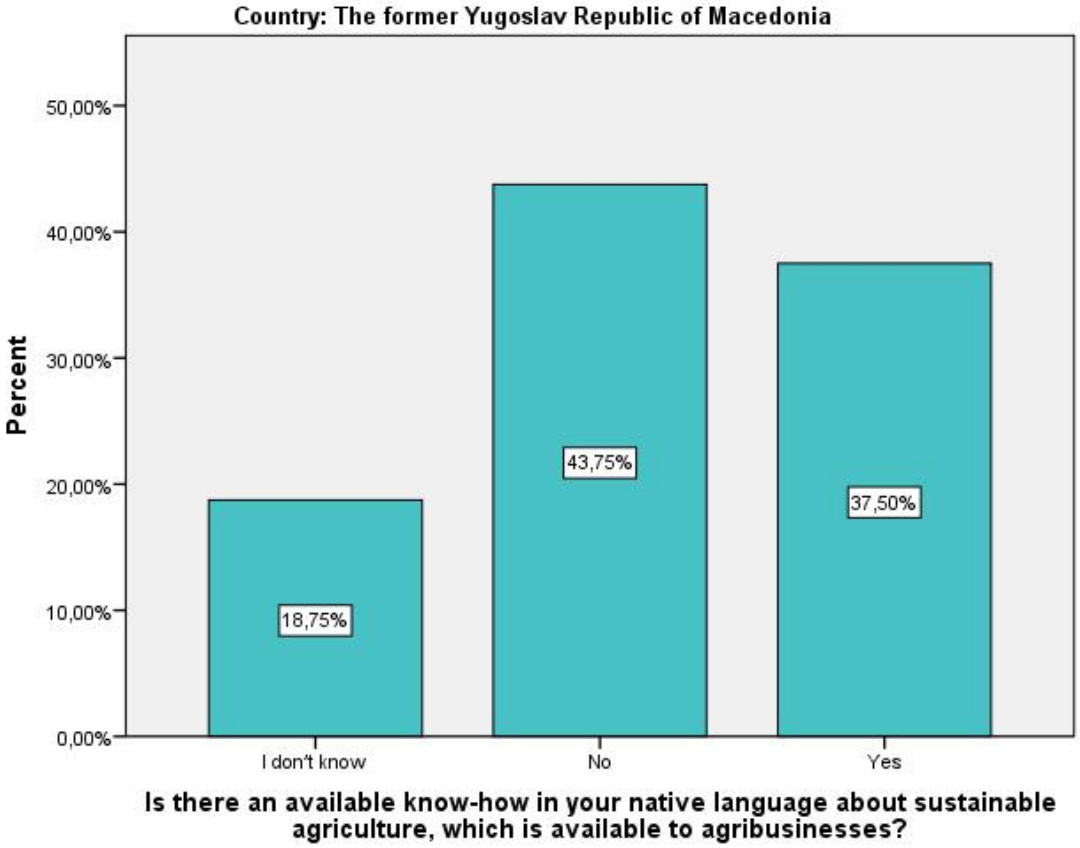


Figure 28 Farmers' knowledge on an available know-how in their native language about sustainable agriculture

About this question the availability of know-how in your native language about sustainable agriculture , positive provided answers were 37,50% **(Fig. 28)**, however negative answers gave 43,75% of the interviewers which is very discouraging finding and even 18,75% of them do not know if there is available know-how .

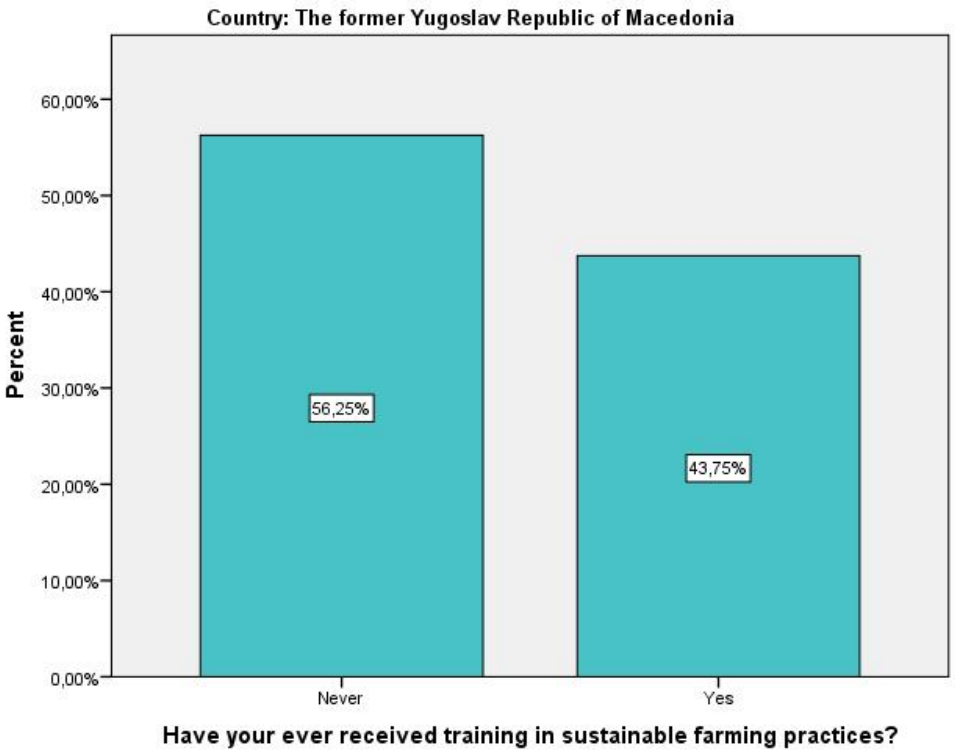


Figure 29 Farmers' response regarding training received in sustainable farming practices

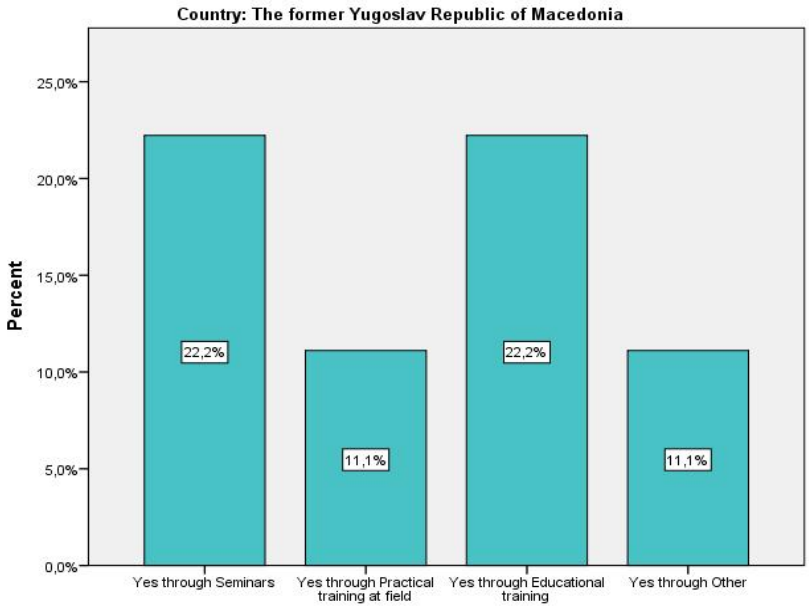


Figure 30 Farmers' type of training for those given positive answer

(Fig. 29) Here we can see that the percent 56,25% of farmers that never received training in sustainable farming practices is bigger than the farmers which did get training 43,75%.
By comparing this findings those who did receive training 22% of them get it through seminars and also other 22% through Educational training the rest of the farmers get it through practical training at field and other **(Fig. 30)** .

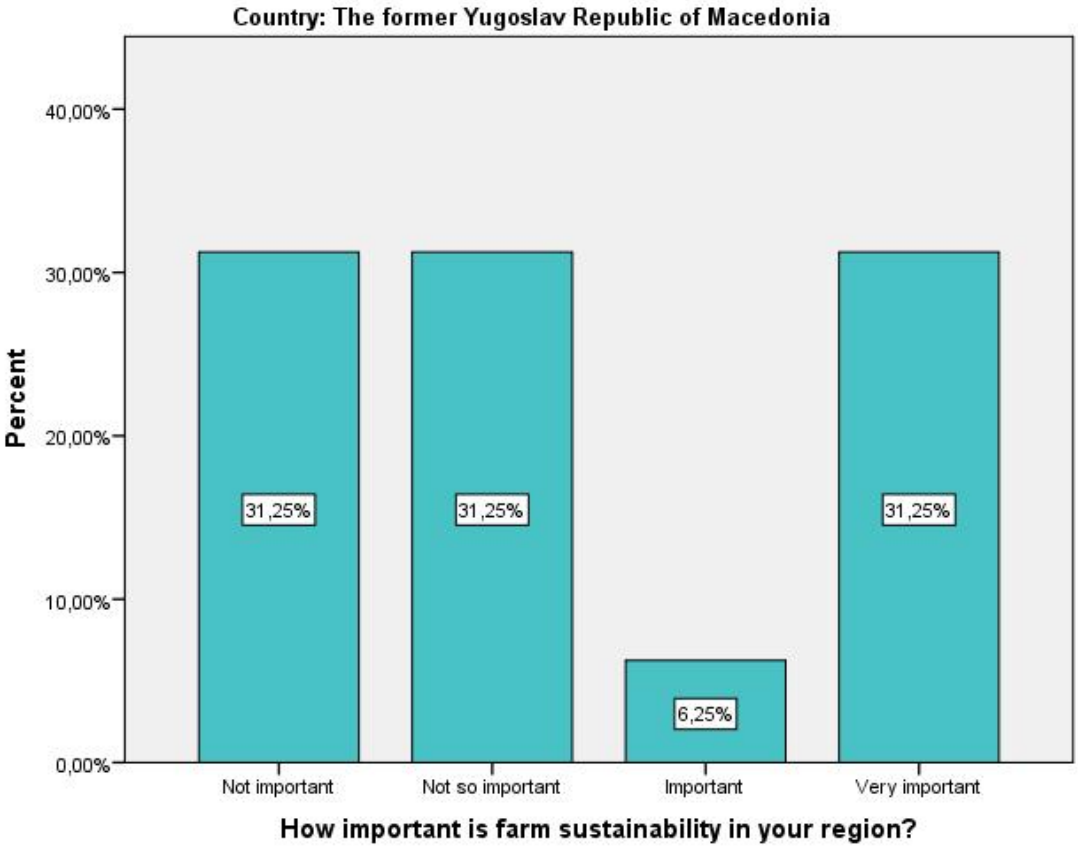


Figure 31 Farmers' reply in evaluating the importance of farm sustainability in their region

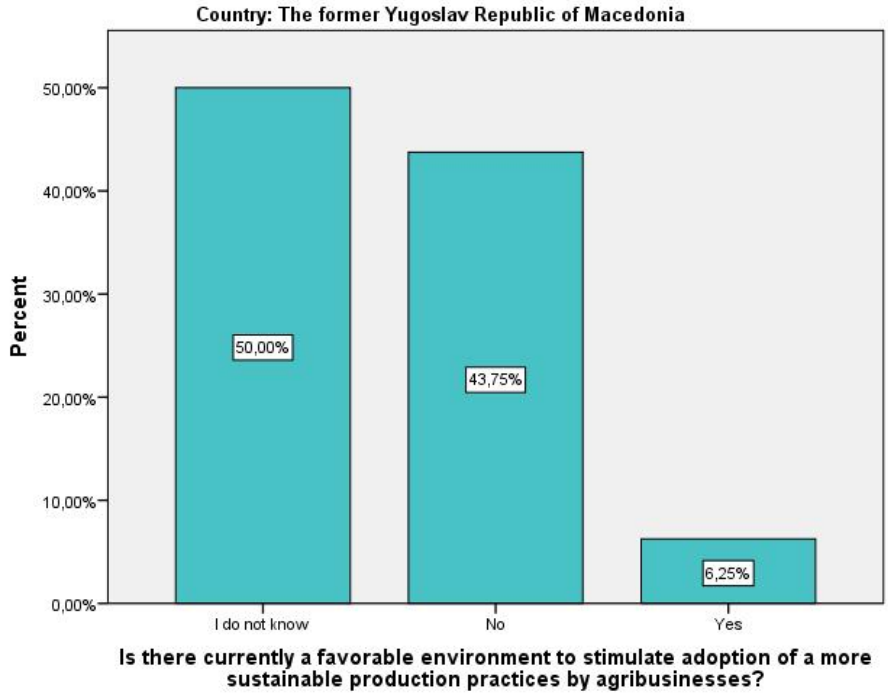


Figure 32 Farmers' reply if a favorable environment to stimulate adoption of a more sustainable production practices by agri-businesses currently exists.

(Fig. 31) The question about Importance in farm sustainability in the region shown some discouraging answers 31,25% said that it is not important and also 31,25% answered not so important in contrast very important answered also 31,25% and only 6,25% of the farmers think it is important.

A lot of negative responses have been expressed as regard the current favorable environment to stimulate adoption of a more sustainable production practices by agribusiness, **(Fig. 32)** 43,75% said that there is not favorable environment and there is 50% of farmers that do not know if there is or there isn't, less but not least small number of 6,25% of surveys think that there is a favorable environment to stimulate adoption of a more sustainable production practices by agribusiness.

In this case also the negative opinion is more expressed than the positive 75% of the interviewers said "NO" to are there any available governmental subsides or favorable financial instruments, which agribusinesses can use to switch to sustainable production. Only 18,75% of the surveys answered positively and 6,25% do not know **(Fig. 33)**.

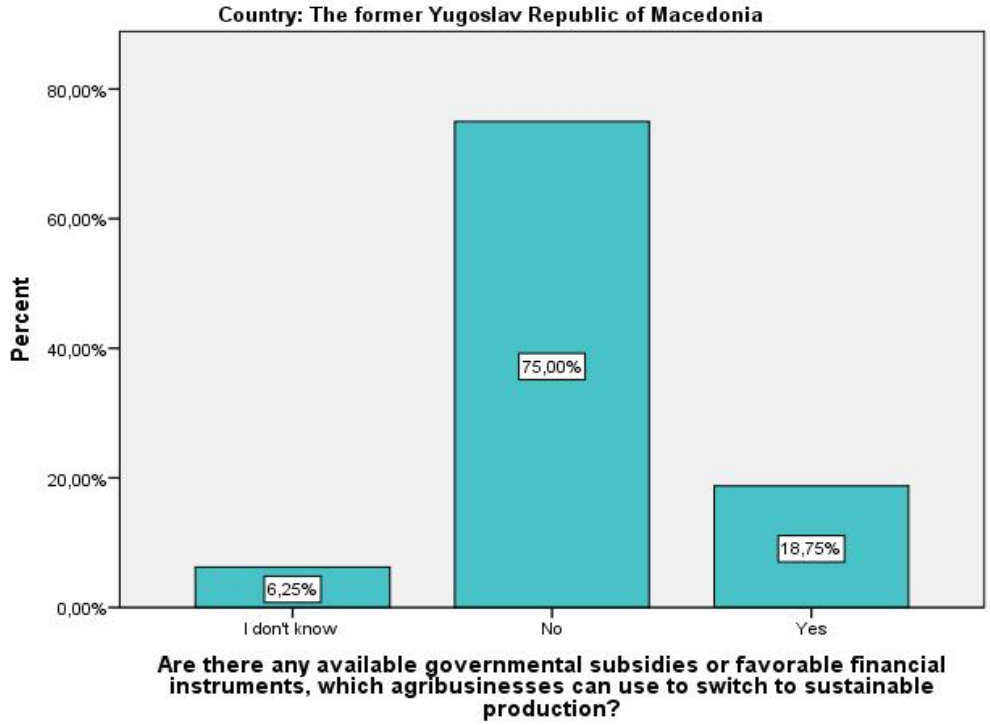


Figure 33 Farmers' response if there are any available governmental subsidies or favorable financial instruments which agro-businesses can use to switch to sustainable production

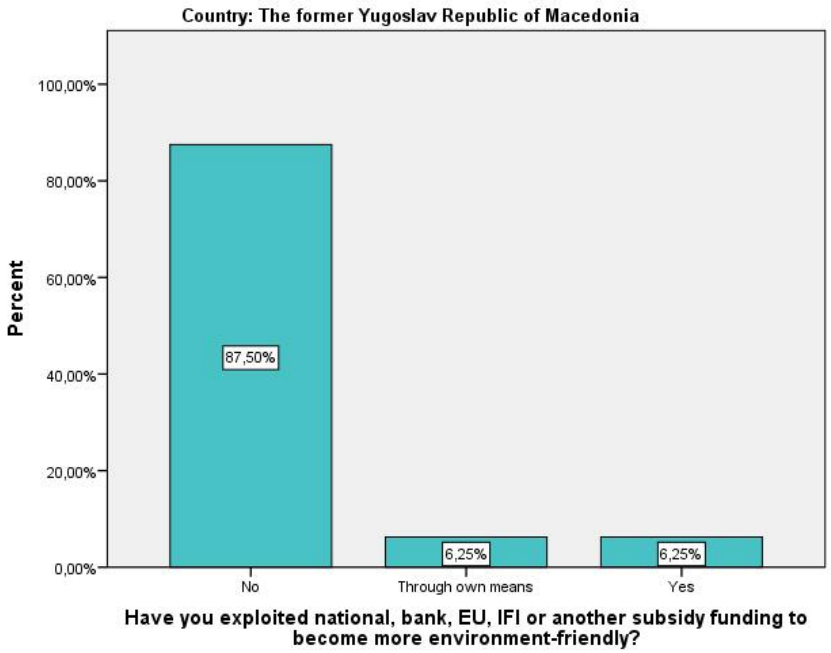


Figure 34 Farmers' reply if they had exploited national, bank, EU, IFI or another subsidy funding to become more-environmental-friendly

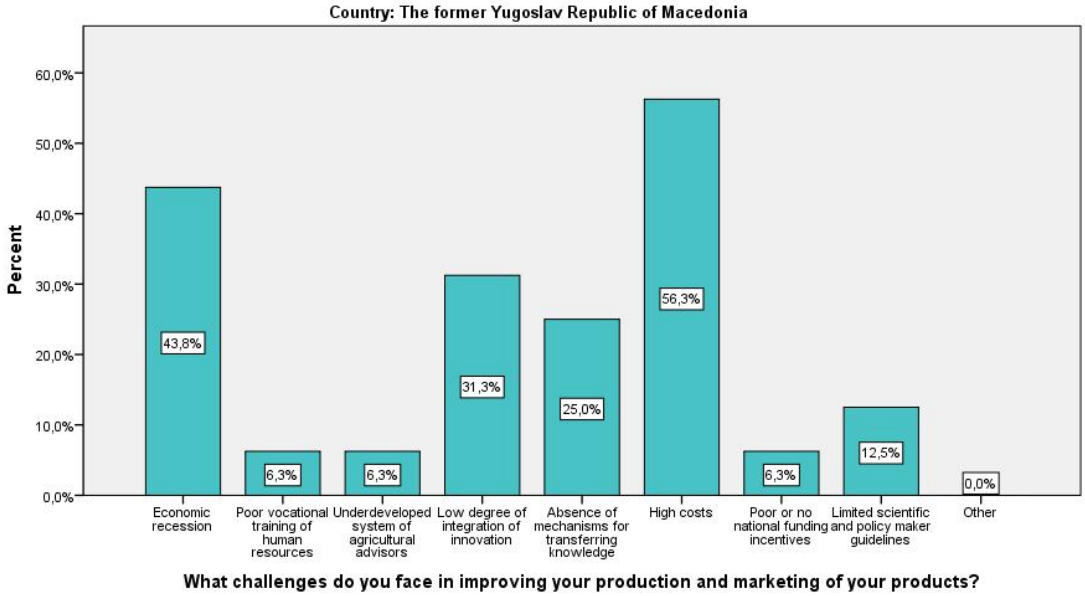


Figure 35 Challenges for the farmers in improving production and marketing of the products

87,50% did not had any benefit of the national bank, EU, IFI, or another subsidy funding to become more environment-friendly, 6,25% had the benefit but there is few of them 6,25% that answered through our means **(Fig. 34)**.

(Fig. 35) The biggest challenge for the farmers in FYROM in improving the production and marketing of the products is due the high costs more than 50% of the participants said that. The second one is the economic recession which is with 43,8%, the other one is low degree of integration and innovation (31,3%). The rest challenges that farmers face are:

- Absence of mechanisms for transferring knowledge
- Limited scientific and policy marker guidelines
- Poor vocational training of human resources
- Underdeveloped system of agricultural advisors
- Poor or no national funding incentives

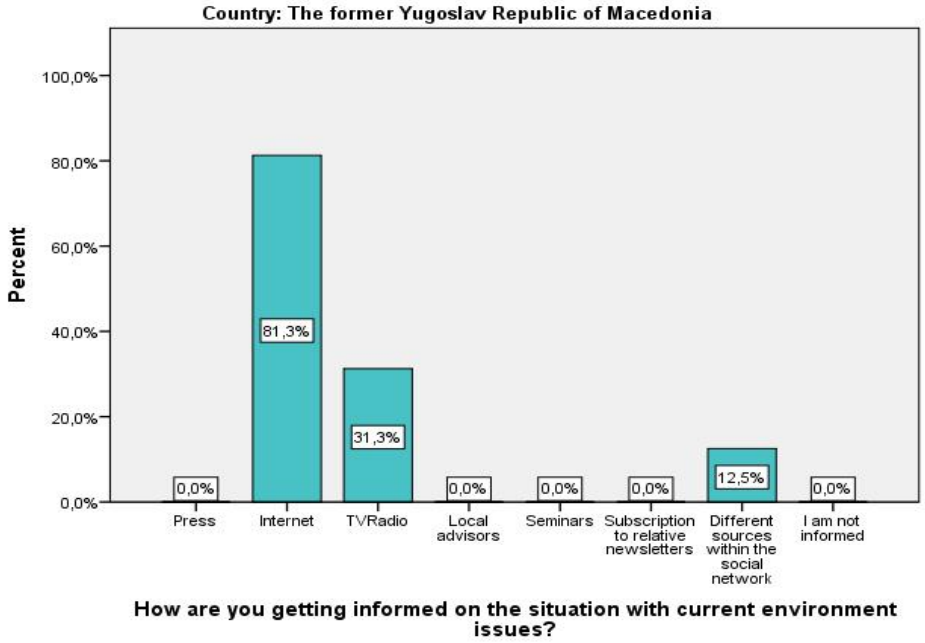


Figure 36 Sources where farmers get informed about current environmental issues

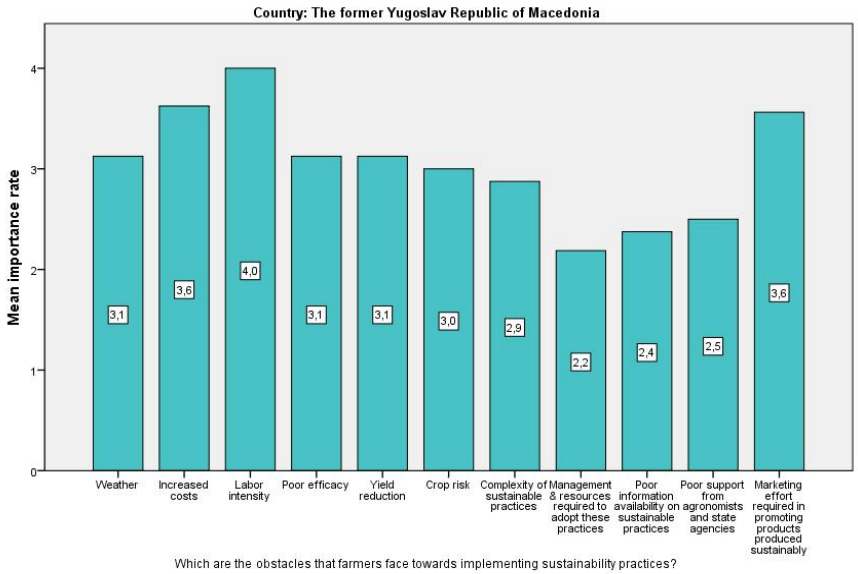


Figure 37 Farmers' obstacles faced towards implementing sustainability practices

(Fig 36) 81,3% of them are getting informed throw internet about current environment issues, over 30% on the TV/Radio and only 12,5% use different sources within the social network.

Here interviewers were asked to rate using grades from 1-5. **(Fig. 37)** One thing that farmers face towards implementing sustainability practices and all agreed on and also got the biggest grade it is the labor intensity, than are increased costs and marketing effort required in promoting products produced sustainably. Other obstacles are:

- ✓ Weather
- ✓ Poor efficacy
- ✓ Yield reduction
- ✓ Crop risk
- ✓ Complexity of sustainable practices
- ✓ Management and resources required to adopt this practices
- ✓ Poor information availability on sustainable practices
- ✓ Poor support of agronomists and state agencies

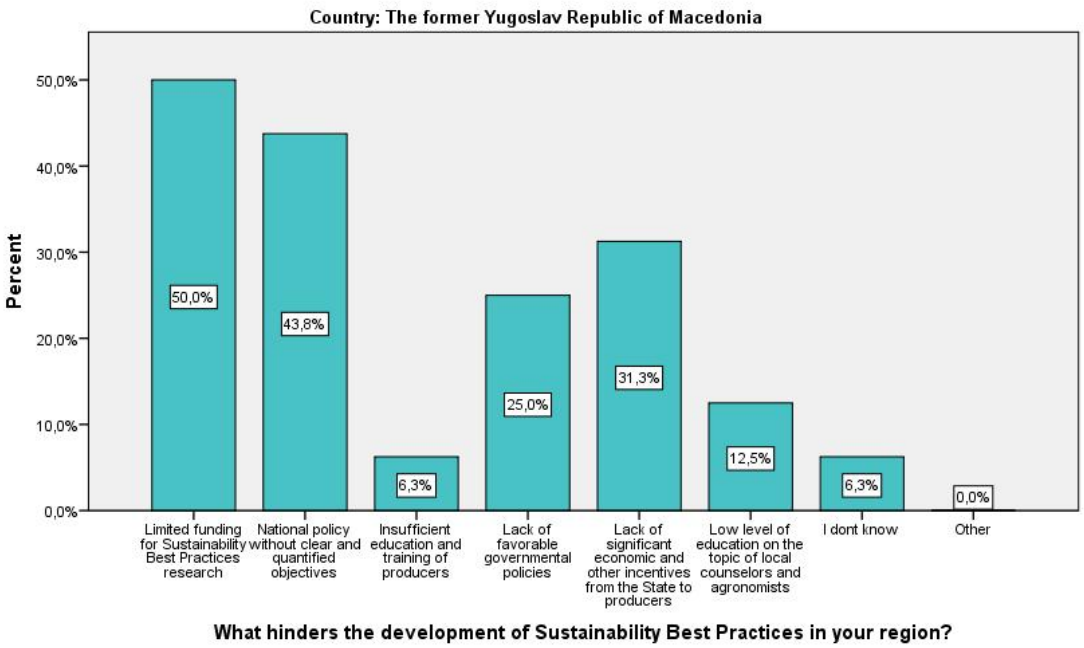


Figure 38 Farmers' reply to reasons that hinder the development of Sustainability Best Practices in your region

For this questions surveys were asked to write their own answers in a free text box **(Fig.38)**. 50% of them gave clear answer that limited funding hinders the development of Sustainability Best Practices in their region. Other of the answers that were provided are:

- National policy without clear and quantified objectives
- Lack of significant economic and other incentives from the State to producers
- Lack of favorable governmental polices
- Low level of education on the topic of local counselors and agronomists
- Insufficient education and training of producers

Only 6,3% do not know what hinders the development of Sustainability Best Practices in their region

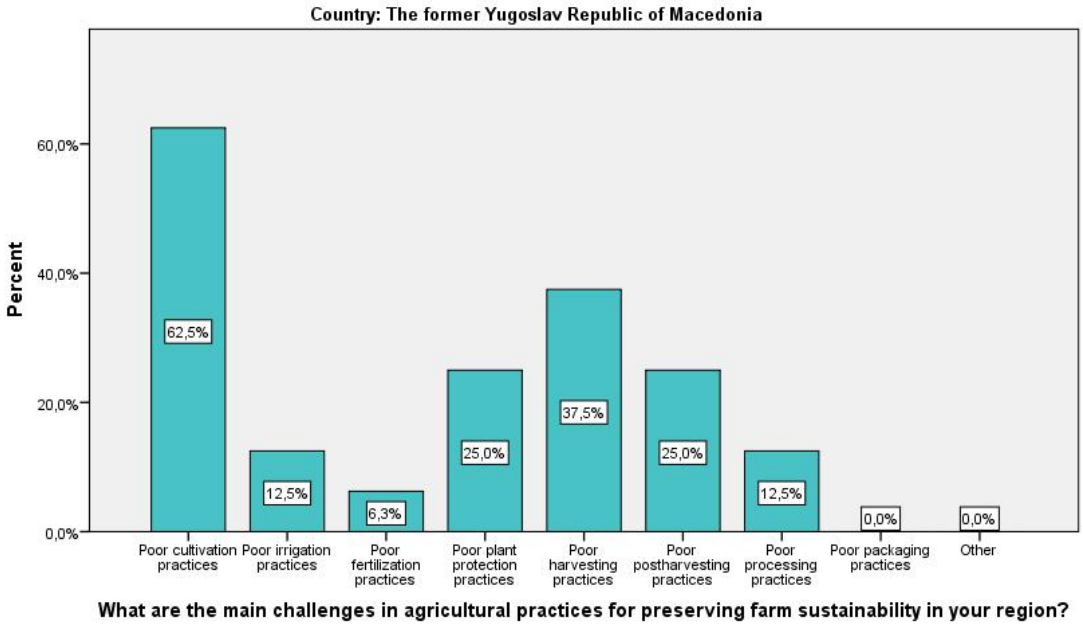


Figure 39 Farmers' response to the main challenges faced in agricultural practices for preserving farm sustainability

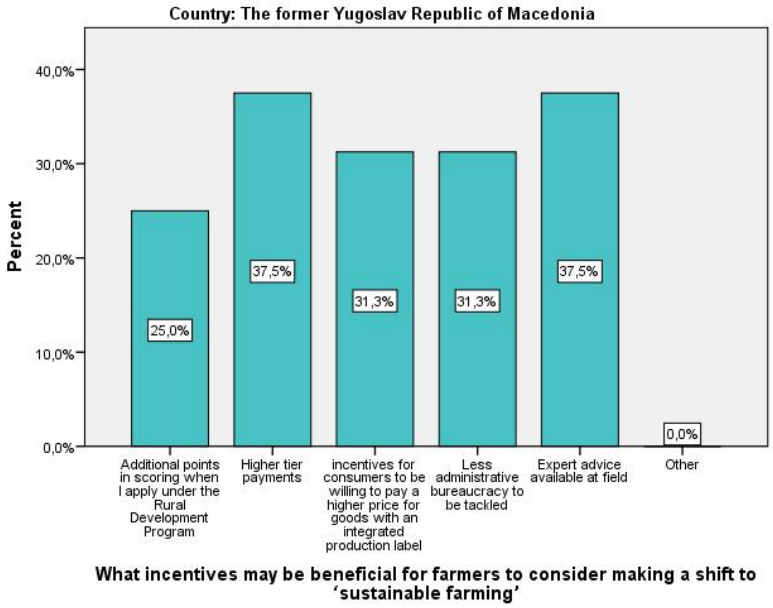


Figure 40 Farmers' incentives that may be beneficial to consider when making a shift to sustainable farming

About this question **(Fig. 39)** over 60% answered that poor cultivation practices is the main challenge in agricultural practices for preserving farm sustainability. On the second place is poor harvesting practices with 37,5% , then it follows poor plant protection practices and poor post harvesting practices with same percentage of 25, with 12,5% are poor processing practices and poor irrigation practices and with only 6,3% of the opinion about the main challenges in agricultural practices of the farmers are the poor fertilization practices.

(Fig. 40) Higher tier payments (37,5%) and expert advice available at field (37,5%) will definitely be beneficial for farmers to consider making a shift to 'sustainable farming' according to our surveys. Also, less administrative bureaucracy to be tackled, incentives for consumers to be willing to pay a higher price for goods with an integrated production label (31,3%) and of course additional points in scoring when they apply under the Rural Development Program (25%) will change their mind to shift to 'Sustainable farming'.

4.2 Policy makers

4.2.1 General characteristic of respondents

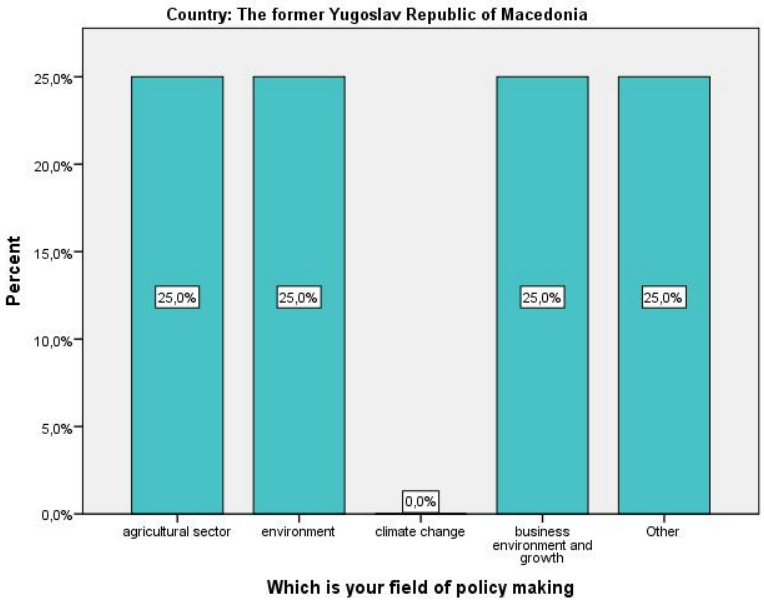


Figure 41 Field of policy makers

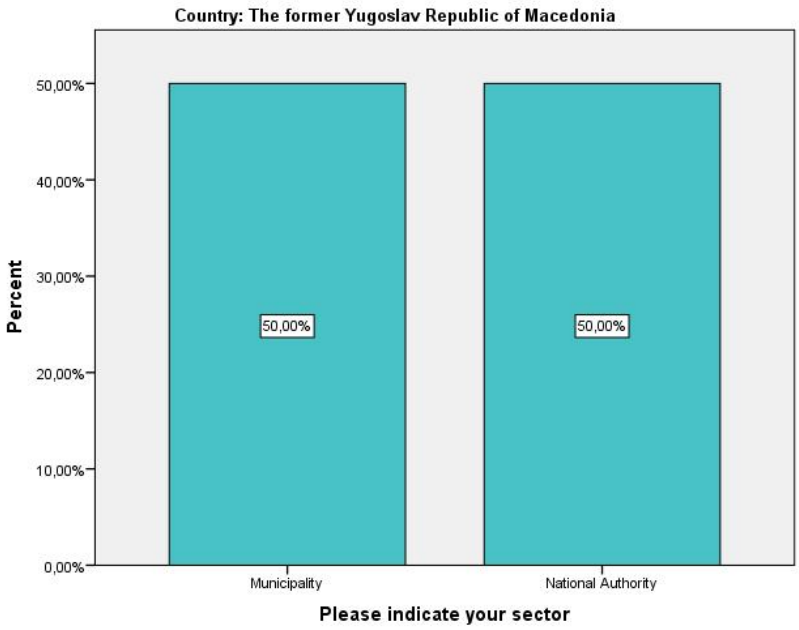


Figure 42 Sector of policy making

As it can be seen **(Fig. 41)**, all of participants are evenly distributed among all fields of expertise (25%): agricultural sector, environment, business environment and growth and other. Policy makers with experience in climate change did not participate in the survey.

Also **(Fig. 42)** 50% of the policy makers are deployed in Municipality and the other 50% in the National Authority.

4.1.3 Current state of opinion – Sustainable Farming

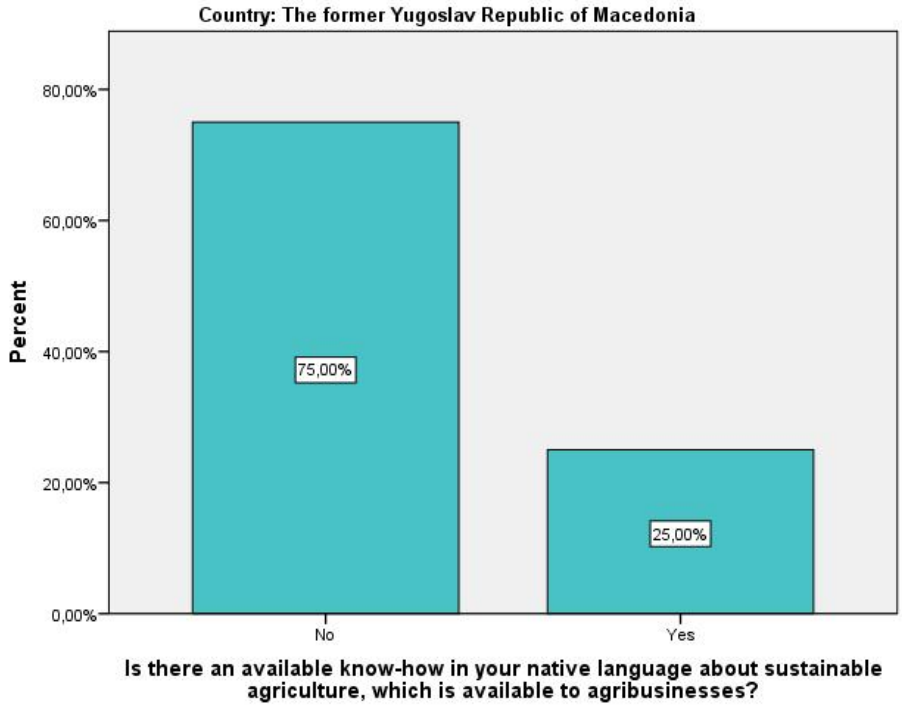


Figure 43 Policy makers' knowledge on an available know-how in their native language about sustainable agriculture

The majority of participating policy makers answered negative about this question 75% of them, however there are only 25% answered positively that there is available know-how in their native language about sustainable agriculture, which is available to agribusiness **(Fig.43)**.

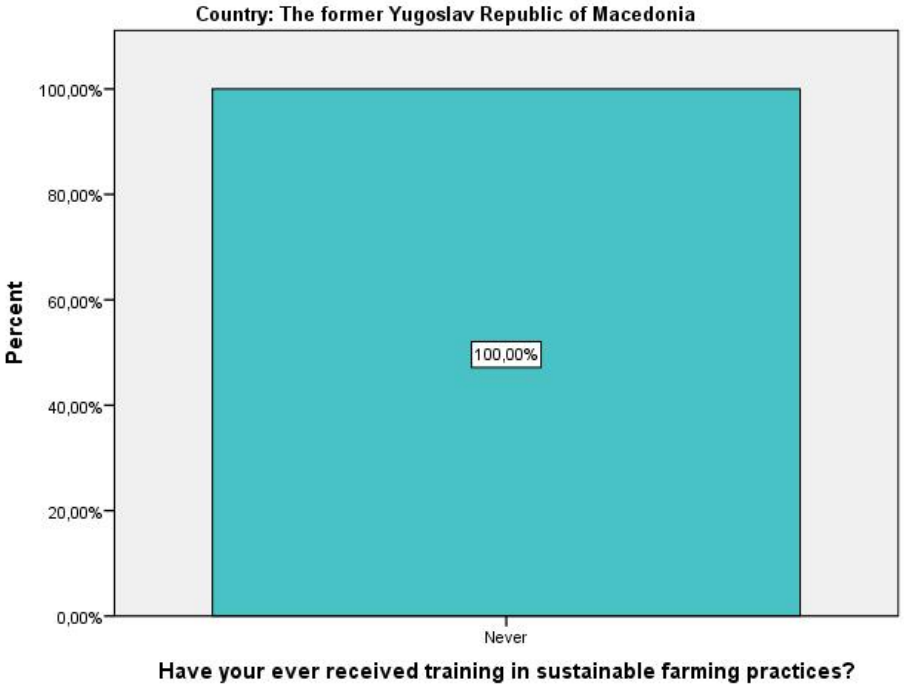


Figure 44 Policy makers' response regarding training received in sustainable farming practices.

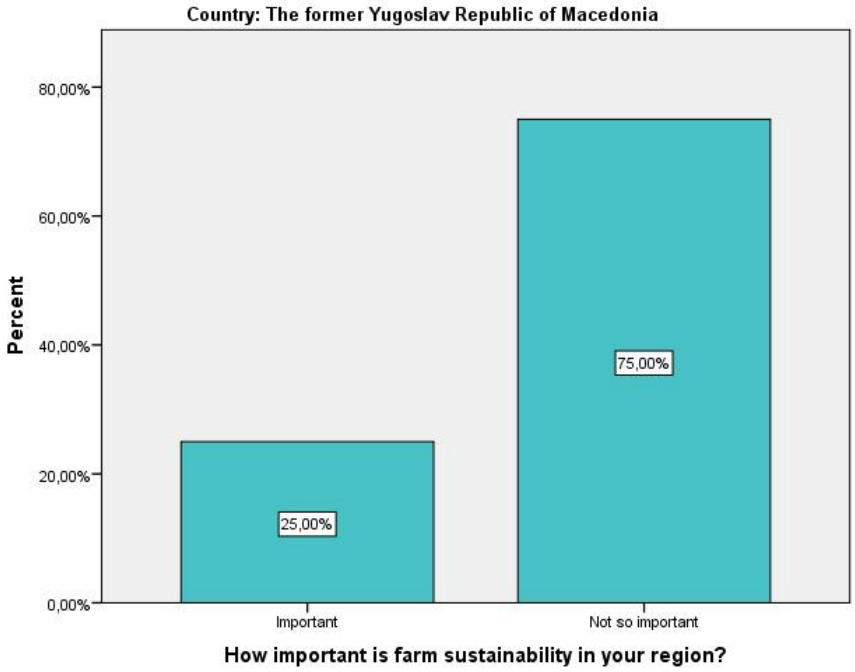


Figure 45 Policy makers' reply in evaluating the importance of farm sustainability in their region

(Fig. 44) None of the participating policy makers never received training in sustainable farming practices.

This question is important and have discouraging answers 75% of the policy makers think that in their region farm sustainability it is not so important likewise only 25 % of them think that is important **(Fig.45)**.

(Fig. 46) When the surveys were asked if they consider is there is currently a favorable environment to stimulate adoption of a more sustainable production practices by agribusiness 25 % said that they do not know and the other 25 % don't think that there is no such favorable environment, meanwhile 50% of the policy makers believes that there is such an environment, therefore this is a positive attitude.

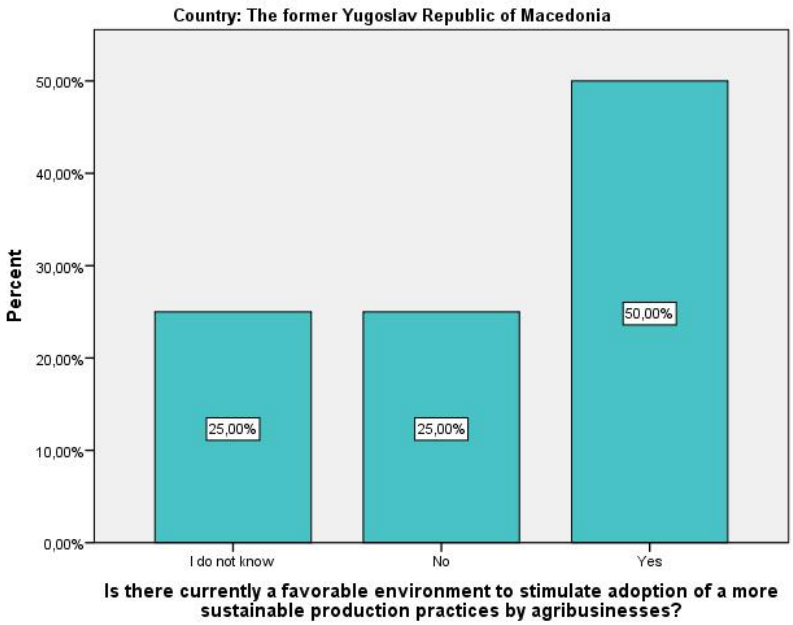


Figure 46 Policy makers' reply if a favorable environment to stimulate adoption of a more sustainable production practices by agri-businesses currently exists.

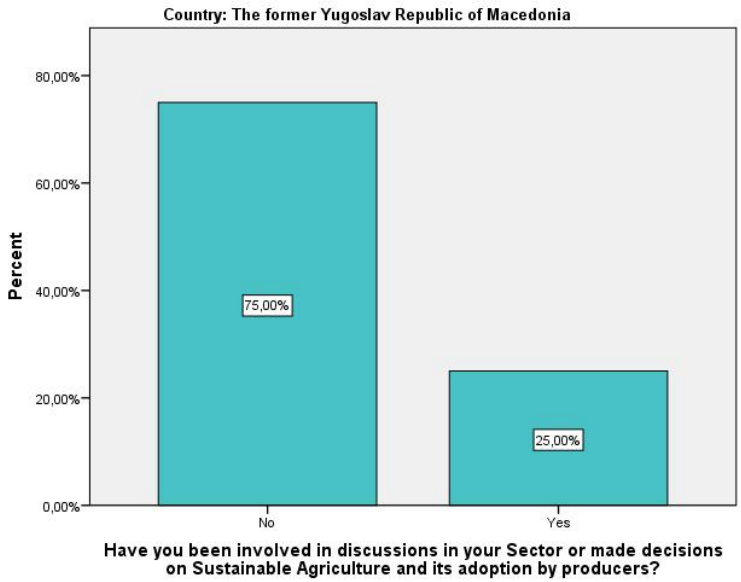


Figure 47 Policy makers' reply if they had been involved in discussions in their Sector or had made decisions on Sustainable Agriculture and its adoption by farmers

Most of the policy makers (75%) have not been involved in discussion in their sector or made decision on Sustainable Agriculture and its adoption, only 25% have been involved **(Fig.47)**.

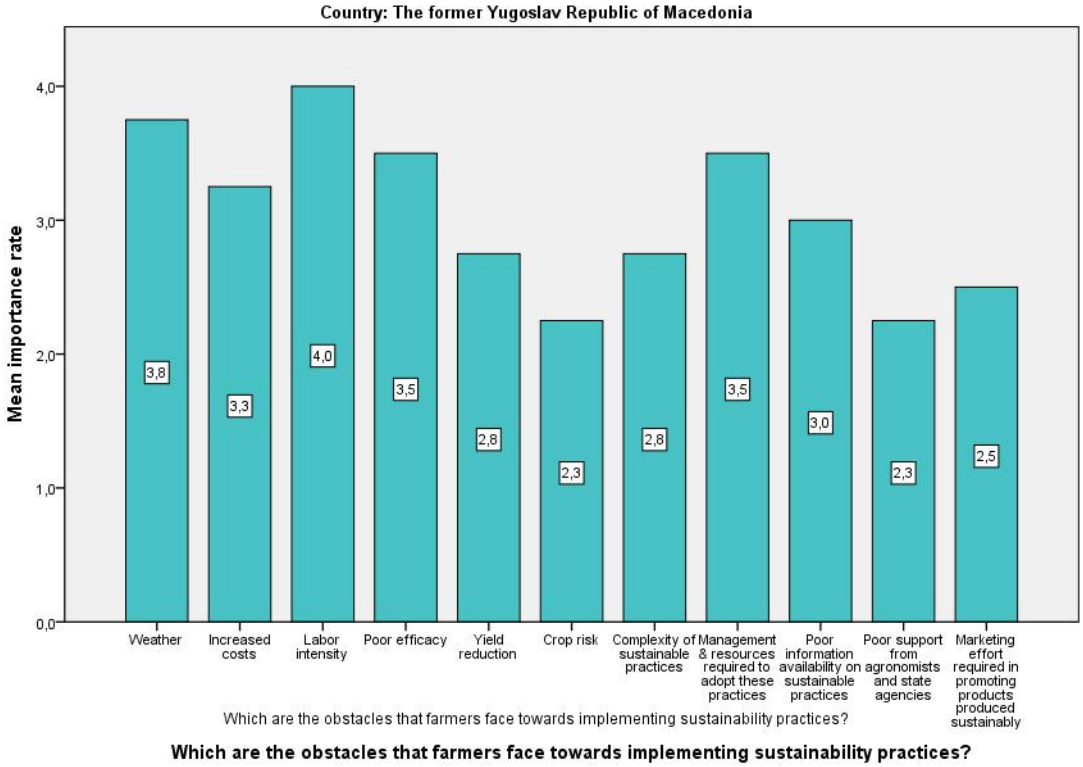


Figure 48 Policy makers' obstacles faced towards implementing sustainability practices

Here **(Fig. 48)** policy makers were asked to rate using grades from 1-5, about the obstacles that farmers face towards implementing sustainability practices and they ordered the following factors of importance:

- Labor intensity
- Weather
- Poor efficacy
- Management and resources required to adopt these practices
- Increased costs
- Poor information availability on sustainable practices
- Yield reduction
- Complexity of sustainable practices
- Marketing effort required in promoting products produced sustainably
- Corp risk
- Poor support from agronomists and state agencies

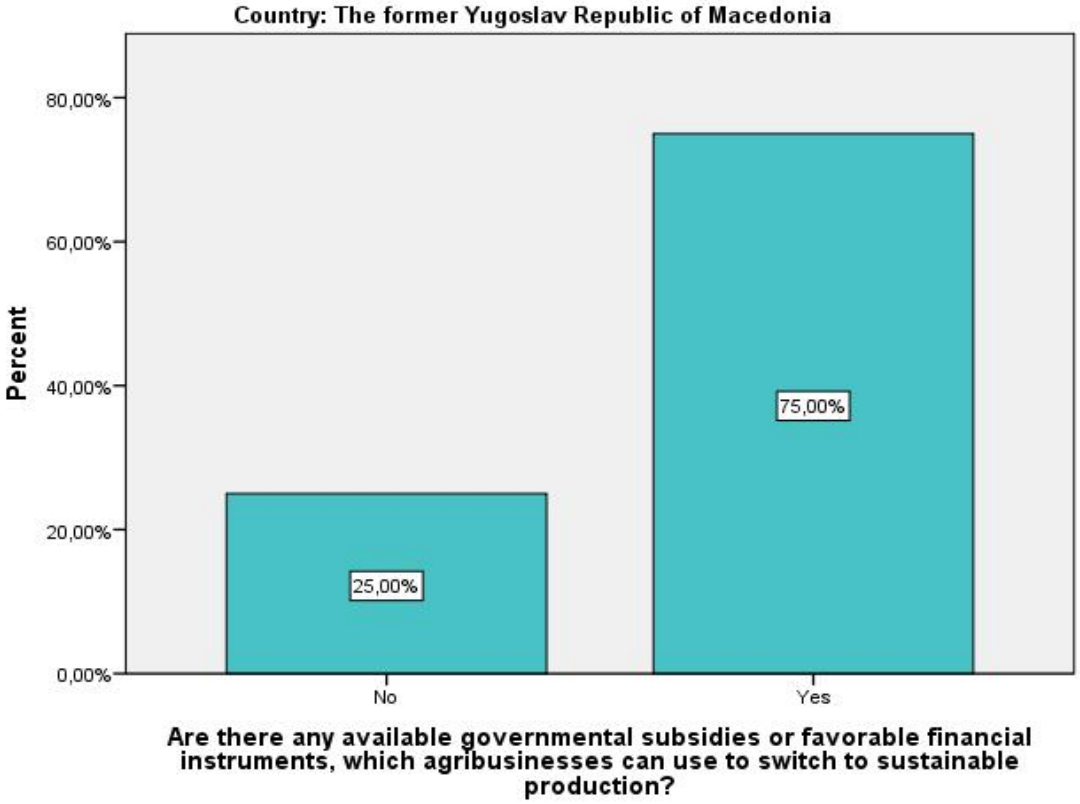


Figure 49 Policy makers' response if there are any available governmental subsidies or favorable financial instruments which agro-businesses can use to switch to sustainable production

About this question we can conclude that policy makers are more positive that there are available governmental subsidies or favorable financial instruments, which agribusiness can use to switch to sustainable production (75%), on the other hand only 25% does not think that **(Fig.49)**.

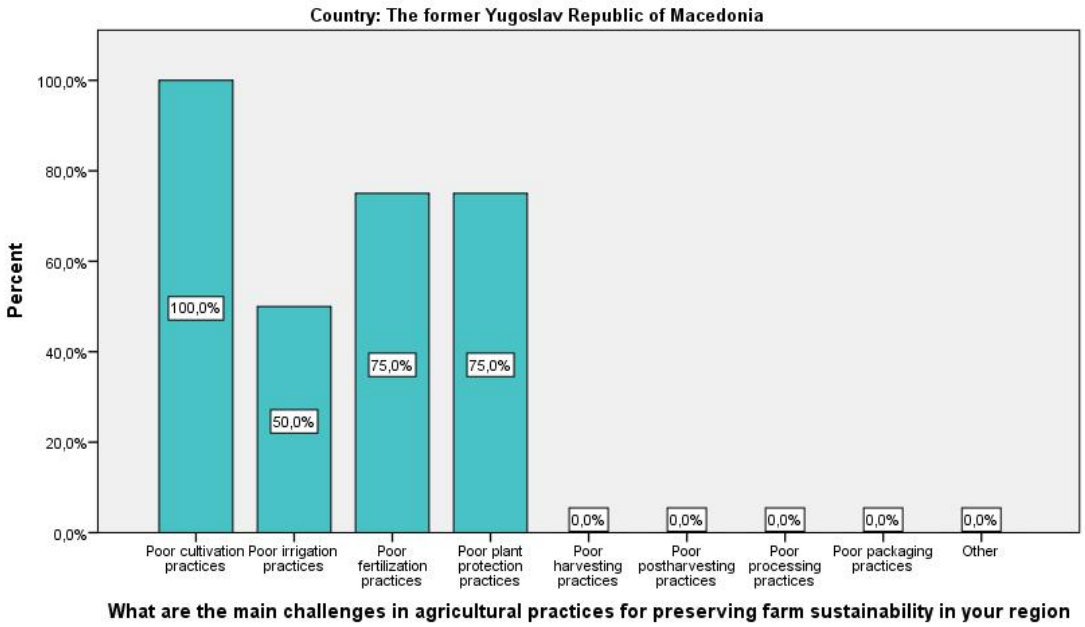


Figure 50 Policy makers' response to the main challenges faced in agricultural practices for preserving farm sustainability

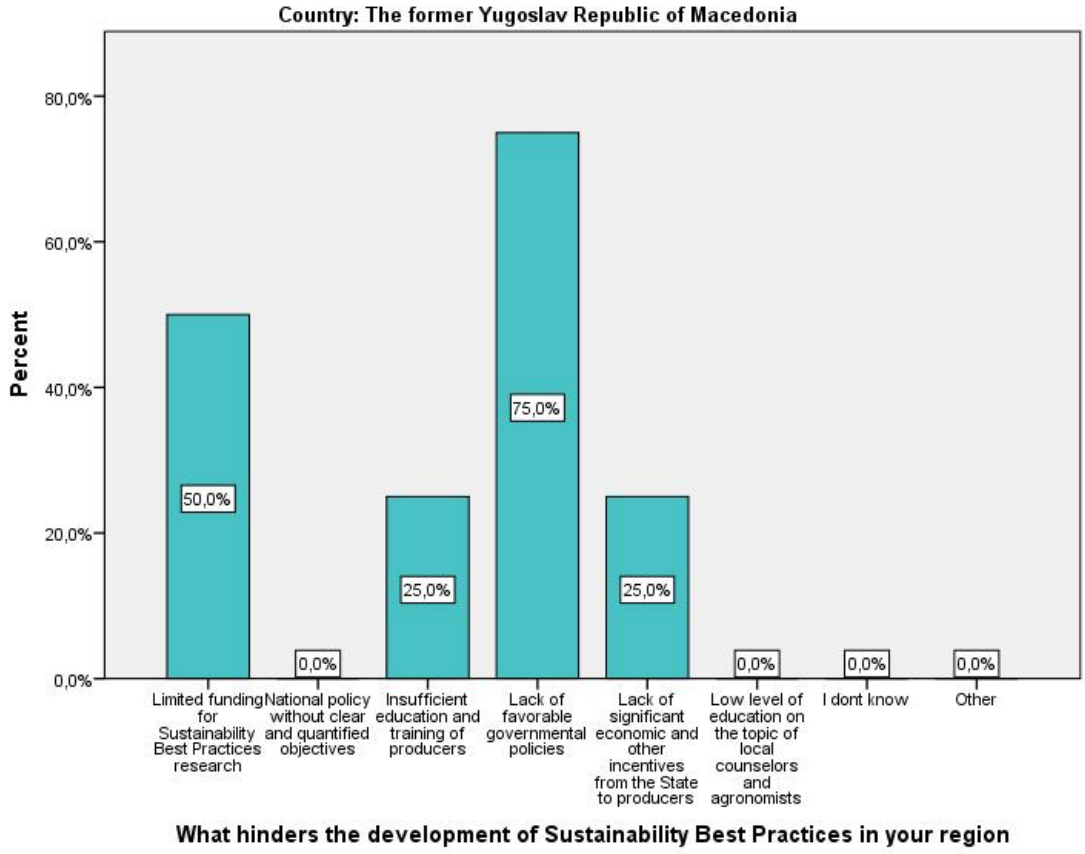


Figure 51 Policy makers' reply to reasons that hinder the development of Sustainability Best Practices in your region

The opinion of the policy makers about main challenges in agricultural practices for preserving farm sustainability in their region is the poor cultivation practices is the first challenge then poor fertilization practices and poor plant protection practices are demonstrated with 75%. And in the end with only 50% are the poor irrigation practices **(Fig.50)**.

(Fig. 51) For the question what hinders the development of Sustainability Best Practices the opinion of the policy makers are very precise with over 70% first in line is the lack of favorable governmental policies, after that with 50% are the limited funding for Sustainability Best Practices research and finally equal significance is given to Insufficient education and training of producers and the Lack of significant economic and other incentives from the State to producers.

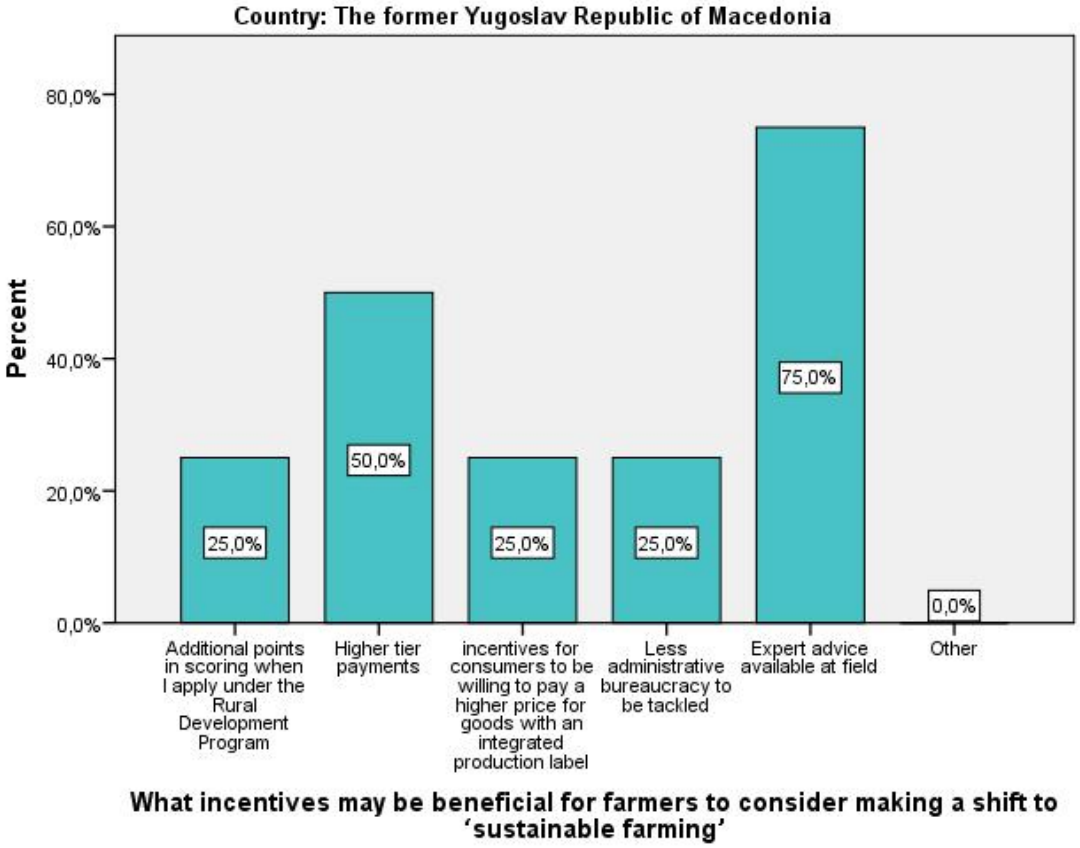


Figure 52 Farmers' incentives that may be beneficial to consider when making a shift to sustainable farming

As regard the incentives **(Fig. 52)** that interviewers consider beneficial in order farmers to shift to sustainable farming, most of policy makers think that that Expert advice available at field is the most important and beneficial (75%), in addition also beneficial incentives are : Higher tier payments (50%), Additional points in scoring when applying under the Rural Development Program (25%), incentives for consumers to be willing to pay a higher price for goods with an integrated production label (25%) and Less administrative bureaucracy to be tackled.

4 Conclusions

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 Balkan agricultural sector.

The first target group consisted of policy makers and regional authorities such as leaders and heads of local authorities, representatives of the Ministries of Agriculture and Food, decision makers, state agencies and other stakeholders while the second target group was composed of managers/head of farmers cooperatives/agronomists as persons/links between the government and the farmers.

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 in the agricultural sector. The main findings and gaps as regard sustainability best practices and their current and future adoption by the agricultural sector are:

- ✓ The educational level of farmers and people who own different types of agribusinesses raised compared to the past. Although secondary education level dominates and higher but none of them has post graduate education. Knowing or be familiar with ICT is also positive.

- ✓ Main characteristic of the agricultural sector are small holdings, family businesses and enterprises employing small number of employees.

- ✓ The weakness regard this is reflected by orientation to the products mainly to local markets and only small number of them export their products (12,5%) due limited entry to European and International markets. This is also owed to the absence of treacability of the conventional products that blocks their entry to European and international markets.

- ✓ We can conclude that our surveys only 50 % of them have awareness regard, environmental issues, as for example climate change, impacts of agriculture and circular economy. Meanwhile, there is room for significant improvement, considering also that our interviewers receives information and knowledge mainly from the internet.

- ✓ Enormous problem seems to be the limited training of farmers and the policy makers; 56,25% of them declared that they were never trained on sustainable farming, while none of the policy makers that have been participants in our survey never received training in sustainable farming. Seminars could be an effective mean for the first steps of their education, however, training at field by experts could provide them specific skills and the capability to apply best practices by a correct and effective way, as they declared during the survey, as well.

- ✓ Maybe half of the farmers (50%) appears willing to adopt sustainable practices at the near furture, as for example reuse of water, use of green energy, reuse of organic waste, however the majority of the interviewees (approximately 75%) are not aware of the existence of know-how, available at their native language.
  This will prevent them from familiarization and implementation, this can be due, on the one hand, to their own inconsistency in information discovery, and on the other hand, to ineffective actions of policy makers which prevent diffusion of information and available means to the interested stakeholders.

- ✓ Knowledge and implementation of national and European laws and regulations have dividated answers, with many of the interviewees of to declare themselves as non-informed and not in line with the legislative framework while there is other group of them that is informed and follow their laws and regulations. Therefore, and in relation to the previous conclusion regarding education necessity, education and training on the national and European legal framework must be included in policy makers' future plans.

- ✓ A positive background towards treacebility is the fact that the majority of farmers/enterprises (62,50%) keep or plan to keep in the near future records of yield, inputs, outputs, costs, etc. This fact has to be exploited by the policy makers by developing and implementing the appropriate measures and means in order farmers/enterprises to understand the necessity of developing business plans for the long viability of their farms/enterprises, which will further boost local and national economies through the well being and growth of the enterprises.

- ✓ The biggest challenge for the farmers in improving the production and marketing of the products is due the high costs more than 50% of the participants said that. Also 75% of the farmers say that there is not any available governmental subsides or favorable financial instruments, which agribusinesses can exploit to switch to sustainable production and orient high value products to the market, while 75% of the policy makers said that there is.

- ✓ The opinion of the policy makers about main challenges in agricultural practices for preserving farm sustainability in their region is the poor cultivation practices is the first challenge then poor fertilization practices and poor plant protection practices are demonstrated with 75%. And in the end with only 50% are the poor irrigation practices also poor practices currently implemented for cultivation, irrigation, plant protection and fertilization were prioritized as challenges for preserving sustainability by the farmers too.

- ✓ About the main obstacle that farmers face towards implementing sustainability the both groups said that - Labor intensity is the first than are: Weather, Poor efficacy, Management and resources required to adopt these practices, Increased costs, Poor information availability on sustainable practices, Yield reduction, Complexity of sustainable practices, Marketing effort required in promoting products produced sustainably, Corp risk, Poor support from agronomists and state agencies

- ✓ A discouraging finding, that requires measures for its reversal, is that the majority of the farmers believe that there is currently no favorable environment to stimulate adoption of more sustainable production practices (43,75%), in contrast to the belief of policy makers (50%).

- ✓ Factors defined by both groups that hinder the implementation of sustainability best practices, 50% of the farmers gave clear answer that limited funding hinders the development of Sustainability Best Practices in their region. Other answers that were provided are :
  - National policy without clear and quantified objectives
  - Lack of significant economic and other incentives from the State to producers
  - Lack of favorable governmental polices
  - Low level of education on the topic of local counselors and agronomists
  - Insufficient education and training of producers

- ✓ According to farmers, significant incentives that could boost shift to sustainable farming could be: higher tier payments, experts advice at field and bureaucracy limitation.

- ✓ Positive is that as regard the incentives that interviewers consider beneficial in order farmers to shift to sustainable farming, most of policy makers think that that Expert advice available at field is the most important and beneficial (75%), in addition also beneficial incentives are : Higher tier payments (50%), Additional points in scoring when applying under the Rural Development Program (25%), incentives for consumers to be willing to pay a higher price for goods with an integrated production label (25%) and Less administrative bureaucracy to be tackled.

All in all main things that is important and beneficial for developing sustainable management strategies for the agricultural sector are:

- There is an urgent need for education/training of farmers/enterprises/policy makers, which should be designed to cover the needs of the farmers/agribusiness. Indicatively, the educational design could include:

a. Seminars and theoretical training on sustainability best practices and issues related to the economical development of the FYROM farms/enterprises

b. training at fields

c. education on legislative issues and ways of implementation

d. programs for the improvement of already existed knowledge, skills and capabilities of farmers (e.g. composting, reuse of water, recycling of waste/wastewater, etc)

e. education on general environmental issues, as for example circular economy, climate change and mitigation/adaptation, which will increase farmers environmental awareness, boost mentality change and all the problems that is known but not familiar for the farmers and by that make them to act as responsible citizens.

Current misunderstandings about sustainable agriculture strategies needs to be explained trough seminars, educational and practical seminars. Education and training should not be limited only to technical and practical issues, but cover also other subjects, related to sustainable agriculture, as for example market opportunities, economic benefits, risk for cultivation and yield, contiguency plans, income insurance, etc.

Significant proportion of policy makers (100%) have not received training on sustainable agriculture and also that a very large proportion of producers are not aware of the availability of financial support instruments, the establishment of intermediate well-informed and trained bodies, agencies, departments (preferably with a local or regional character), will be of significant importance to communicate with national and regional policies on the adoption of sustainable practices in FYROM effectively. Targeted actions to inform producers/agribusinesses and communicate support measures and funding instruments should be designed and implemented by these services.

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Methodology

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