Interreg
EUROPEAN UNION
Balkan-Mediterranean
BalkanRoad

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

PROJECT DELIVERABLE

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Extended Summary

The present report provides the findings of an in-depth GAP analysis, conducted in the context of the INTERREG BalkanROAD project, to define and evaluate the gaps for adoption of sustainable agricultural and products processing practices in Cyprus. 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 (TG-1) was composed of managers/heads of farmers cooperatives/agronomists as persons/links between the government and the farmers. Part of the first target group were also individual farmers/producers of different agricultural products. The second target group (TG-2) consisted of policy makers 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.

After the completion of the literature review, an e-survey took place between March and May 2018. In total, 12 farmers and 5 policy makers from Cyprus participated in the survey by filling in the respective e-questionnaires.

The main findings of this survey indicate that the human workforce of the agriculture sector in Cyprus is gradually aging, and thus, it comes as no surprise that Cypriot farmers lack familiarity with new and emerging technologies, especially ICTs, which has a negative impact on them keeping up to date with new trends, practices, laws and regulations, etc. They do not seem to fully comprehend the concepts of sustainable practices and circular economy, thus fail to understand the benefits of adopting and implementing sustainability best practices.

Finally, farmers in Cyprus consider the lack of knowledge on the subject of sustainability far more important than climate change, weather and the lack of subsidies, a strong indication for the urgent need for education/training of farmers/enterprises, which should be designed to cover the needs of TG-1 by a holistic way, through dissemination mechanisms that would help the transfer of knowledge from the policy makers' level to the farmers' level.

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**.

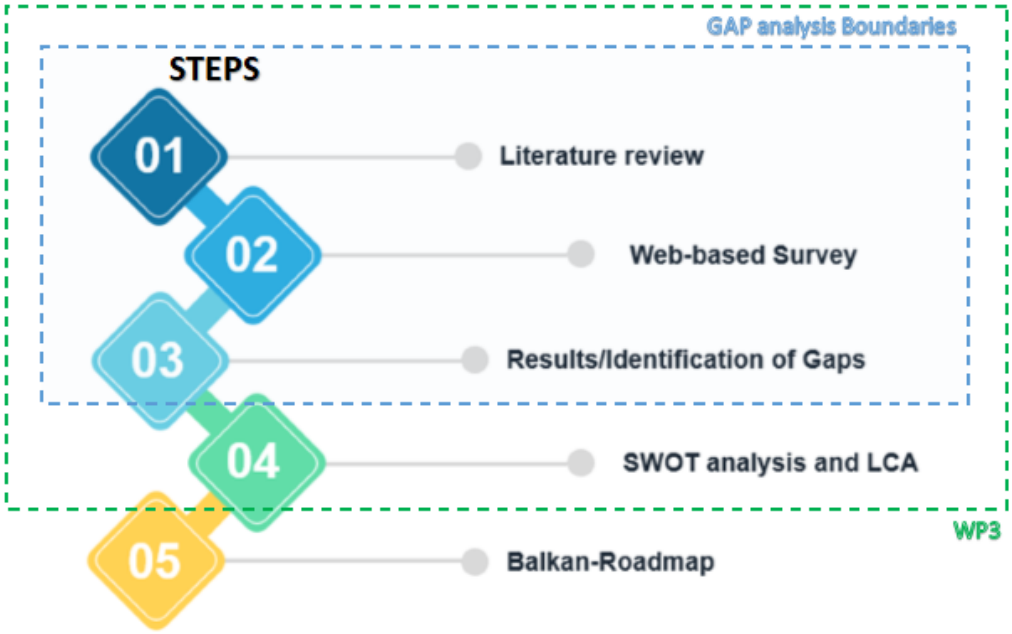


Figure 1. Methodological steps of GAP analysis adopted in BalkanROAD.

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.

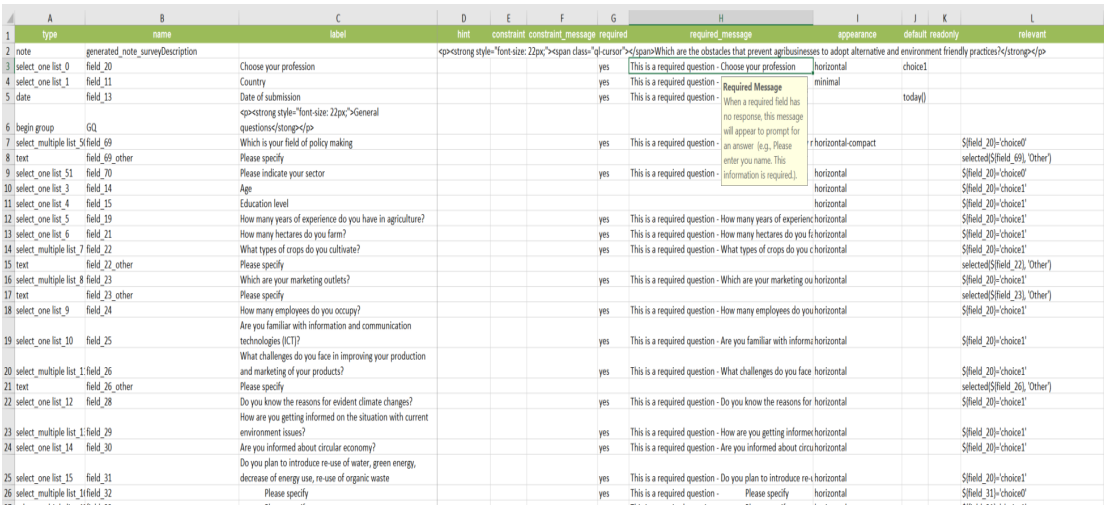
In this context, a variety of web- and hard copy-based resources were examined, including academic sources, peer-reviewed journal articles along with publications of central and provisional governments and related organizations. As a result, a substantial bibliography was compiled, focusing on Balkan-based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

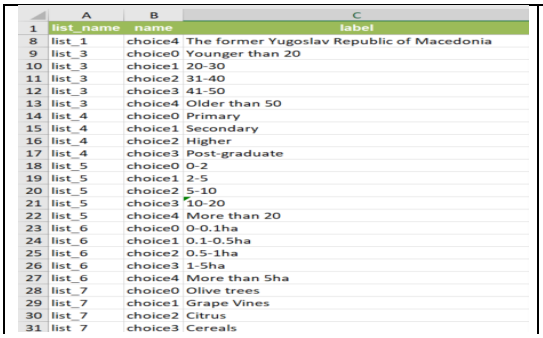
The GAP analysis survey questions and answers organized in proper form in order to develop a web-based application using XLS Forms and Survey123 for ArcGIS, hosted in BPI's ArcGIS online for Organizations. The questions divided in those which are addressed to policy makers and those to producers and 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.

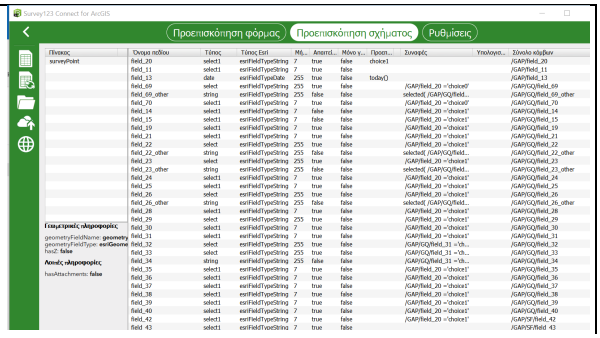


Figure 4. GAP analysis survey XLSForm predefined values.

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

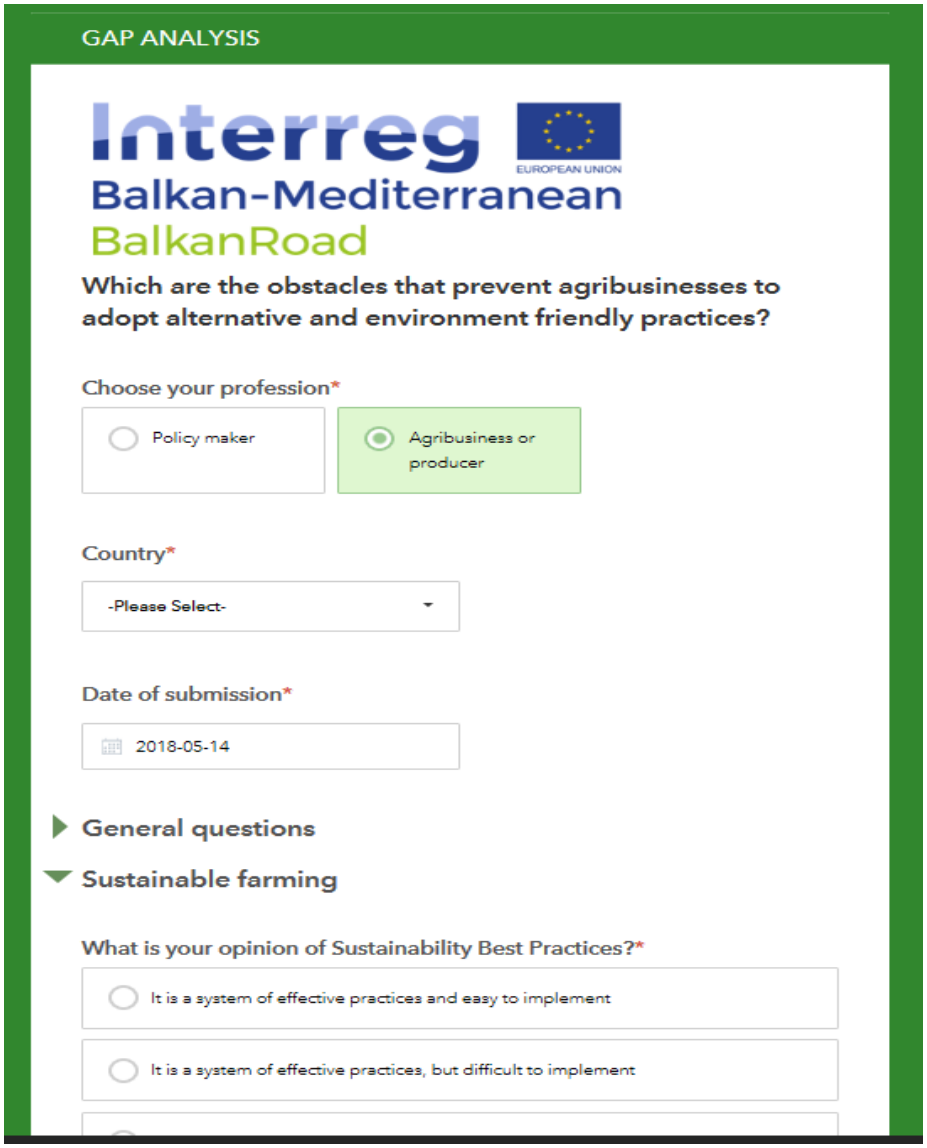


Figure 5. GAP Analysis survey App.

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).

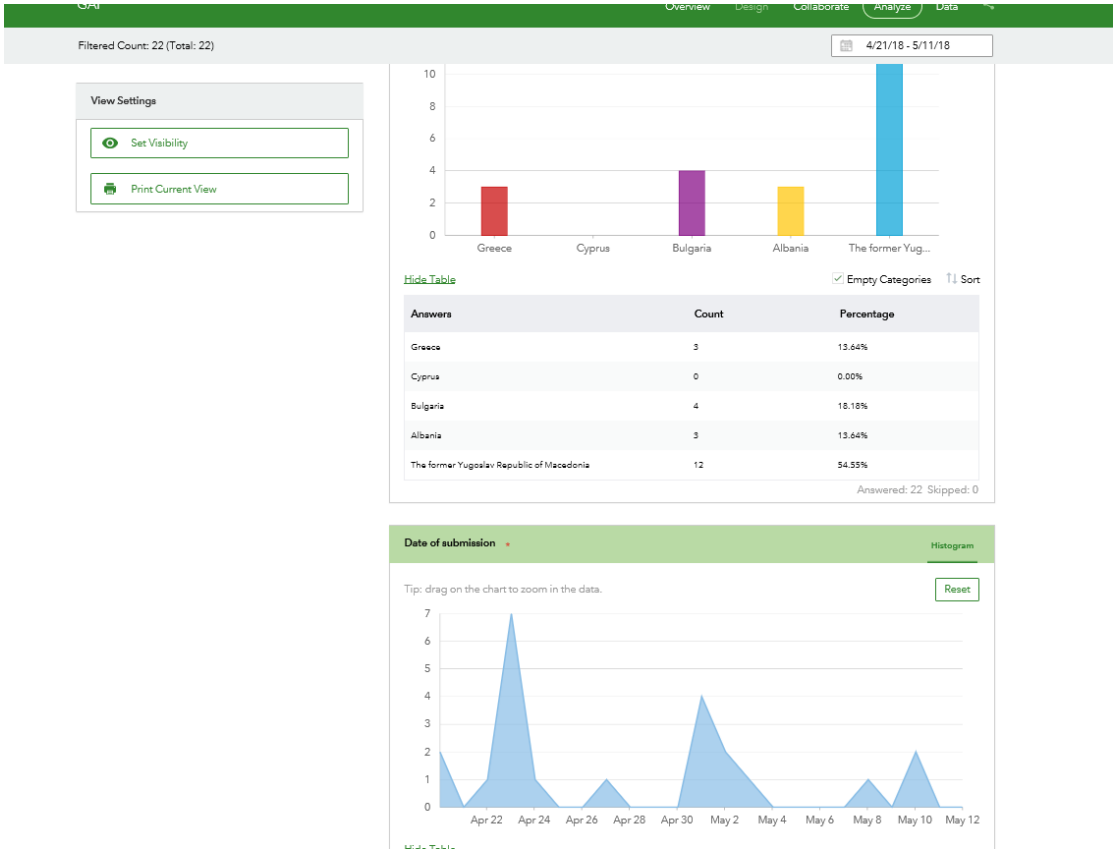


Figure 6. GAP analysis data analysis on web

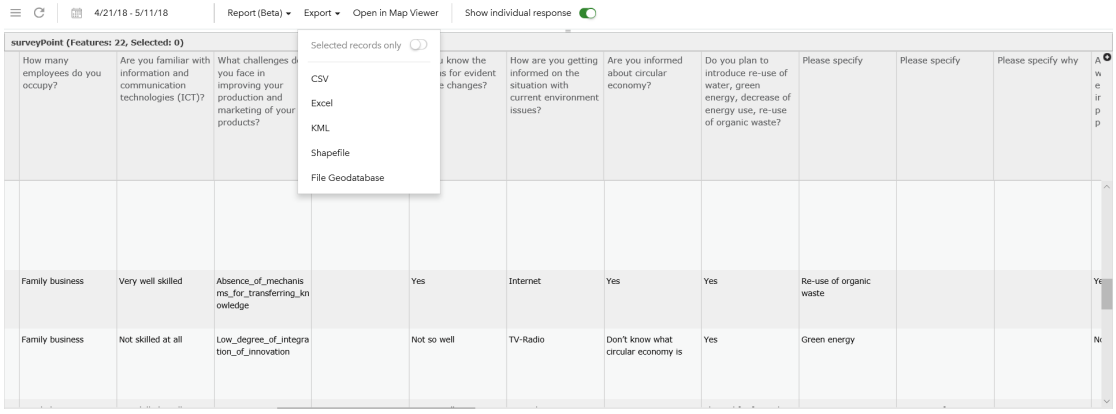


Figure 7. GAP analysis data export.

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 Cyprus

Cyprus is an island country situated in the eastern Mediterranean, with an estimated population of nine hundred forty seven thousands (947.000) inhabitants, based on the latest population demographic report of 2016, published by the national statistical service in 2017 (Cystat, 2016). With an average latitude of 35° North and longitude of 33° East, it is considered to currently being the eastern point of the European Union. The fact that Cyprus is surrounded by water, the Mediterranean Sea, due to its nature as an island, plays a major part in the country's climate conditions.

Figure 8. The eastern Mediterranean Region

Cyprus covers a total area of 9,254 square kilometres and can be divided in four physical areas, due to the geo-morphological characteristics of its ground (Cyprus Meteorological Service, 2018). These, given by the Cyprus Meteorological Service, are (see Figure 9):

- The Troodos mountain range, which is situated in centre-west part of the island, and has a top of 1,951 meters above sea level called Olympos Mountain top.
- The Pentadaktylos mountain range, a relatively long and narrow range spreading along the northern coast of the island, with a top of approximately 1,000 meters.
- The plain of Measoria, which is situated between the Troodos and Pentadaktylos mountain ranges and has a low altitude, not surpassing 180 meters above sea level.
- The plains and valleys, which are spread along the coast line.

Based on the above mentioned morphology, Cyprus is divided into four climatic zones (as can be seen in Figure 10):

- Coastal climatic zone
- Inland climatic zone.
- Semi-mountainous climatic zone.
- Mountainous climatic zone.

Figure 9. Morphological Map of Cyprus

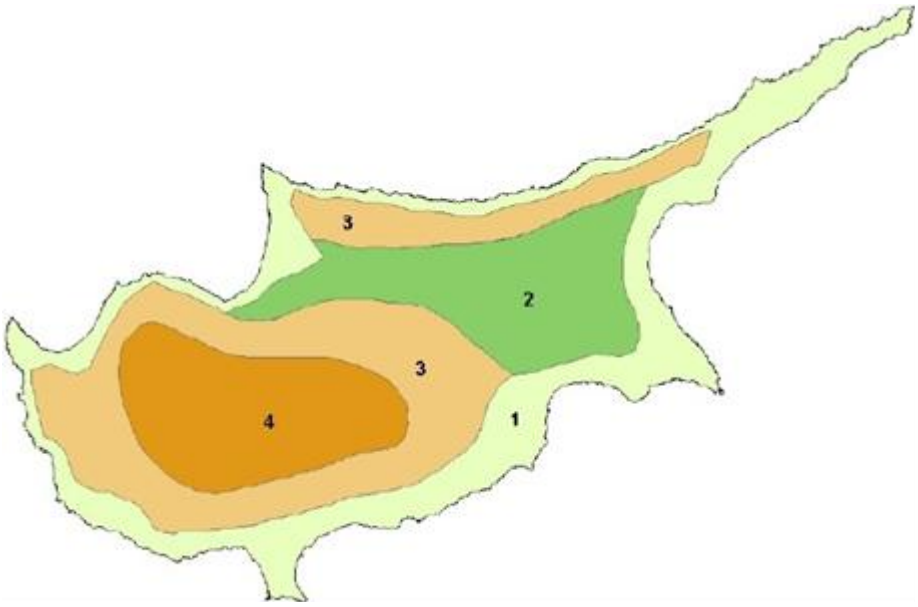


Figure 10. Climatic Zones of Cyprus (1 - coastal zone, 2 - inland zone, 3 - semi-mountainous zone, 4 - mountainous zone).

Cyprus has an intense Mediterranean climate, or according to Köppen climate classification (see Figure 11.) a Subtropical (Csa) climate and partly a Semi-Arid (Bsh) type climate (to the north-eastern part of the island). The main characteristics of Cyprus' Mediterranean climate are the hot and dry summer from mid-May until mid-September, the mild but rainy winter from mid-November until mid-March and the transitional seasons (spring and autumn) in between.

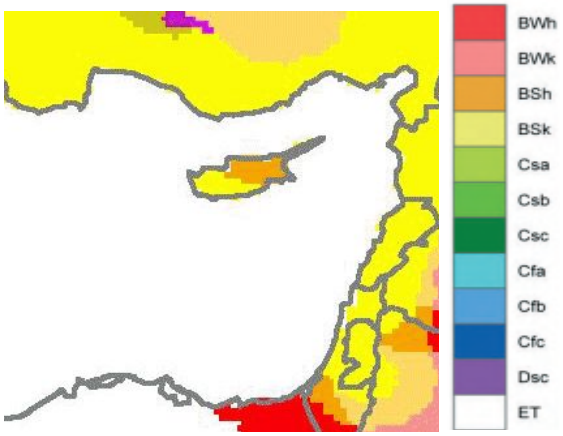


Figure 11. Köppen climate classification map of Cyprus

During summertime, Cyprus, and the eastern Mediterranean region in general, are under the influence of a seasonal shallow trough of low pressure extending from the great continental depression, centred in southwest Asia. This results in high temperatures and clear sky. Precipitation during this period is pretty low and usually amounts lower than 5% of the mean annual total. In winter Cyprus is near the track of fairly frequent small depressions which cross the Mediterranean Sea from west to east between the continental anticyclone of Eurasia and the generally low pressure belt of North Africa. These depressions give periods of disturbed weather usually lasting from one to three days and produce most of the annual precipitation, the average fall from December to February being about 60% of the annual total.

The central Troodos massif and, to a less extent, the long narrow Kyrenia mountain range, Pentadaktylos, play an important role in the meteorology of Cyprus and the climatic differences observed in different parts of the island. The predominantly clear skies and high sunshine amounts give large seasonal and daily differences between temperatures of the sea and the interior of the island which also cause considerable local effects especially near the coasts.

The seasonal difference between mid-summer and mid-winter temperatures is quite large at 18°C inland and about 14°C on the coasts. Differences between day maximum and night minimum temperatures are also quite large, especially inland in summer. These differences are in winter 8 to 10°C on the lowlands and 5 to 6°C on the mountains, increasing in summer to 16°C on the central plain and 9 to 12°C elsewhere.

In July and August the mean daily temperature ranges between near 30°C on the central plain and 23°C on the Troodos mountains, while the average maximum temperature for these months ranges between 37°C and 28°C respectively. Even though the average high temperatures are not so bad for summertime, there are quite a few days during July and August where temperatures can reach really high values. In these extreme heat-wave conditions, temperatures can reach as high as more than 45°C inland and as much as 40°C along the coast. In the mountain regions, conditions are much better under these circumstances.

In January the mean daily temperature is around 10°C on the central plain and 3°C on the higher parts of Troodos mountains with an average minimum temperature near 5°C and almost 0°C respectively. These values increase slightly in the coast line with an average daily mean temperature of about 12.5°C and an average daily low temperature of 8°C. Despite the relatively mild winter conditions, temperature may drop several degrees Celsius below

zero in the mountains for a substantial number of days during winter and for quite a few days in the inland region. Along the cost, near 0°C temperatures are very rare, with minimum temperatures of around 2-3°C being observed during the coldest winter nights.

The average annual total precipitation increases up the south-western windward slopes from 450 mm to nearly 1,100 mm at the top of the central mountainous regions. On the leeward slopes amounts decrease steadily northwards and eastwards to between 300 and 350 mm in the central plain of Mesaoria and the flat south-eastern parts of the island. The narrow ridge of the Kyrenia/Pentadaktylos range, stretching 100 miles from west to east along the extreme north of the island, produces a relatively small increase of rainfall to nearly 550 mm along its ridge at about 1,000 m. Rainfall in the warmer months contributes little or nothing to water resources and agriculture. The small amounts which fall are rapidly absorbed by the very dry soil and soon evaporated in high temperatures and low humidity.

Autumn and winter rainfall, on which agriculture and water supply generally depend, is somewhat variable. The average rainfall for the year as a whole is about 480 mm but it was as low as 182 mm in 1972/73 and as high as 759 mm in 1968/69 (the average rainfall refers to the island as a whole and covers the period 1951-1980). Statistical analysis of rainfall in Cyprus reveals a decreasing trend of rainfall amounts in the last 30 years.

Snow occurs rarely in the lowlands and on the Kyrenia/Pentadaktyos range but falls frequently every winter on ground above 1,000 m usually occurring by the first week in December and ending by mid-April. Although snow cover is not continuous during the coldest months, it may lie to considerable depths for several weeks especially on the northern slopes of high Troodos mountain range.

Another important aspect of the climate in Cyprus is relative humidity. Elevation above mean sea level and distance from the coast has considerable effects on the relative humidity which to a large extent are a reflection of temperature differences. Humidity may be described as average or slightly low at 65 to 95% during winter days and at night throughout the year. Near midday in summer it is very low with values on the central plain usually a little over 30% and occasionally as low as 15%. However, along the south coast line due to the prevailing south-west winds, there are quite a few days during summertime where relative humidity values can reach as high as 90% or slightly more, especially during evening hours. These high values of relative humidity affect to a great extent thermal comfort conditions inside buildings and severely increase cooling load demand.

Over the eastern Mediterranean generally surface winds are mostly westerly or south-westerly in winter and north-westerly or northerly in summer. Usually of light or moderate strength, they rarely reach gale force. Over the island of Cyprus however winds are quite variable in direction with orography and local heating effects playing a large part in determination of local wind direction and strength. Differences of temperature between sea and land, built up daily in predominant periods of clear skies in summer, cause considerable sea and land breezes. Whilst these are most marked near the coasts they regularly penetrate far inland in summer reaching the capital, Nicosia, and often bringing a welcome reduction of temperature and also an increase in humidity. As a matter of fact, these breezes come from a south-west to west direction during evening to early morning hours during summer time. This is exploited mainly for thermal comfort conditions of residential houses. As a result, most bedrooms have a southwest orientation and large window openings facing west direction. This provides a sense of light breeze and cooler conditions during summer nights.

Gales are infrequent over Cyprus but may occur especially on exposed coasts with winter depressions. Small whirlwinds are common in summer appearing mostly near midday as

"dust devils" on the hot dry central plain. Very rarely vortices, approaching a diameter of 100 m or so and with the characteristics of water spouts at sea and of small tornadoes on land, occur in a thundery type of weather. Localized damage caused by these has been reported on a few occasions but in general Cyprus suffers relatively little wind damage.

As far as sunshine is concerned, all parts of Cyprus enjoy a very sunny climate compared with most countries. In the central plain and eastern lowlands the average number of hours of bright sunshine for the whole year is 75% of the time that the sun is above the horizon. Over the whole summer six months there is an average of 11.5 hours of bright sunshine per day whilst in winter this is reduced only to 5.5 hours in the cloudiest months, December and January. Even on the high mountains the cloudiest winter months have an average of nearly 4 hours bright sunshine per day and in June and July the figure reaches 11 hours. In total, Cyprus receives an average of 3,300 to 3,500 hours of sunshine per year. This is about double that of cities in the northern half of Europe (for example London has 1,461 hours). However, in winter there can be more than four times more sunshine (for example London has 37 hours while coastal locations in Cyprus have around 180 hours of sunshine in December, that is, as much as in May in London).

Finally, seasonal change in mean soil temperatures is from about 10 °C in January to 33 °C in July at 10 centimetres depth and from 14 °C to 28 °C at one metre. On the mountains at 1,000 metres above sea level these mean seasonal values are lowered by about 5 °C. Even in the highest areas penetration of frost into the ground is insufficient to cause problems. Absorption of large amounts of solar energy during the day and high radiation losses in clear skies at night cause a wide daily range of soil temperatures in summer. At the soil surface the daily variation on a typical July day in the lowlands is between 15 °C near dawn to near 60 °C in middle of the afternoon. At only 5 centimetres depth the variation is reduced to between 24 and 42 °C and at 50 centimetres depth there is no daily temperature change (Cyprus Meteorological Service, 2018).

3.1 Statistical data for agricultural production

Cultivation types, important cultivations from economical point of view, areas of cultivation, farmers profile, existence of associations and their role in the sector-the economy and the society, problems, weak and strong points, new trends in agriculture, etc

Based on agricultural statistics published by the Cyprus National Statistical Service, the total cultivated land in Cyprus for the year 2015 amounted to 108,680 (one hundred and eight thousand six hundred eighty) hectares. Nearly 70% of cultivated land is used for growing grains and plantations destined for livestock food. Around 7% of the land is used for cultivation of potatoes and vegetables and the rest 23% is used mainly for growing fruits, vines, nuts, olives and carobs (Cystat, 2017).

In 2010, according to the Census of Agriculture (2010) [4], there were 38.859 Agricultural Farms (AFs) showing a decreasing trend compared to 45.200 in 2003, while the average size of the AFs remained at three (3) hectares. It is noted that the total utilized agricultural area decreased by 24% compared to 2003. Additionally in 2010, 81% of the AFs had a size of less than 3 hectares which occupied 22% of the utilized agricultural land, while the remaining 19% of the AFs were larger than 3 hectares and occupied 78% of utilized agricultural land.

The aforementioned structural trend can be attributed to the change in the operational framework of the agricultural sector after Cyprus accession to the EU, which led to the reduction of protectionism, the abolition of price support, the decoupling of support from

production, the decrease of prices and subsidies, the increase of input costs, the opening of markets, which led the agricultural sector to operate in a highly competitive environment. Last but not least, factors such as frequent droughts and climate changes which have adverse effects, have been affecting severely the competitiveness of the agricultural sector (Cyprus Ministry of Agriculture Rural Development and Environment, 2015).

The Legal status of the agricultural holders is as follows: 38,394 out of 38,859 or 99% were operated by individuals, 406 by companies, 34 by Government and 25 by others. The percentage of private holdings had a marginal decrease to 98.8% in 2010 compared to 99% in 2003, whereas a marginal increase was recorded in the percentage of companies (1% in 2010 from 0,8% in 2003), while Public or Government remains stable at 0.1% (Cystat, 2014).

In terms of age structure, according to the 2010 Census, the average age of farmers is 59 years compared to 54 years in 2003. Age stratification remained relatively stable. Indicatively, 62% of workers in agriculture in 2010 are over 55 years of age compared to 49% in 2003 and only 3% are under 35 years of age.

This feature is also associated with one of the most basic structural problems that Cyprus Agriculture is facing, i.e. the very low percentage of farmers that have vocational education and training. In particular, the majority of farmers (94%) have only practical experience, 5% has some basic agricultural education, while only 0.4% has full agricultural education (Cyprus Ministry of Agriculture Rural Development and Environment, 2015).

The main government authority supervising all agriculture related activities is the Cyprus the Ministry of Agriculture, Rural Development and Environment, which is responsible to promote through an integrated coordination, the protection and sustainable management of the environment, natural resources, and the sustainable management of agricultural, livestock and fisheries production. The Ministry consists of 11 departments and is the competent authority for the Cyprus Agricultural Payments Organization (CAPO) and the Agricultural Insurance Organization (OGA). Table 2 summarizes the Departments, Services and Semi-Governmental Organizations that fall under the jurisdiction of the Ministry.

Table 2. Departments, Services and Semi-Governmental Organizations that fall under the jurisdiction of the Ministry of Agriculture, Rural Development and Environment

Departments, Services and Semi-Governmental Organizations	
A. Agriculture	C. **Environment**
1.Department of Agriculture	11.Department of Environment
2.Department of Veterinary Services	D. **Semi-Governmental Organisations**
3.Agricultural Research Institute	1.Agrigultural Insurance Organization
	2.Cyprus Agricultural Payments Organisation
4.Land Consolidation Department	
5.Department of Fisheries and Marine Research	
B. Natural resources	
6.Water Development Department	
7.Forestry Department	
8.Geological Survey Department	
9.Meteorological Service	

10.Mines Service

3.2 Economic data

The Cypriot economy, mainly from 2000 until today, is characterized by the growth of the tertiary sector (services) and shrinking of the other two sectors of the economy (primary and secondary). Indicatively, agriculture has remained steady in terms of size and contribution to the national GDP, contributing around 700 million euro annually for the past fifteen years. Nevertheless, as a percentage to the total GDP, it is constantly diminishing, as depicted in Figures 12 and 13 below (Cystat, 2017).

As a consequence, the workforce employed in the agriculture sector has followed a similar path. While people employed in the agriculture sector in 2000 amounted to just over thirty one thousand (31,000) or 9.4% of the total workforce, these have been reduced to nearly half, to fifteen thousand eight hundred or 3.8% of the total workforce in 2015 (Cystat, 2017).

A similar trend is observed in the agricultural income. Although it showed increasing trends over the period 2000-2002, with the accession of Cyprus to the EU in 2004 and the implementation of the Common Agricultural Policy (CAP) it started decreasing, with the decrease being particularly pronounced in recent years, especially in small agricultural farms. This outcome emerged mainly from the study "Impacts of the accession of Cyprus to the EU and the future dynamics of the Cypriot agricultural sector" (Ministry of Agriculture, Natural Resources and Environment, 2010) (Cyprus Ministry of Agriculture Rural Development and Environment, 2015).

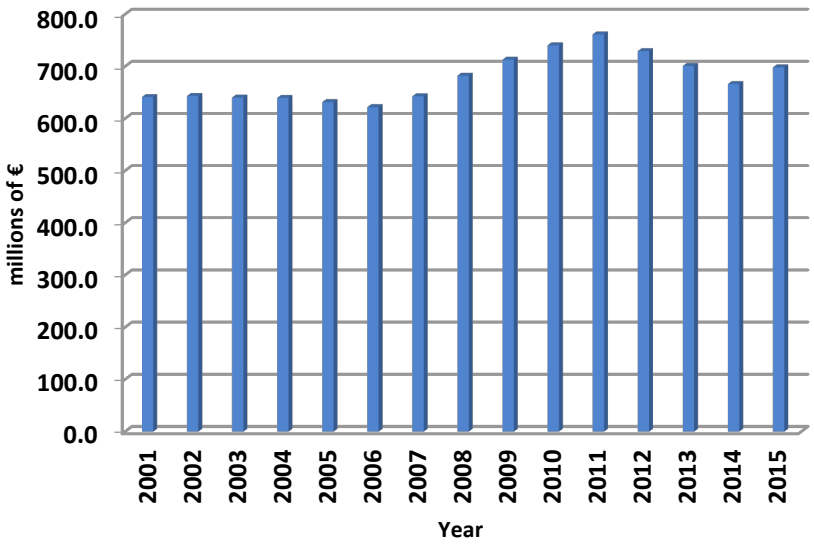


Figure 12. Agriculture contribution to Cyprus GDP per annum [3]

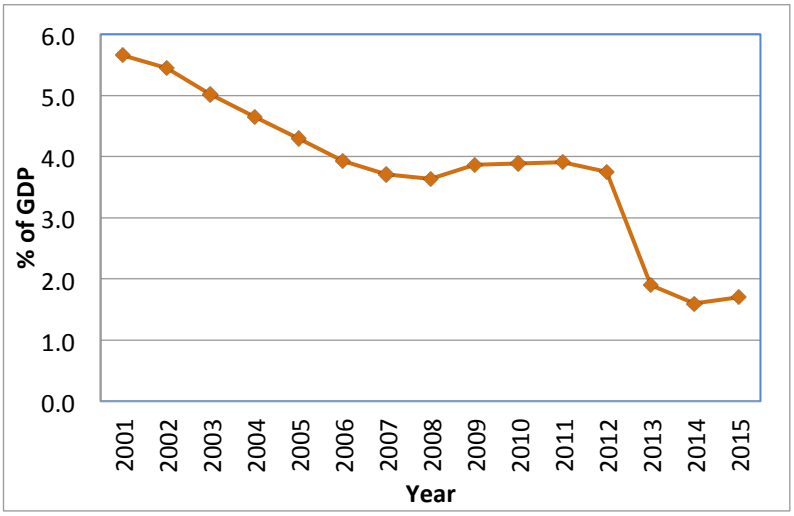


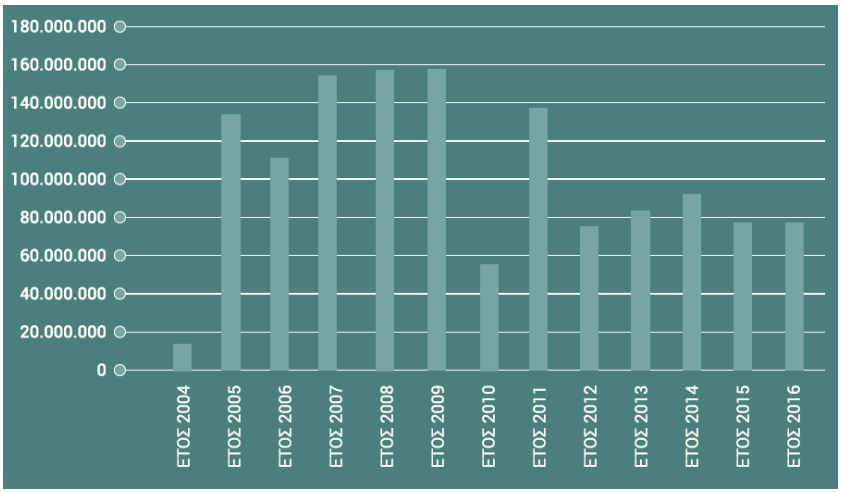
Figure 13. Agriculture % contribution to national GDP [3]

For the support and boost of the diminishing agriculture sector, there are mainly two non-governmental organizations, CAPO and OGA, which are responsible to channel funding to the active farmers.

CAPO, the Cyprus Agricultural Payments Organization, is an independent legal entity and it operates as an autonomous public organization based on its own legislation. The main responsibility of CAPO is the payment and the management of funds, which Cyprus is entitled to for the agricultural sector, after its entry to the European Union, as well as the management of all other aid granted from national funds to support farming and rural areas. In practice, CAPO implements the Common Agricultural Policy (CAP), through the payments it makes (Cyprus Agricultural Payments Organisation, 2018).

The main funding tool for farmers direct funding is the Single Area Payment Scheme. The following graphic shows the payments made through this scheme between 2004 and 2016. As indicated by the graphic the total funding from CAPO to farmers has stayed the same (around 75 million euro) for the years 2015-2016 but has significantly decreased compared to the years 2007-2009 were funding had reached over 150 million euro in payments.

Table 3. Payments made from CAPO to farmers through the Single Area Payment Scheme between 2004 and 2016.



According to CAPO's Annual Reports, the following payments, shown in Table 4, have been made regarding the Agricultural Development Measures between 1/7/2004 and 31/12/2016. In total, since its founding year, 1999, until today, CAPO has distributed to the local farmers total fundings amounting to approximately 1.5 billion euro.

Table 4. Payments made through the Agricultural Development Measures between 2004 and 2016.

Agricultural Development	**European Funds**	**State Funds**	**Total**
Agricultural Development Measures 2004-2006	73.150.039	93.348.106	166.498.145
Agricultural Development Measures 2007-2013	165.228.267	117.360.911	282.589.178
Agricultural Development Measures 2014-2020	14.284.189	12.494.180	26.778.369
Total Payments Agr. Development Measures	252.662.496	223.203.196	475.865.692
Percentages	53,10%	46,90%	

OGA, the Agricultural Insurance Organization, is supported by farmers through their income and in return they receive compensation in case of losses from insured natural risks for their insured agricultural production. According to the Statistics of OGA for years 1978-2011, the main natural reason for compensation was drought affecting mainly cereal cultivations. Whereas hail and frost was the second natural cause affecting mainly potatoes, deciduous trees and vines.

3.3 Climate change and Agriculture

During the 20th century remarkable variations and trends were observed in the climate of Cyprus, particularly in the two basic climatic parameters, precipitation and temperature. Similar climatic variations and trends were observed in countries of the eastern Mediterranean and the Middle East, which is an evidence of change in the general circulation of the atmosphere in the area (Cyprus Meteorological Service, 2018).

In Cyprus the precipitation presented a decreasing trend and the temperature presented an increasing trend. The rates of change of precipitation and temperature are greater during the second half of the century compared to those in the first half of the century. In the last decades the number of years of low precipitation and drought is greater than before and the semi – arid conditions both in Cyprus and in the eastern Mediterranean were deteriorated. Also, the most of the warm years in the century were observed in the last 20 years (Cyprus Meteorological Service, 2018).

The decrease in the amount of precipitation was remarkable. On the other hand, the average annual temperature in Cyprus, both in urban and in rural areas, presented an increasing trend. It is estimated that by 2030 Precipitation will decrease by 10-15% and

Temperature will increase by 1.0-1.5°C compared to the normal values of the period 1961-1990 (Cyprus Meteorological Service, 2018). It must be noted that according to the greenhouse gas emissions inventory reports, the total emissions in Cyprus have increased by 52% during the period 1990-2012, while since 2008 an average annual reduction of 3% has been observed (Cyprus Ministry of Agriculture Rural Development and Environment, 2015).

Furthermore, the impacts of climate change are expected to be particularly severe for Cyprus, where climate change is already evident, given the rising average temperatures and decreasing average annual rainfall observed over the last 100 years. The impacts of climate change will not only persist, but will intensify over the coming decades (Cyprus Ministry of Agriculture Rural Development and Environment, 2015).

As a result of the above, Cyprus faces the challenge of developing its economy in a way as to minimize the emissions of greenhouse gases, and at the same time adopt and implement those measures and actions appropriate to enable adaptation to climate change. Moreover, given that a substantial share of the greenhouse gas emissions in Cyprus comprises fluorinated greenhouse gases, emphasizes the need for the full and proper implementation of the legal framework for their reduction and / or recovery (Cyprus Ministry of Agriculture Rural Development and Environment, 2015).

3.4 Sustainable Agriculture

As mentioned earlier, it is estimated that agriculture alone (without counting forests) exploits about 109,000 hectares of land (23% of the total area of Cyprus controlled by the Republic of Cyprus). The way in which agriculture is practiced in these areas has both positive and negative effects on the environment. The farmer is no longer just a food producer, but also helps to prevent the degradation of territorial resources, to maintain the biodiversity, the protection and preservation of water resources, as well as the limitation of the effects of climate change through its farming practices (Cyprus Ministry of Agriculture Rural Development and Environment, 2015).

In relation to natural resources, soil provides services that are essential to human needs and the survival of ecosystems. However, the soil as a non-renewable resource is under degradation, which will be intensified if no action is taken. For the protection of soil, the Republic of Cyprus has adopted in 2002 the Law of Use of sludge in agriculture. Due to the climate change and the over pumping of groundwater aquifers have undergone qualitative and quantitative degradation. Furthermore, nitrate pollution of groundwater and surface waters is a complex phenomenon which is mainly caused by the agricultural activities (Cyprus Ministry of Agriculture Rural Development and Environment, 2015).

The poor function of livestock holdings and the improper management of large volumes of livestock waste have resulted in environmental pollution of groundwater aquifers. Thus pursuant to the Decree for the cow-livestock units (Κ.Δ.Π 433/2006), the farmers have the obligation to build watertight platforms for storage of solid manure. Similarly the pig farmers are obliged to have the Waste Disposal Pigpens which process the wastes from swine breeding with mechanical separation (Κ.Δ.Π 737/2003) (Cyprus Ministry of Agriculture Rural Development and Environment, 2015).

The Common Agricultural Policy (CAP), gives particular emphasis on the sustainable management of natural resources and environmental protection by providing incentives for environmentally friendly farm practices. More specifically, these actions include systems of

crop rotation, Integrated Production Management and organic farming, which result in improvement of groundwater aquifers, improvement of the structure, chemical composition and soil fertility, preservation of biodiversity (Cyprus Ministry of Agriculture Rural Development and Environment, 2015) etc.

In addition, water scarcity is one of the most serious problems faced by Cyprus through the centuries. Droughts are very common and it is anticipated that climate change in the Mediterranean basin will lead to further reductions in annual and seasonal water availability (Cyprus Ministry of Agriculture Rural Development and Environment, 2015).

In view of these challenges, the need to develop and implement measures that aim at increasing water availability and water security is a priority. The objective is to satisfy the water demand for domestic, agricultural, industrial, environmental and other uses, to the maximum extent possible. In this context, in the past decades major construction water projects implemented for irrigation, water supply, environmental protection and other uses, such as dams, water treatment plants, pipelines, etc. The operation and preventive maintenance of these projects as well as the continuous upgrading and construction of new water development projects are essential.

Despite the implementation of these projects, the problem of water scarcity remains. In order to address this problem and improve the reliability of water sources for domestic and irrigation uses, the Water Development Department (WDD) promotes the optimum use of non-conventional water resources, such as desalination and recycling. The use of non-conventional water resources reduces the dependency of the water supply on the weather conditions, contributes to climate change adaptation and risk prevention and enhances the water balance. Desalination has augmented the domestic water supply and eliminated the dependency of the large urban, suburban and tourist centers on rainfall. The use of recycled water is expected to increase the supply of irrigation water and provides significant protection against droughts. Recycled water is a constant source of water since the quantities produced are based on water consumption while quantities of water, which would have otherwise been lost, are reclaimed.

Finally, it is necessary to evaluate the water balance and the optimum allocation of available water resources for all uses. The estimated annual water demand for the Government controlled areas is 252 million m^3 (irrigation 152, domestic 73.5, livestock 8.5, industrial 8 and green areas 10). The estimated 2011 water balance indicated a water deficit of 43 million m^3, which was covered by desalinated (32 million m^3) and recycled water (11 million m^3) (Cyprus Ministry of Agriculture Rural Development and Environment, 2015).

3.5 IT in Agriculture

As mentioned above, due to the high average of farmers which is 59 years and the very low percentage of farmers that have vocational education and training, cultivation practices are mainly based on experience gained through years in the field. Therefore, IT technologies are rarely applied in agriculture and are limited to weather forecasting mainly. Nevertheless, information systems can be found in the detailed monitoring of cows raised for milk production, where the genealogical characteristics of the animals are recorded and their full medical history and production data are monitored closely.

3.6 National targets for Agricultural Sector development

As seen in previous paragraphs, the agriculture sector in Cyprus faces serious challenges and threats, such as aging workforce, lack of knowledge of new methods and practices and heavy reliance on experience, lack of resources such as water or soil degradation, etc. In order to confront these challenges and support the agriculture sector, the Cyprus Ministry of Agriculture, Rural Development and Environment has put into place a national Strategic plan for the years 2014-2020, that is updated in constant intervals.

The main pillars that the national Strategic Plan is based on for the years 2016-2018 are the following two:

- Application of national and European funding and promotion schemes in the agriculture sector.
- Ensuring the sustainability of natural resources in the agriculture sector and promoting climate smart agriculture

In order to achieve this, specific actions have been proposed under each pillar. In order to support the struggling agriculture sector targeted funding schemes must be implemented distributing evenly national and European resources. In addition, the promotion of products of certified quality is considered a must. Products of protected geographical origin and protected designation origin, organically growth products and traditional products are considered of highly added value and can significantly contribute to the rebirth of the agriculture sector.

Furthermore, the government aims to the proper education and training of existing and potential new farmers in order for them to adapt to environmental changes and introduced new methods and best practices in sustainable agriculture. The organization of training seminars is proposed, providing advisory services to farmers by specialized government personnel, knowledge dissemination actions utilizing ICT technologies, etc. Finally, the establishment of “One stop shops for farmers” is proposed, where a farmer can obtain in one place all the, government permits, etc. needed for his occupation.

As far as the second pillar is concerned, specific targets are set for the promotion of climate smart agriculture. The ministry aims in monitoring and evaluating all funding schemes applied in agriculture in order to assess the most effective ones related to environmentally friendly best practices. Also, an action planned is proposed for the relocation of obtrusive installations and premises, restoration of fire destroyed areas and reactivation of affected farmers, combating rodents, etc.

4 Data Analysis and Discussion

The GAP syrvey was conducted between March and May 2018 and the target group was consisted of policy makers from agricultural and environmental sectors, as well as of managers/heads of farmers cooperatives/agronomists as persons/links between the government and the farmers and individual farmers/producers (see section 2.4: Target groups). The questions requested to be answered are seen in Table 1 in section 2.5.

In total, 12 farmers and 5 policy makers participated in Cyprus in the survey by filling in the respective e-questionnaires.

4.1 Description of the interviewees

4.1.1 Agribusiness and individual farmers

Concerning the managers/heads of farmers cooperatives and individual farmers, consisting the first target group (TG-1), as Figure 14 shows, 40% are older than 50 years old, 30% are between the age of 41 and 50 years old, 20% are between the age of 31 and 40 years old and only 10% are thirty years old or younger.

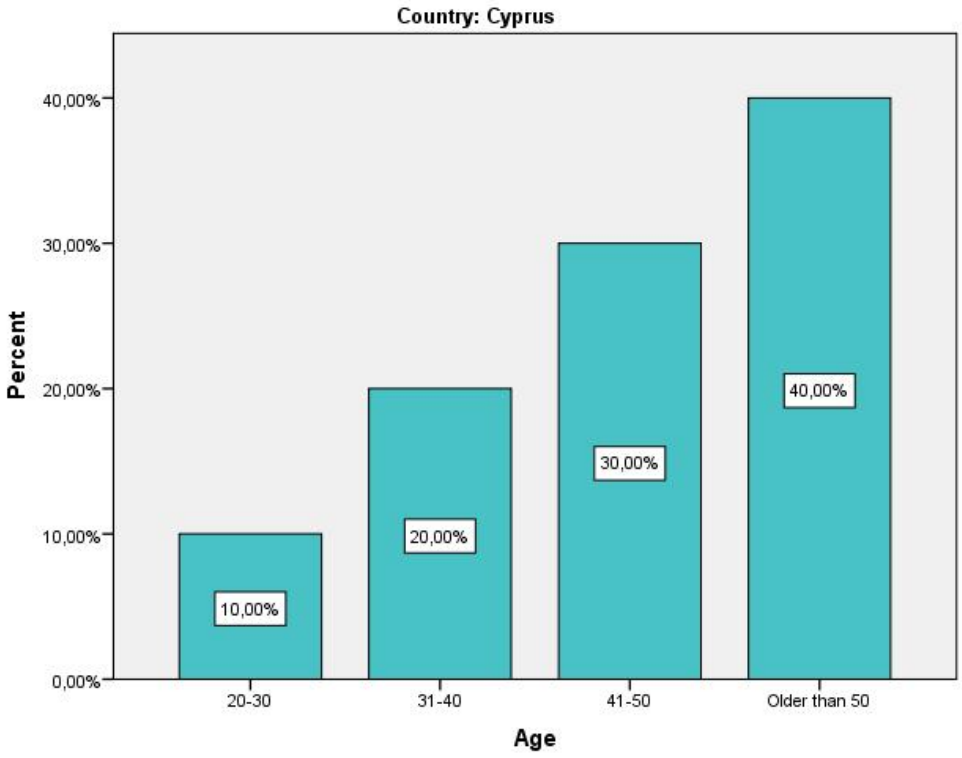


Figure 14. Age of the interviewees belonging to TG-1.

The vast majority of the participants received primary or secondary education with 30% and 60% shares respectively. Only a limited number of participants, amounting to 10%, have received higher education and no one has received post graduate education. These findings are depicted in Figure 15.

Taking into consideration the age groups of the participants and that 70% of them are older than 40 years old, it comes as no surprise that 80% of the participants have more than 20 years of experience in the fields, as shown in Figure 16. A 10% demonstrates an experience more than 10 years and the rest 10% has an experience in agriculture between 2 and 5 years. On the other hand, age seems to play no part in the cultivated land size per farmer. In general, almost all of the participants are small holders and, as illustrated in Figure 17, 40% of them utilize land plots smaller than 5 hectares while the rest 60% cultivates land plots greater than 5 hectares, but nevertheless not too big as available land is quite limited.

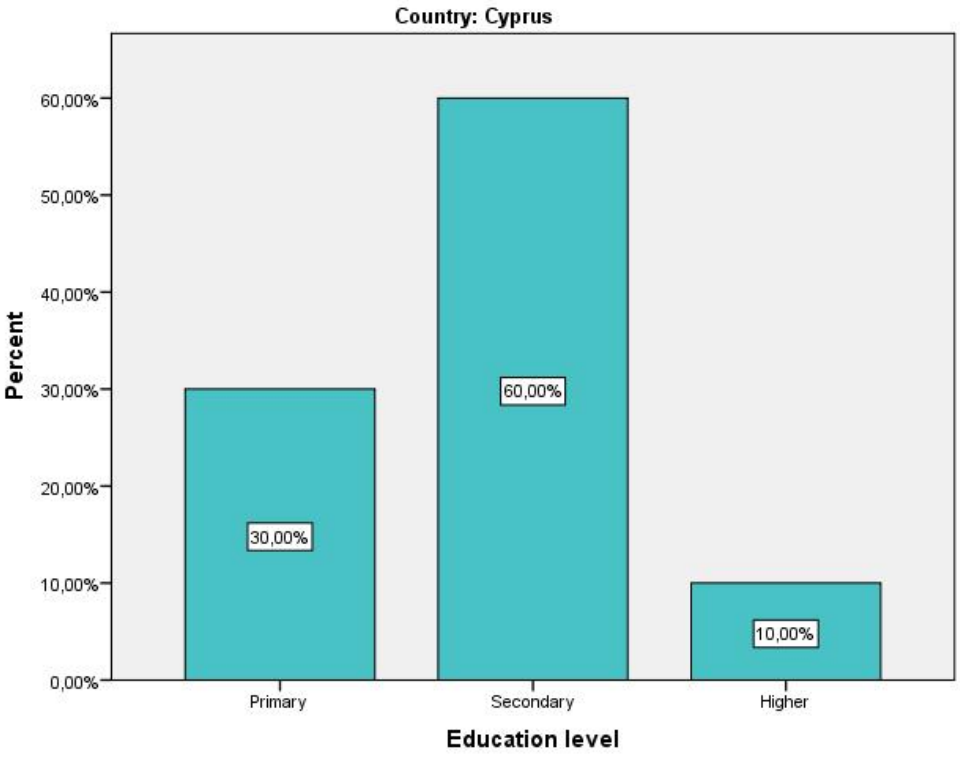


Figure 15. Education level of the interviewees belonging to TG-1.

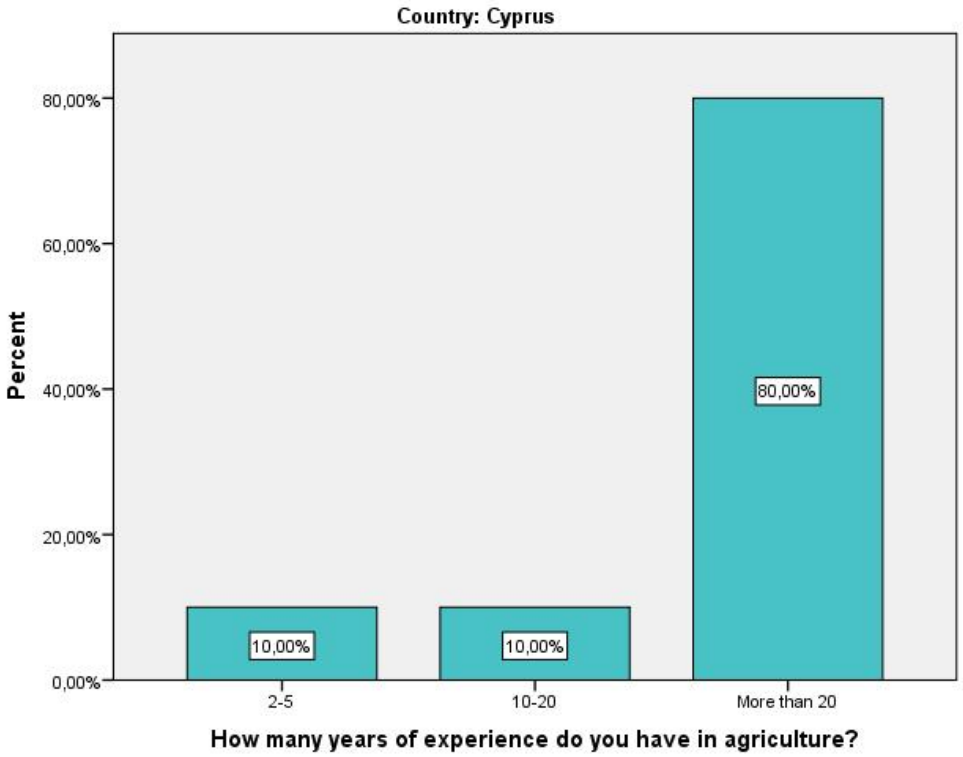


Figure 16. Years of experience in agriculture of the interviewees belonging to TG-1.

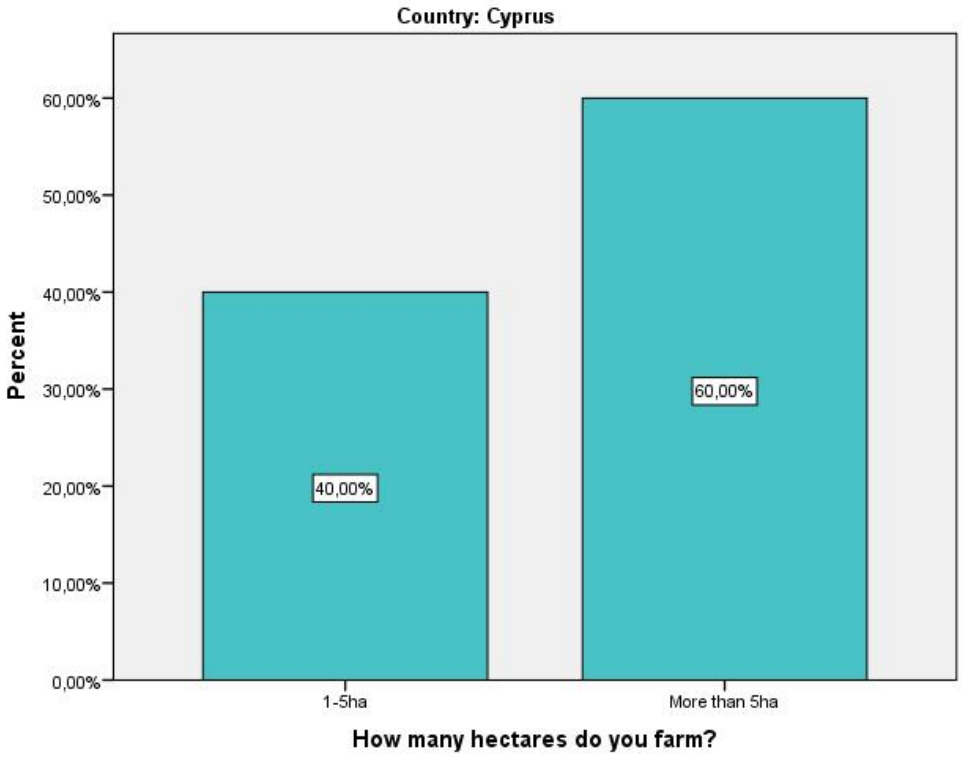


Figure 17. Hectares farmed by the interviewees belonging to TG-1.

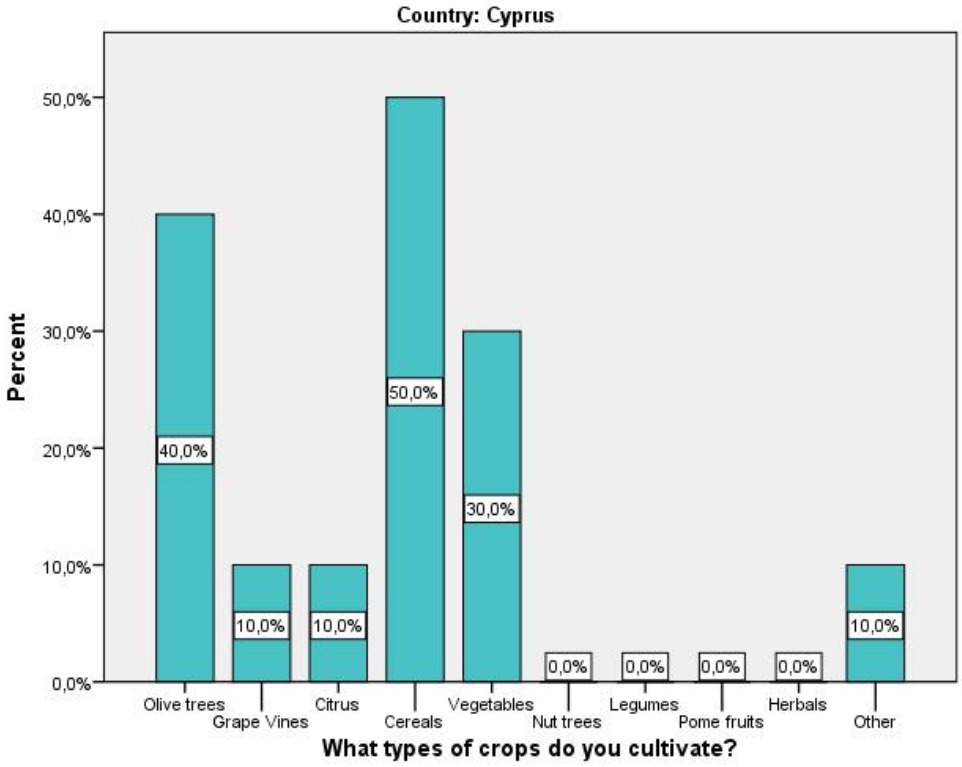


Figure 18. Cultivation types by the interviewees belonging to TG-1.

Cereals are the most popular cultivation (see Figure 18) amongst the participants in the current survey, with olive trees and vegetables following closely. Nevertheless, a small percentage state that they also cultivate grapevines, citrus and other type of crops.

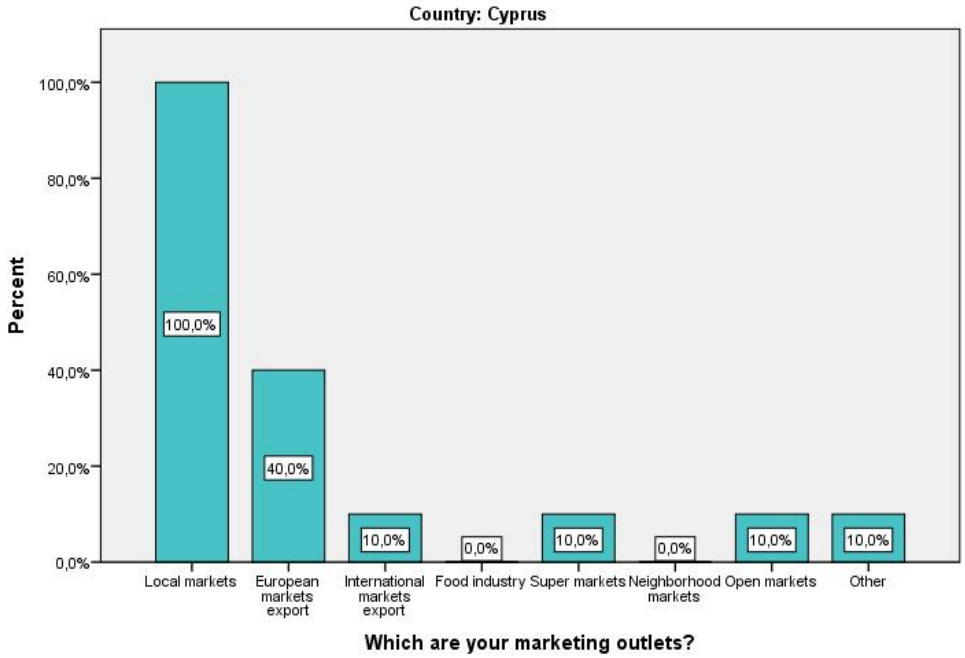


Figure 19. Marketing outlets used by the interviewees belonging to TG-1.

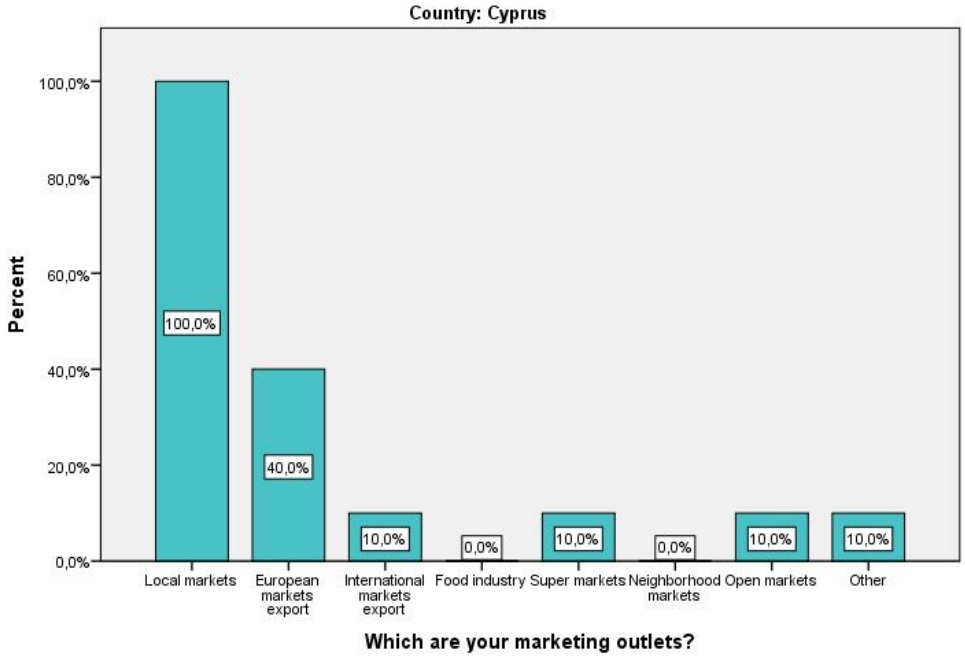


Figure 20. Employees occupied by farmers or agribusinesses.

As shown in Figure 19, all of the survey participants target the local market to promote and sell their products, others to a greater and others to a lesser extent. A significant number (40%) of the participants in TG-1 orient their products for exporting to EU markets while a smaller share (10%) of them have established cooperation with local supermarkets or promote their products in flea markets or other ways.

Figure 20 depicts one of the main characteristics of the Cyprus agriculture sector, which is that the main agribusiness model adopted is that of family business (50%), with the rest of the participants occupying up to 5 employees. This is mainly due to the limited size of cultivated farms, as shown in Figure 17.

4.1.2 Policy Makers

For the purpose of the survey conducted in Cyprus, 5 policy makers participated in total, filling out the distributed questionnaire. The policy makers participants all serve state owned (directly or indirectly) authorities or organizations (see Figure 21), with 2 of them serving in national authorities, 2 of them in regional authorities and the last one in a local municipality (see Figure 21). 60% of the participants stated the environment as their field of expertise, while the rest stated that they are experts in the agriculture sector, climate change and business environment and growth, as shown in Figure 22. Finally, Figures 23 and 24 show that 60% of policy makers participated in the survey received some form of training in sustainable farming systems, while the most interesting part is that this training was received through seminars or educational training but no one received practical training in the field.

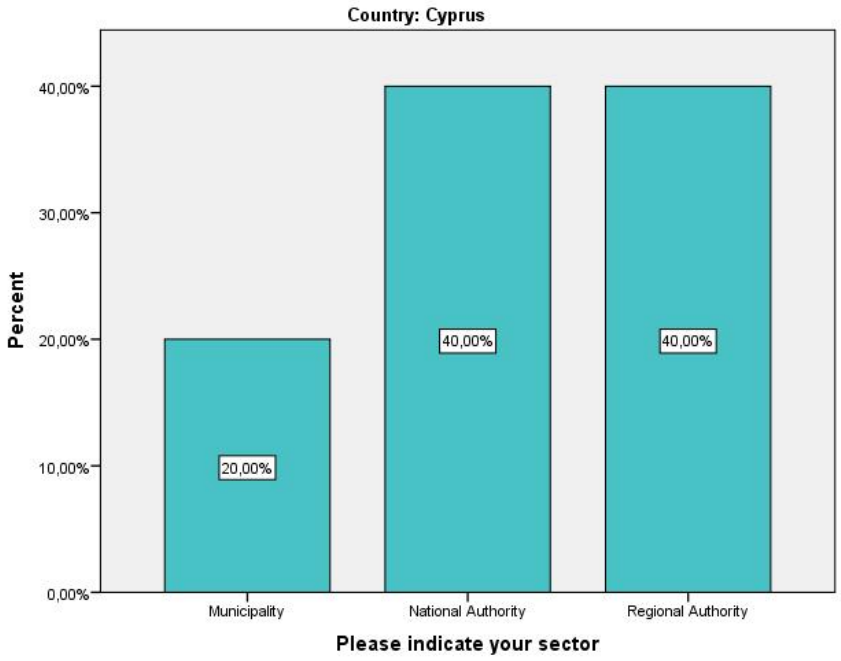


Figure 21. Sectors served by the policy makers (TG-2).

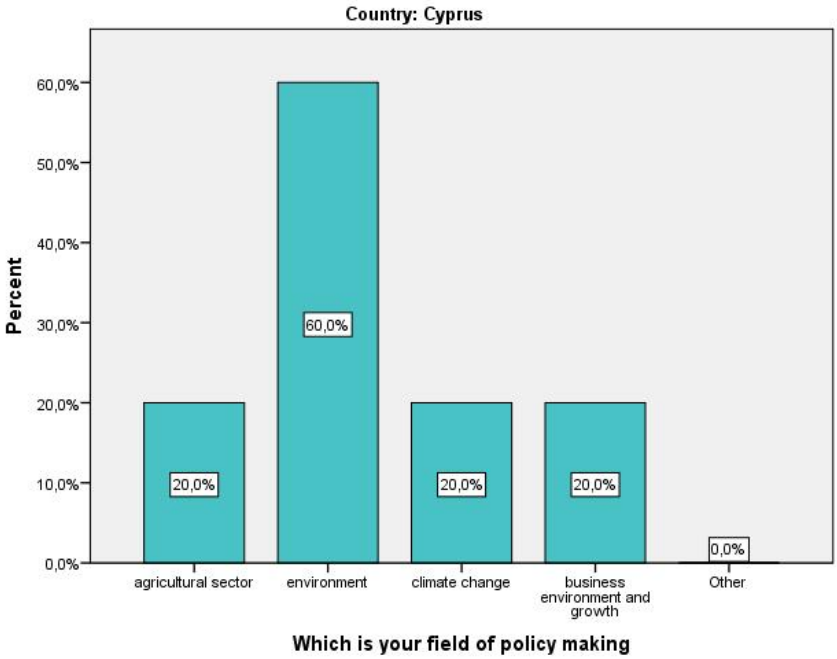


Figure 22. Scientific expertise of the policy makers (TG-2).

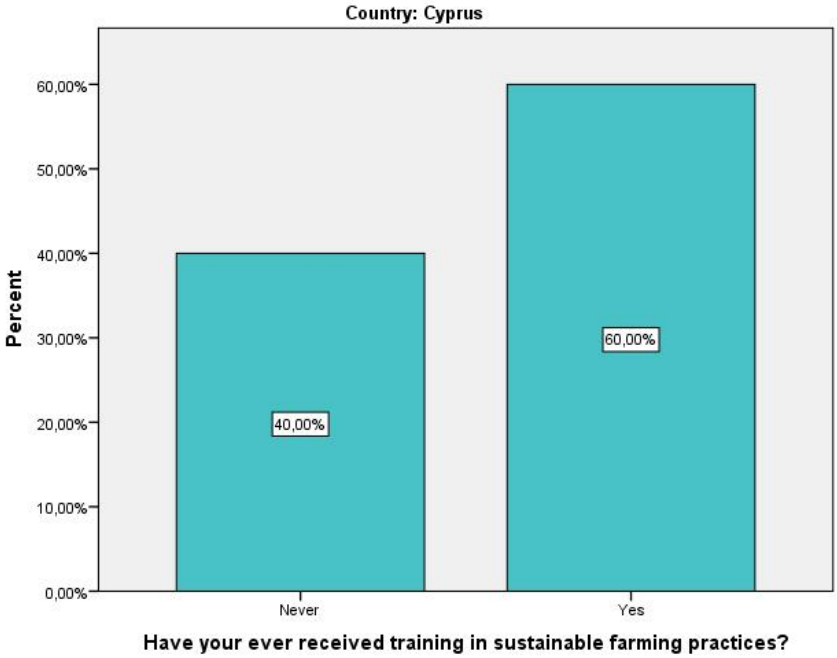


Figure 23. Participating policy makers that have received education/training in sustainable farming systems (TG-2).

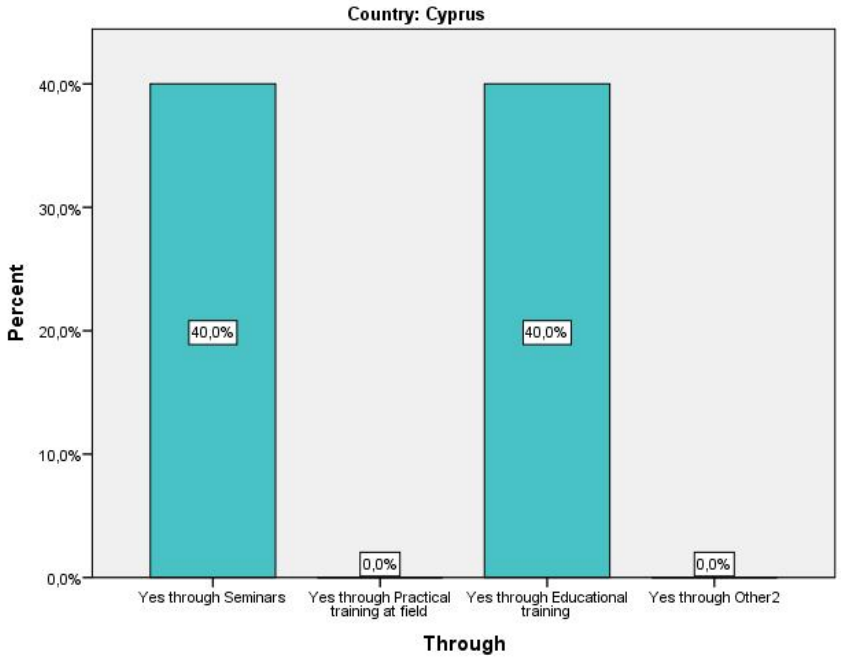


Figure 24. Means of education/training of participating policy makers (TG-2).

4.2 Analysis of the survey's results

4.2.1 Agribusiness and individual farmers (TG-1)

4.2.1.1 Environmental awareness, skills and training

In the current section the skills, training level and familiarity of the participants of TG-1 with global environmental issues are analyzed, e.g. climate change.

Figure 25 shows the answers of the interviewees of TG-1 regarding their familiarity with climate change. While it is encouraging that 80% of the participants are familiar with the term "climate change", since they have answered that they know the reasons for evident climate change or at least not so well (which indicates familiarity with the term "climate change"), the disappointment comes from the fact that 90% of the participating farmers are not at all or have limited knowledge for the reasons of climate change.

Furthermore, looking at Figure 26, regarding familiarity with circular economy, one is only discouraged. 80% of the survey participants classified in TG-1 stated their complete ignorance for circular economy while the rest 20% stated that they have limited knowledge regarding the matter.

In addition, Figure 27 illustrates that 80% of the farmers participating in the survey have limited or no knowledge regarding the environmental impact of currently practiced agricultural production. The above come as no surprise, since as seen in Figures 28 and 29, participating interviewees on TG-1 have received no training in regards to sustainable practices in agriculture.

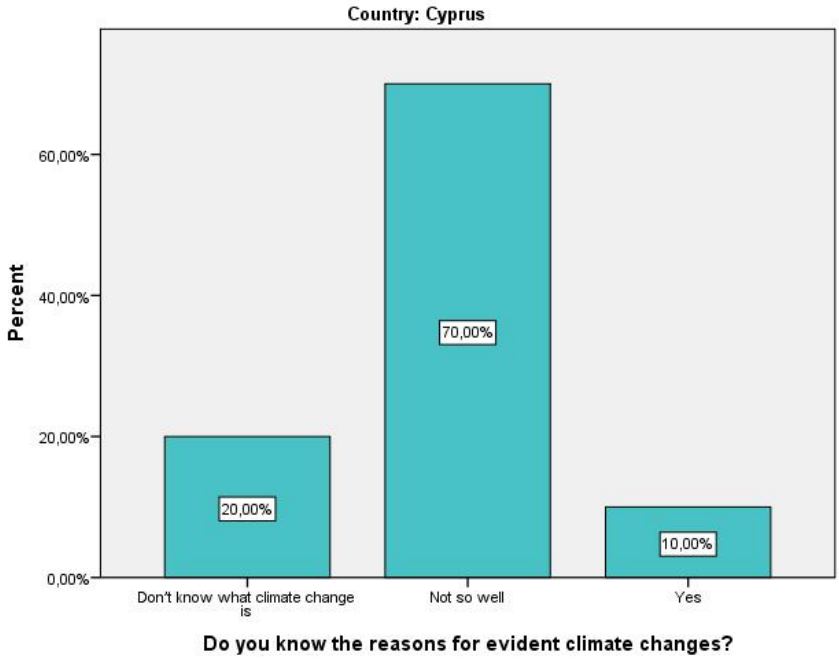


Figure 25. Familiarity of the interviewees of TG-1 with climate change.

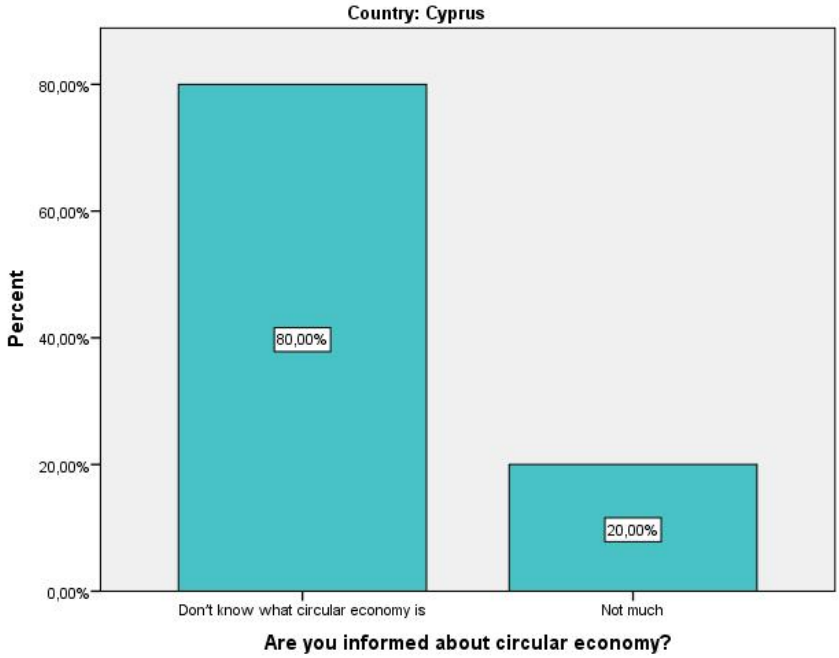


Figure 26. Familiarity of the interviewees of TG-1 with circular economy.

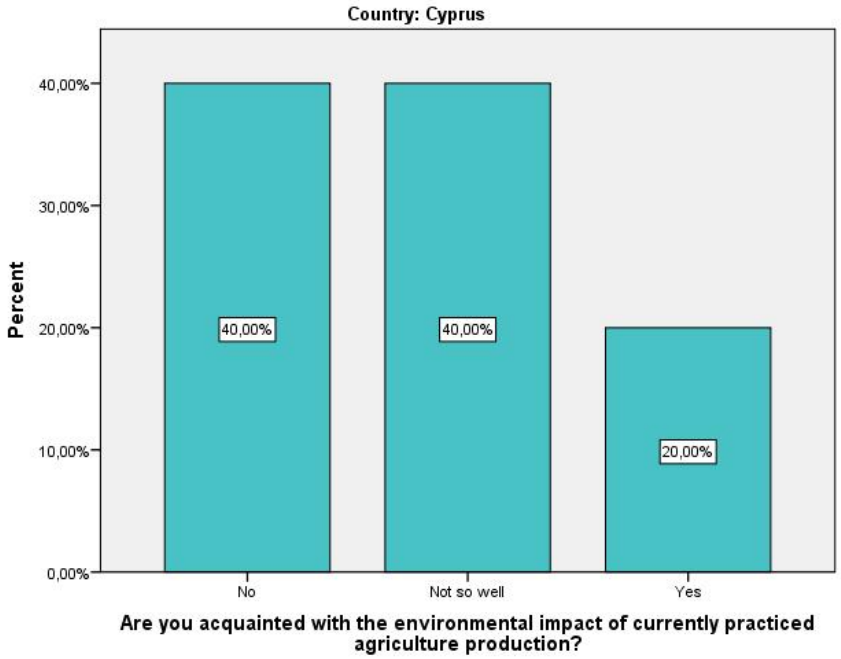


Figure 27. Familiarity of the interviewees of TG-1 with the environmental impact of currently practiced agricultural production.

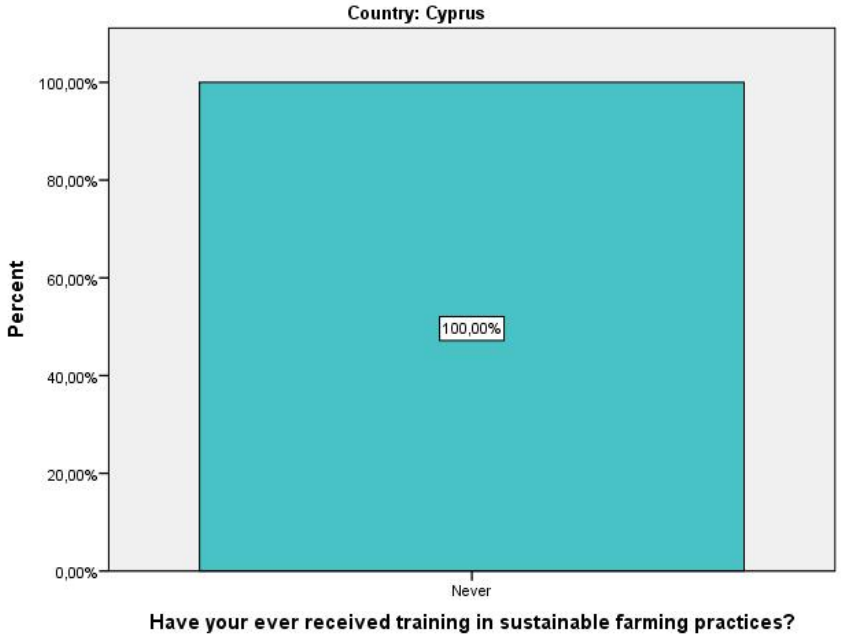


Figure 28. Answers of the interviewees about whether they have received training on sustainable practices.

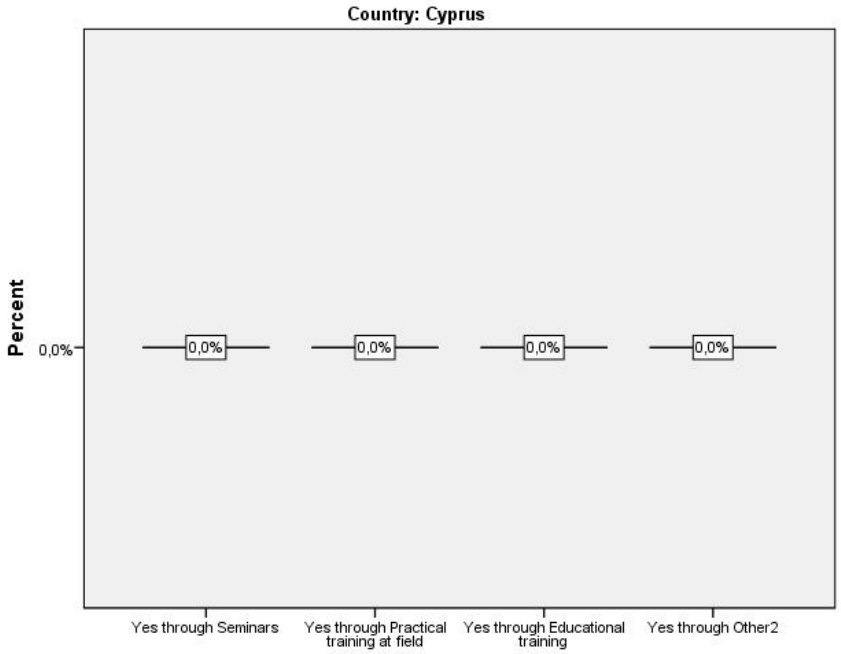


Figure 29. Answers of the interviewees about whether they have received training on sustainable practices.

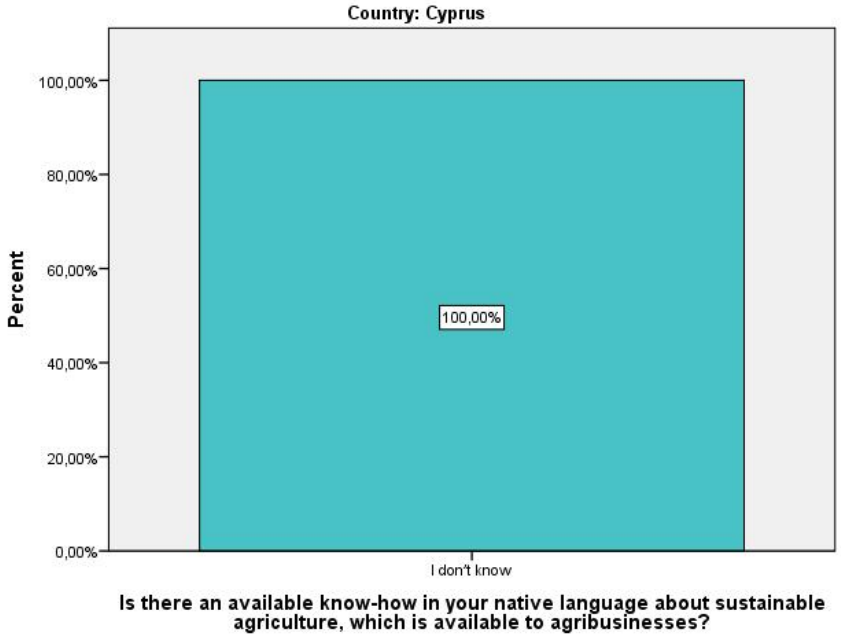


Figure 30. Answers of the interviewees about whether they are aware of available know-how in their language.

Comparing the above findings with the corresponding questions to policy makers one can deduce that there is a lack of the right mechanisms in order to ensure that knowledge and information are circulated and transferred between policy makers and end users, which in this case are the farmers. Maybe, on reason for this is the lack of practical training at the

field amongst policy makers. This is also verified by Figure 30, which illustrates that none of the participating farmers are aware of available know-how in their native language.

In order to assess the willingness of the interviewees to take measures for the protection of the agricultural environment and, in fact, to share global environmental problems such as water scarcity, unsustainable exploitation of natural resources and mismanagement of waste, the following was questioned: "do you plan to introduce re-use of water, green energy, decrease of energy use and re-use of organic waste".

30% of the farmers participating in the survey answered that they are planning to introduce measures protecting the agricultural environment, such as water re-use, green energy, etc., which is quite satisfactory. What is further encouraging is that another 40% share of the participants declared that they are planning to introduce similar measures in the future even though definite answers have not yet been taken (see Figure 31).

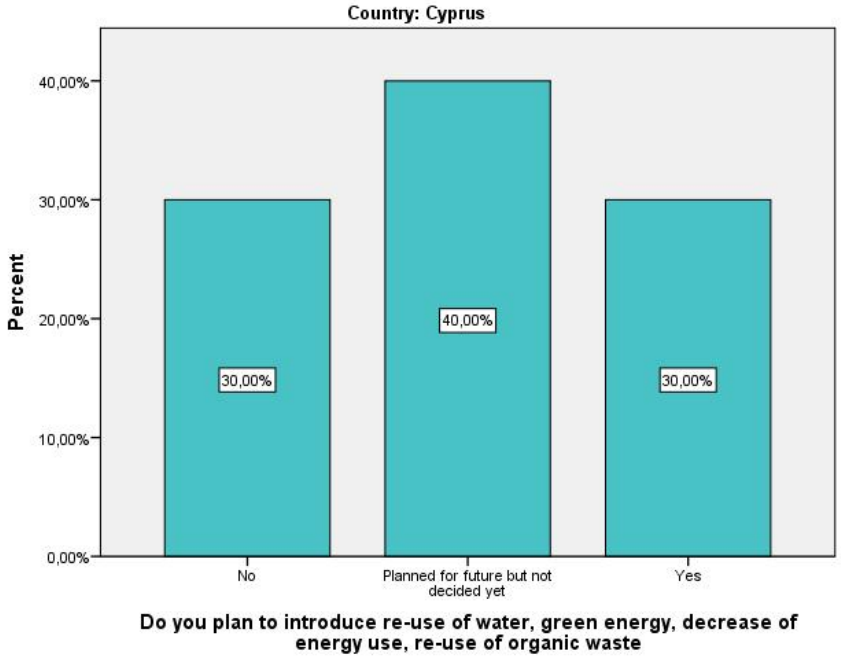


Figure 31. Answers provided to the question whether the interviewees plan to introduce re-use of water, green energy, decrease of energy use ad re-use of organic waste.

The farmers that have answered "yes" to the above question, and are planning to introduce measures to protect the agricultural environment, are intending mainly to reduce their energy consumption, introduce green energy and reuse organic waste. Surprisingly, no one declared his/her intention in reusing water (see Figure 32).

Those who plan to introduce measures to protect the agricultural environment but have not yet decided as such, consider minimizing energy consumption either through saving measures or introduction of green energy, but are also considering the reuse of water and organic waste (see Figure 33).

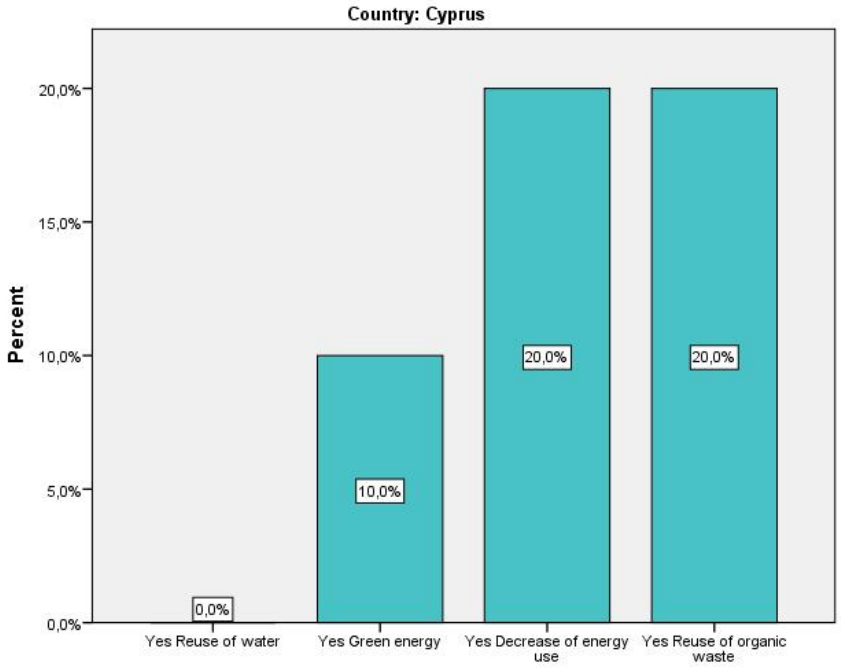


Figure 32. Option selected by the interviewees of TG-1 who are positive to introduce re-use of water, green energy, decrease of energy use ad re-use of organic waste.

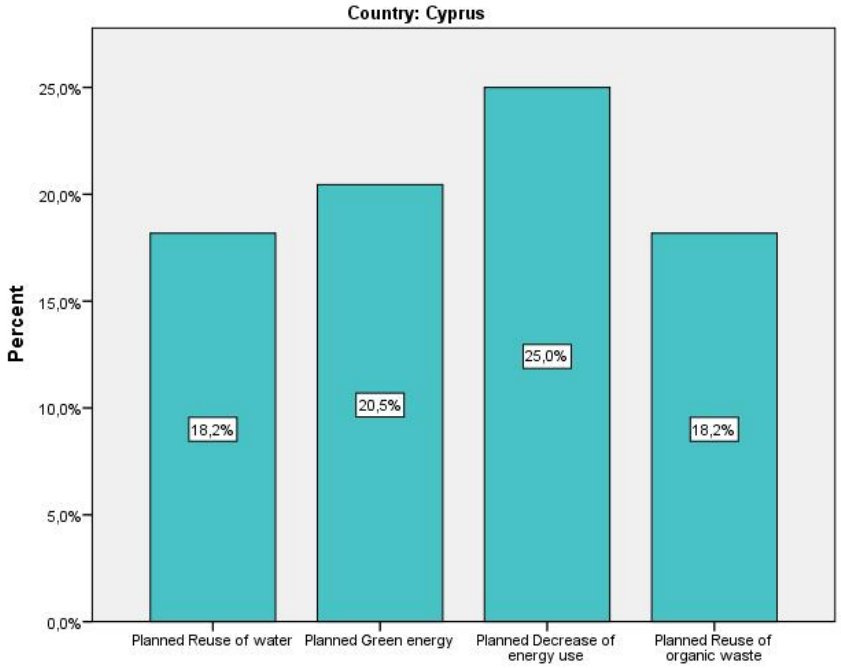


Figure 33. Option selected by the interviewees of TG-1 who are positive to introduce re-use of water, green energy, decrease of energy use ad re-use of organic waste, but they have not decided it yet.

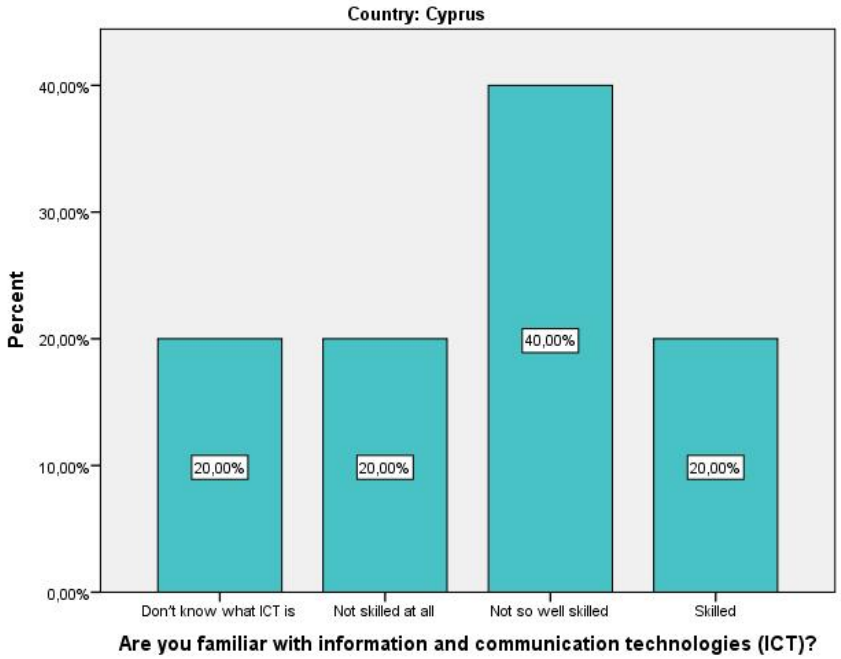


Figure 34. Familiarity of the interviewees of TG-1 with ICT.

Finally, in regards to familiarity of the survey participants of TG-1 to Information and Communication Technologies (ICT) (see Figure 34), it is quite encouraging that 20% are skilled, taking to consideration and the age distribution of the participants. On the other hand, 80% of the participating farmers stated that they have limited or no skills regarding ICTs, showing that there is great room for improvement in the introduction of ICT in the agricultural sector in Cyprus.

4.2.1.2 Professional profile

In order to assess the susceptibility of the participating farmers to laws and regulations compliance, and as an extent to the introduction of sustainable practices, a series of questions were raised regarding the matter. The results are quite intriguing.

The participants were split 50-50 There are those who do not or rarely keep up to date to national and EU legislation and regulations and as a result do not comply or rarely comply to them and there are those who sometimes or always are kept up to date with national and EU legislation and regulations. What is awkward is that the second group states their full compliance to national and EU legislation and regulations, even though they are not always well informed over these (see Figures 35 and 36).

What is also discouraging is the fact that 50% (see Figure 37) of the survey participants do not monitor crop yields, inputs, costs, etc. and in addition 90% (see Figure 38) have no business plan in place or do not know what a business plan is. Finally, 90% of the interviewees in TG-1 (see Figure 39) have not evaluated the suitability of their land prior cultivation.

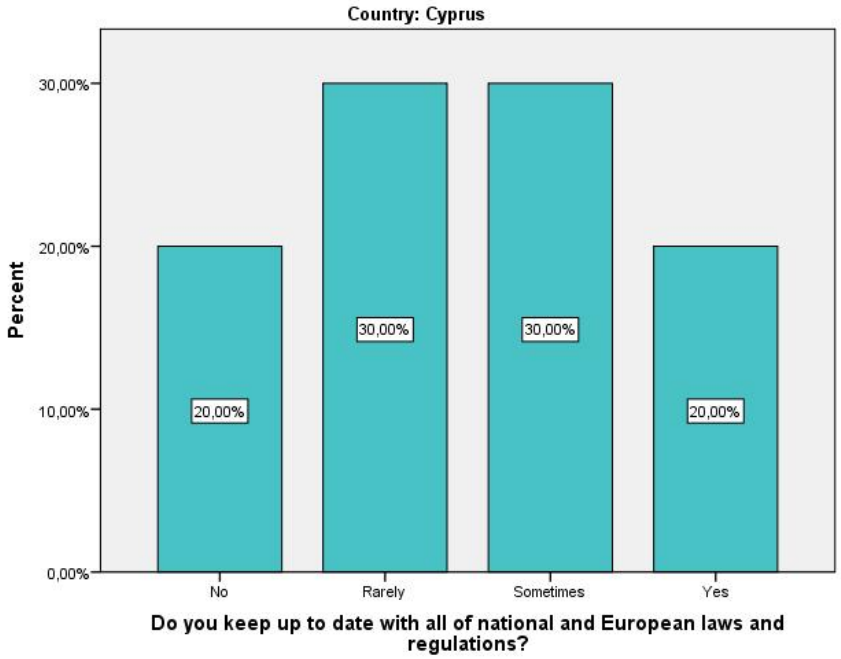


Figure 35. Answers of the interviewees of TG-1 about whether they keep themselves up to date with national and European laws and regulations.

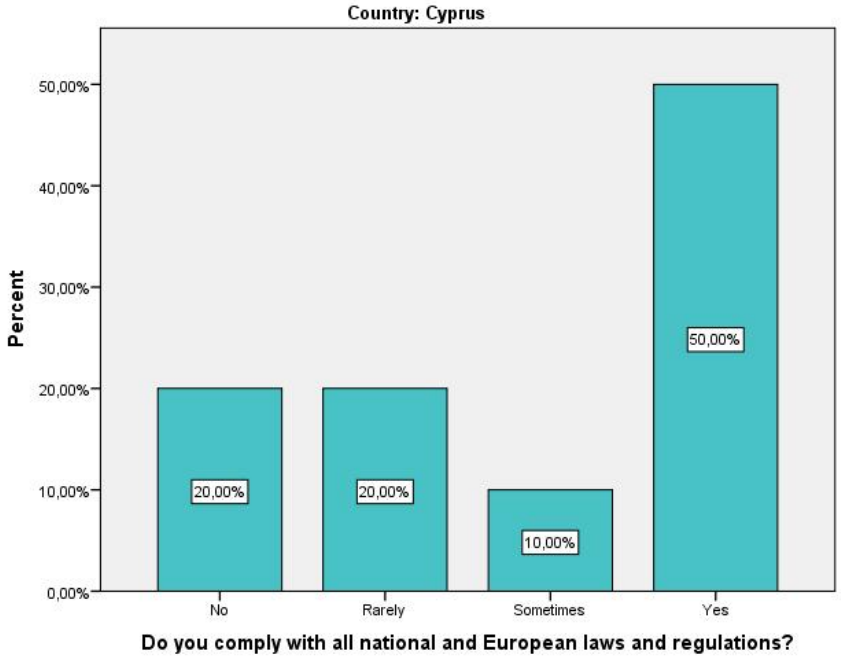


Figure 36. Answers of the interviewees of TG-1 about whether they comply with national and European laws and regulations.

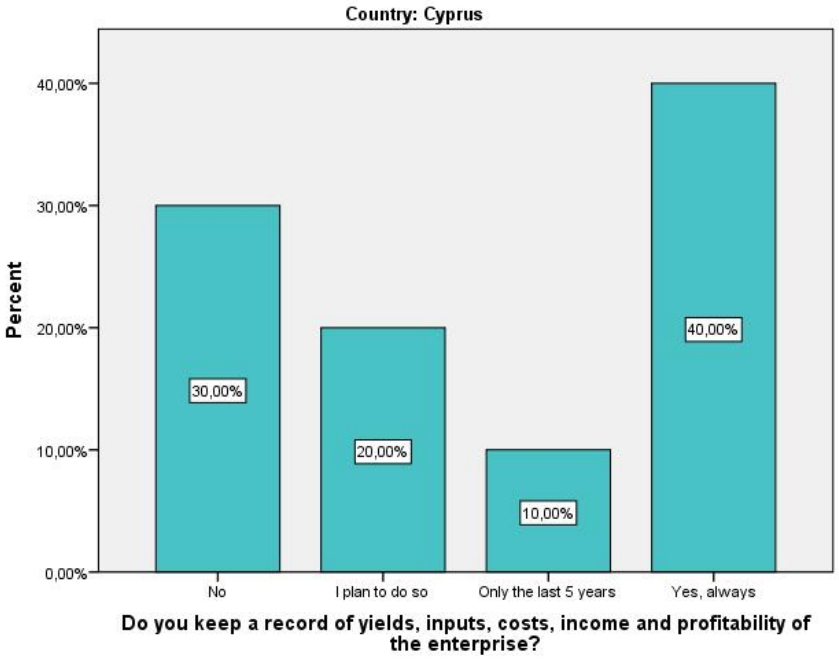


Figure 37. Answers regarding monitoring of the farms/enterprises (i.e. recording of yield, inputs, costs, income and profitability of the enterprise).

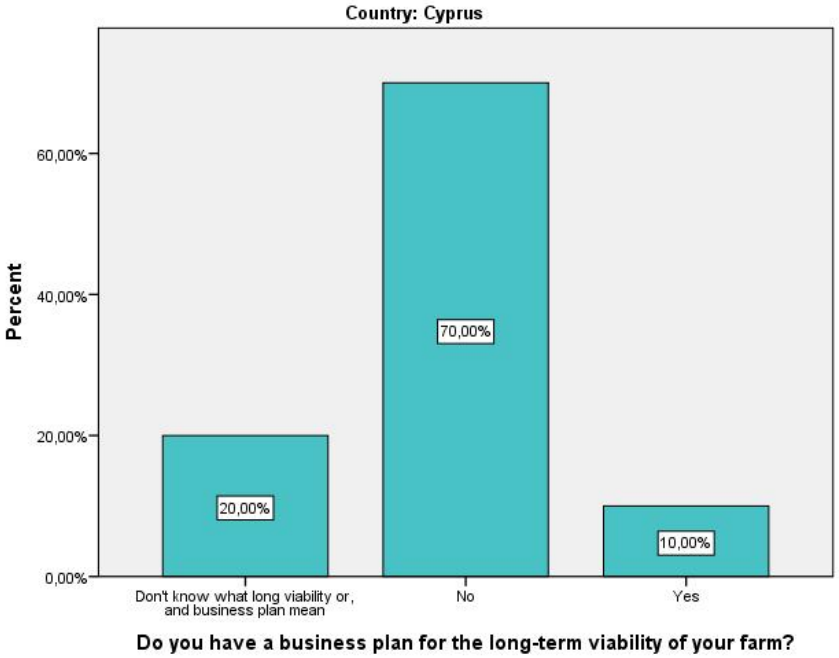


Figure 38. Answers regarding the existence of business plan for the long term viability of farms and enterprises.

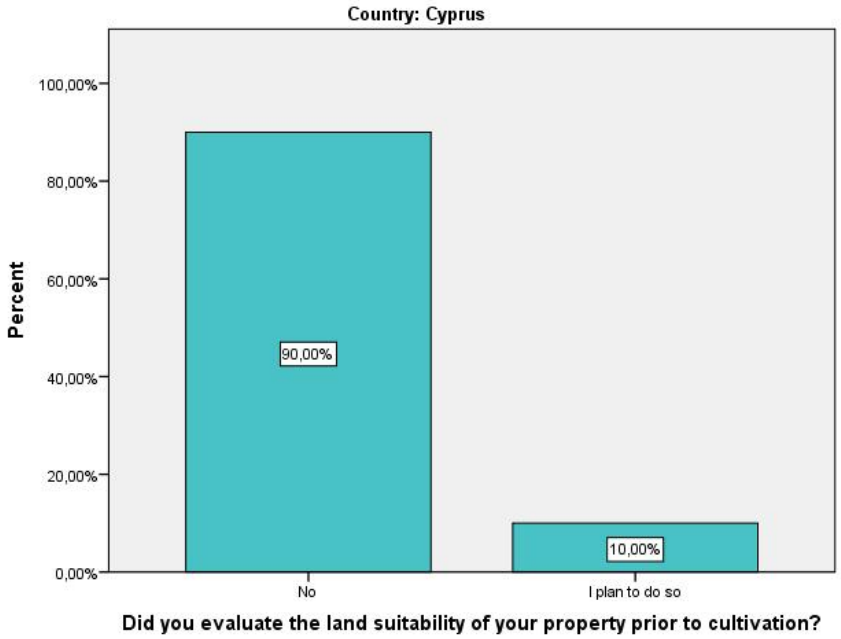


Figure 39. Answers on the question whether the interviewees evaluate land suitability of their property prior to cultivation.

4.2.1.3 Cyprus farmers/enterprises and Sustainable Agriculture

The pool of questions in this third category was used in order to evaluate the opinion of the interviewees of TG-1 on sustainable agriculture and the factors that encourage or discourage them from adopting sustainable agricultural practices.

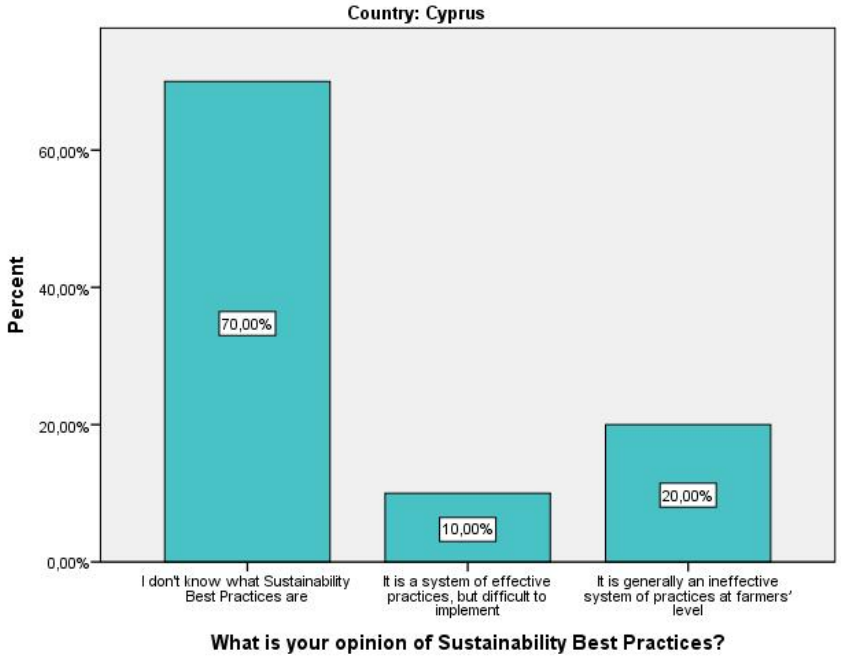


Figure 40. The opinion of the interviewees regarding Sustainability Best Practises.

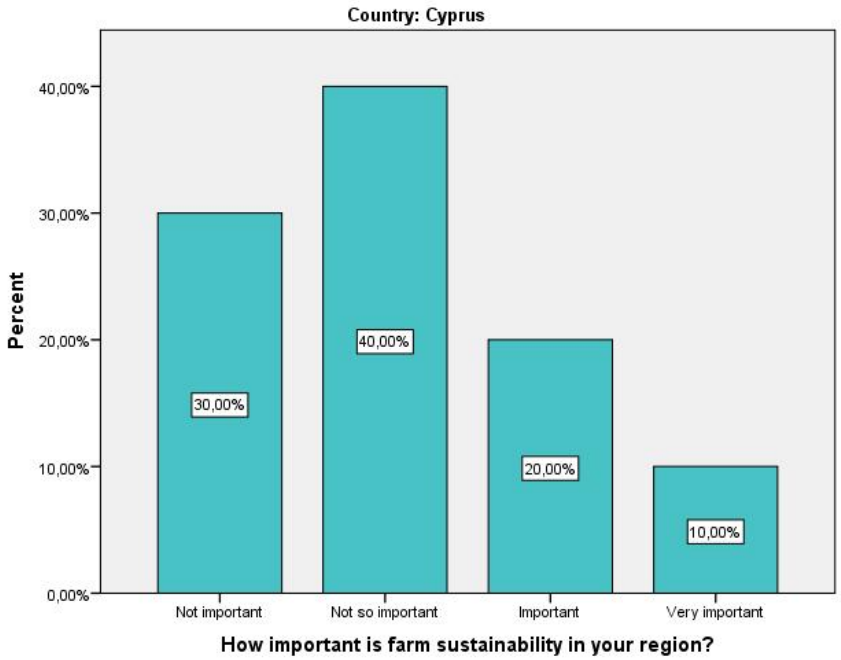


Figure 41. The opinion of the interviewees regarding the importance of farm sustainability at their regions.

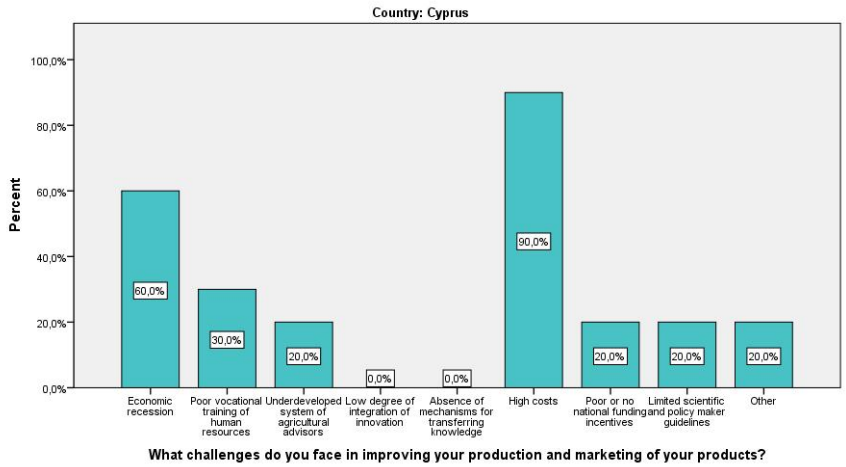


Figure 42. Challenges that the interviewees of TG-1 face in improving production and product marketing in total answers .

Figures 40 and 41 are I agreement with each other as 70% of the survey participants stated that they do not know what sustainable agriculture is, so it would be anticipated that the same percentage declared that they considered sustainability not at all important or not so important. In the question regarding the challenges in production and product marketing (see Figure 42), the dominant reasons are the high costs, economic recession and poor vocational training of human resources (underdeveloped system of agriculture advisors is strongly correlated to the latter).

Another area with great potential for improvement concerns government subsidies and the exploitation of government or other financial instruments (see Figures 43 and 44). 90% of the participating farmers stated their ignorance regarding government funding for switching to sustainable production. So, it comes as no surprise that the same percentage of participants have never exploited national, bank, EU or other subsidies and financial instruments for the adoption of sustainable practices.

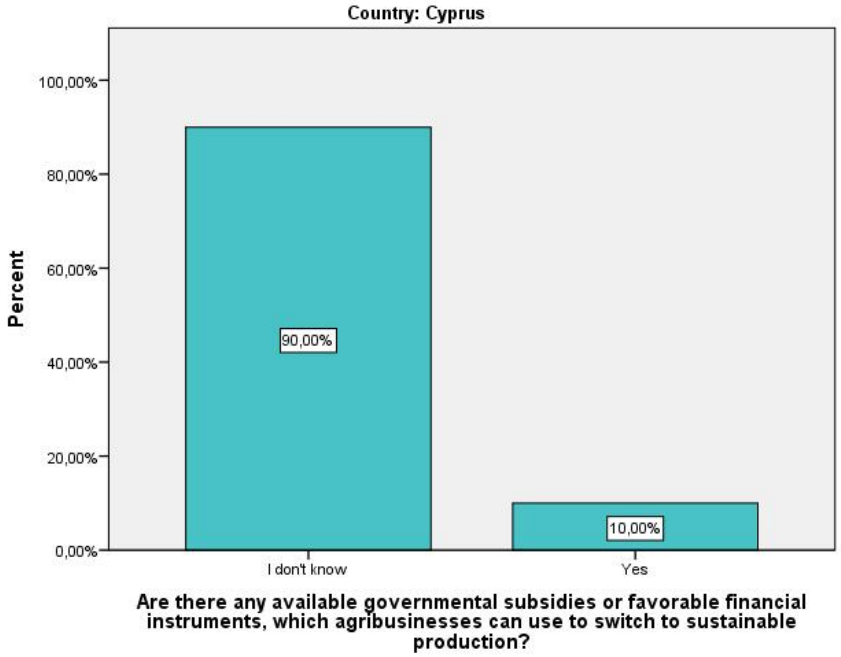


Figure 43. Answers to the question whether the interviewees of TG-1 know if there are any available government subsidies or favourable financial instruments, which agribusinesses can exploit to switch to sustainable production.

In contrast to the above, 80% of the policy makers participating in the current survey stated their knowledge for the existence of government subsidies and other financial instruments for the adoption of sustainable practices (see Figure 52) and 90% of them exploited such funding (see Figure 51).

It is quite evident that there is a lack of communication between the related public authorities that are responsible for managing, distributing and controlling national, EU or other funding and the end-users (the farmers in this case) that are supposed to receive this funding in order to proceed to investments that will overall improve the agricultural sector and industry.

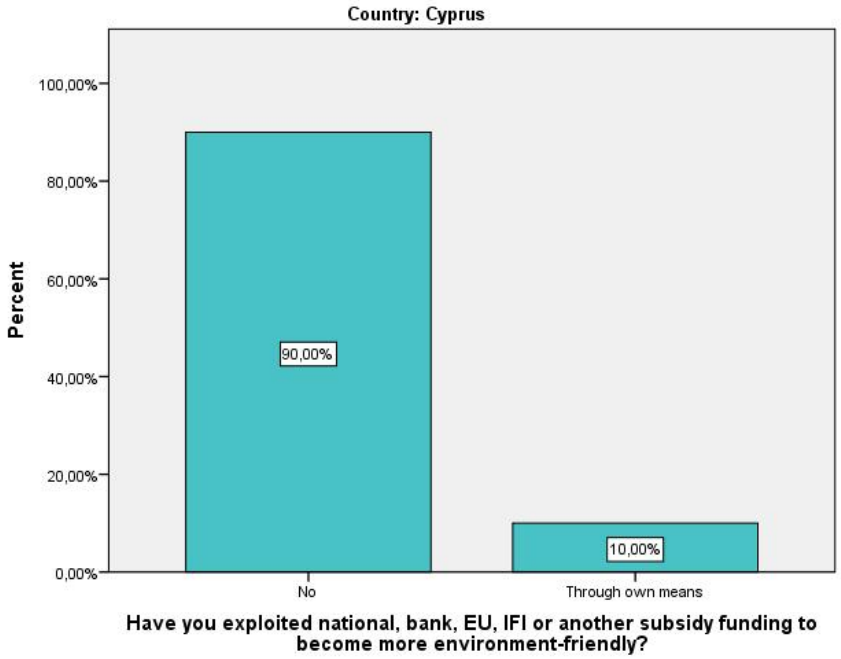


Figure 44. Answers to the question whether the interviewees of TG-1 have exploited bank, national, EU, IFI or other subsidy funding to become more environment friendly.

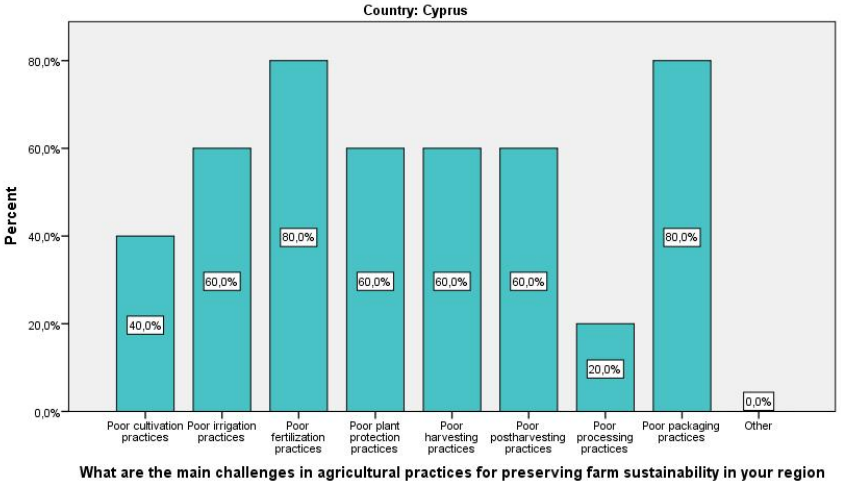


Figure 45. Answers to the question about what are the main challenges in terms of agricultural practices for preserving sustainability.

As far as the main challenges for preserving sustainability in Cyprus (see Figure 45), interviewees in TG-1 identified poor fertilization practices and poor packaging practices as the most important. Closely follow poor irrigation practices, plant protection, harvesting and post-harvesting practices.

The main factors that are considered to act as an obstacle to the implementation of sustainable practices by the interviewees of TG-1 (see Figure 46) are the complexity of sustainable practices and the lack of information and support regarding sustainability practices (which all three are strongly related to one another)

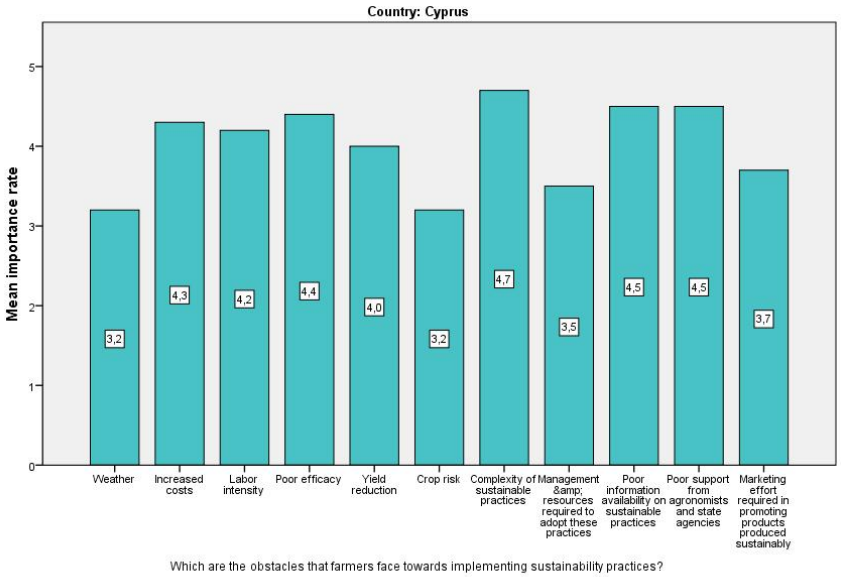


Figure 46. Answers regarding the factors that the interviewees of TG-1 consider as obstacles for producers to implement sustainable practices.

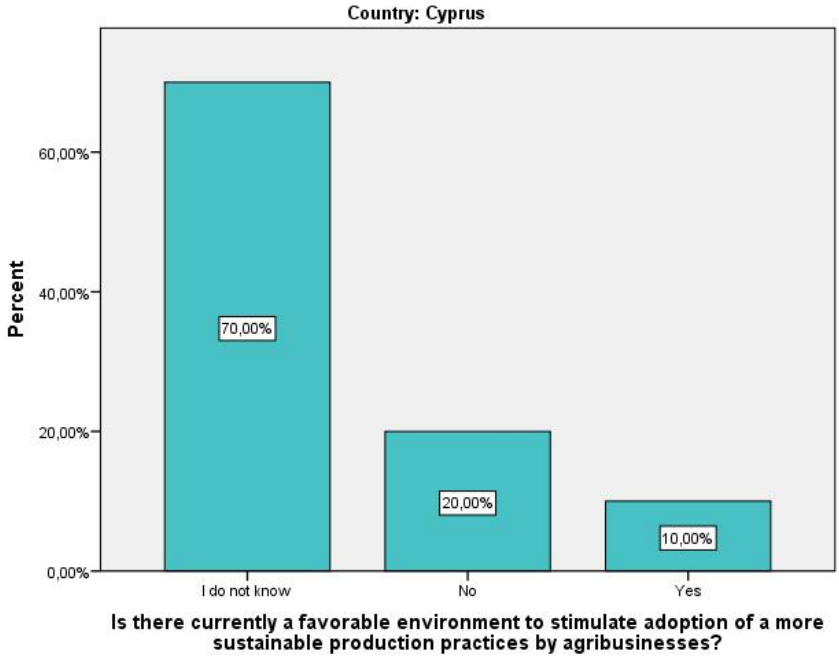


Figure 47. Answers provided to the question if there is currently a favourable environment to stimulate adoption of more sustainable production practices.

As far as the existence of a favorable environment that stimulates the adoption of a more sustainable production practices is concerned (see Figure 47), 70% of survey participants stated that they do not know and another 20% stated that such an environment does not exceed. Only 10% of the participants declared their optimism.

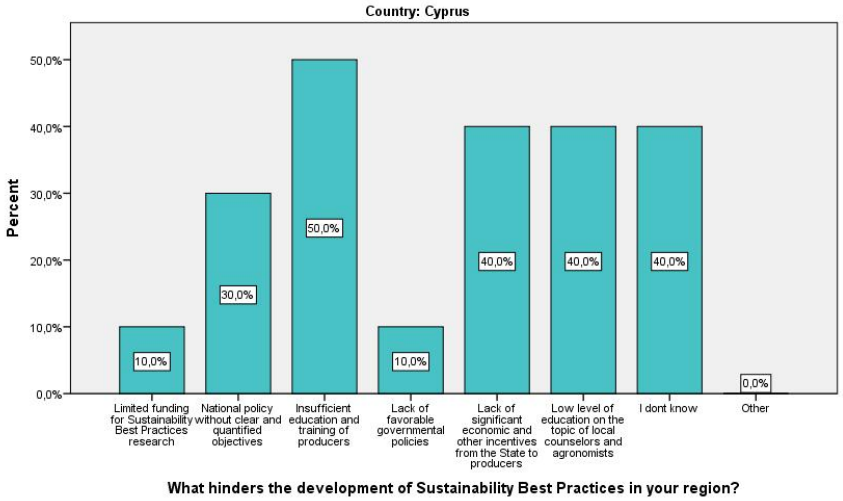


Figure 48. Answers provided by the interviewees of TG-1 to the question "what hinders the development of sustainability best practices in your region".

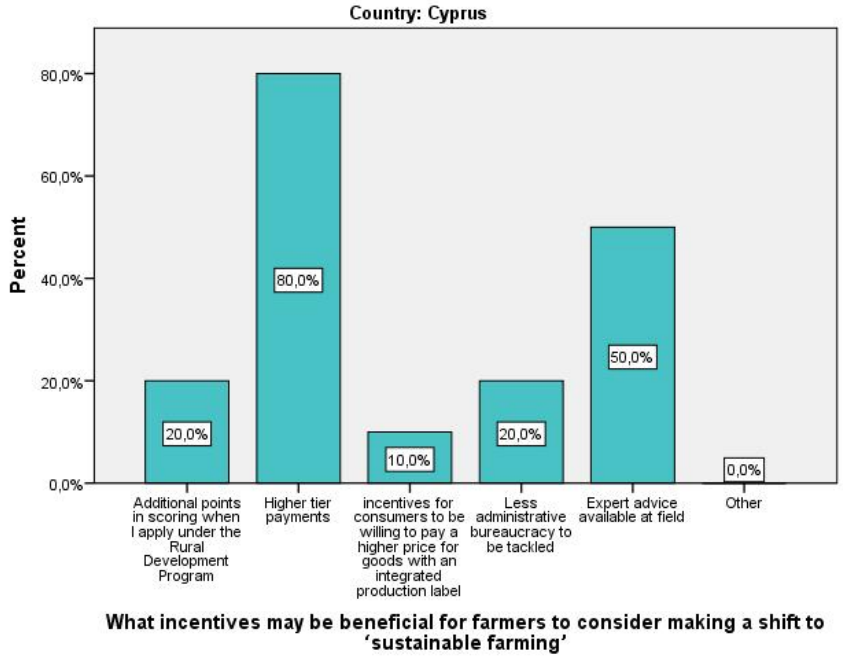


Figure 49. Incentives that the interviewees of TG-1 may consider beneficial in order to shift to sustainable farming.

Finally, regarding the reasons hindering the development of sustainable practices in Cyprus and what incentives may be beneficial towards sustainable farming, Figures 48 and 49 are quite enlightening and in agreement with each other. The three main reasons for hindering sustainable development are considered to be (a) the insufficient education and training of the producers, (b) the low level of education on the topic of local counselors and agronomists and (c) the lack of significant economic and other incentives on behalf of the state. So, it should have been anticipated that farmers expect more subsidy schemes or

other financial instruments towards adopting sustainable practices, as well, as increased expert advising at the field due to their lack of knowledge on the matter.

4.2.2 Policy Makers (TG-2)

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

As regards the availability of know-how in the languages of the policy makers and farmers, the 60% of the policy makers provided positive answers (see Figure 50). This contradicts the perception of farmers, as depicted in Figure 30, that state their ignorance on the matter. Furthermore, the majority of policy makers are aware of the existence of national and other funding and are exploiting it (see Figures 51 and 52).

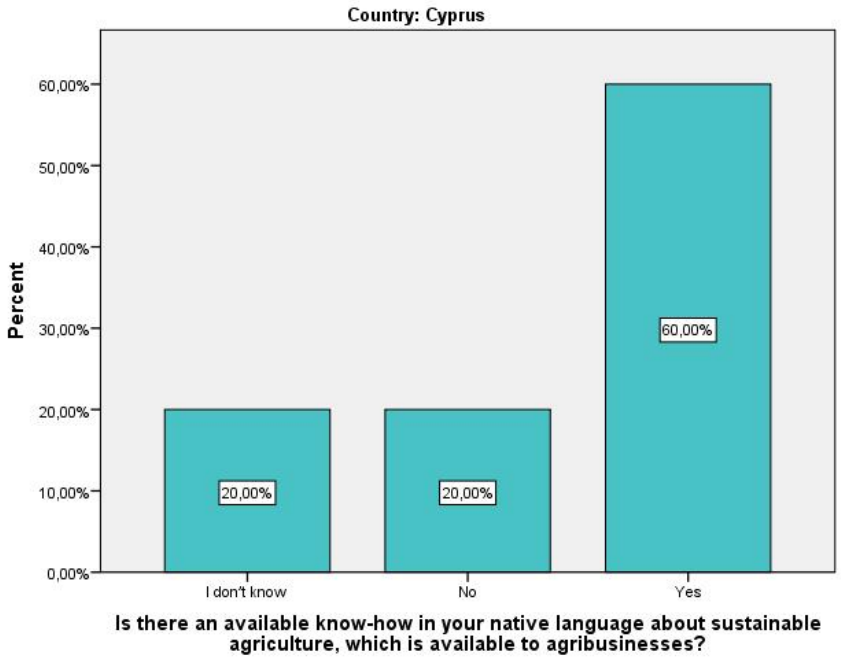


Figure 50. Answers of policy makers about whether they are aware of available know-how in their language.

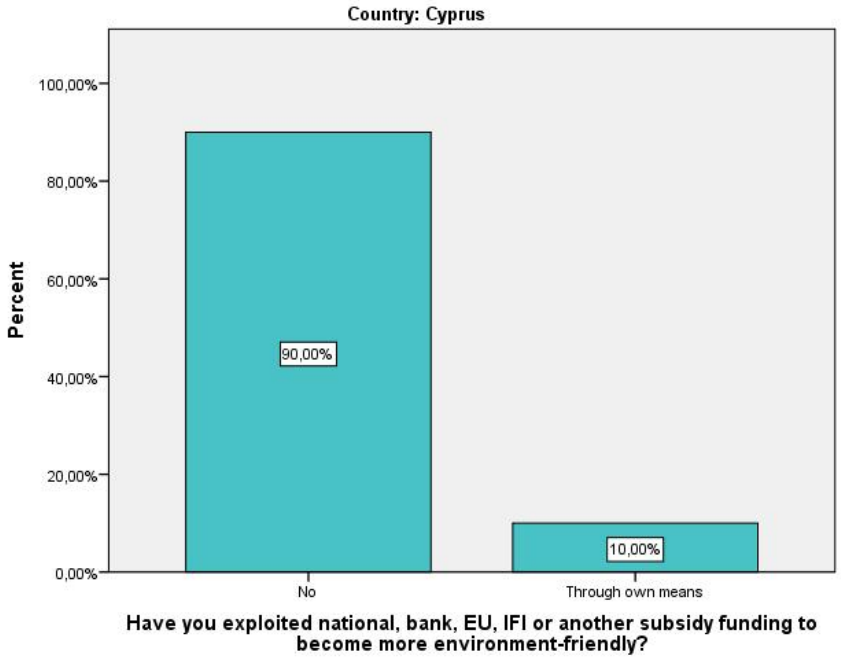


Figure 51. The opinion of the interviewees of TG-2 regarding the importance of farm sustainability at their regions.

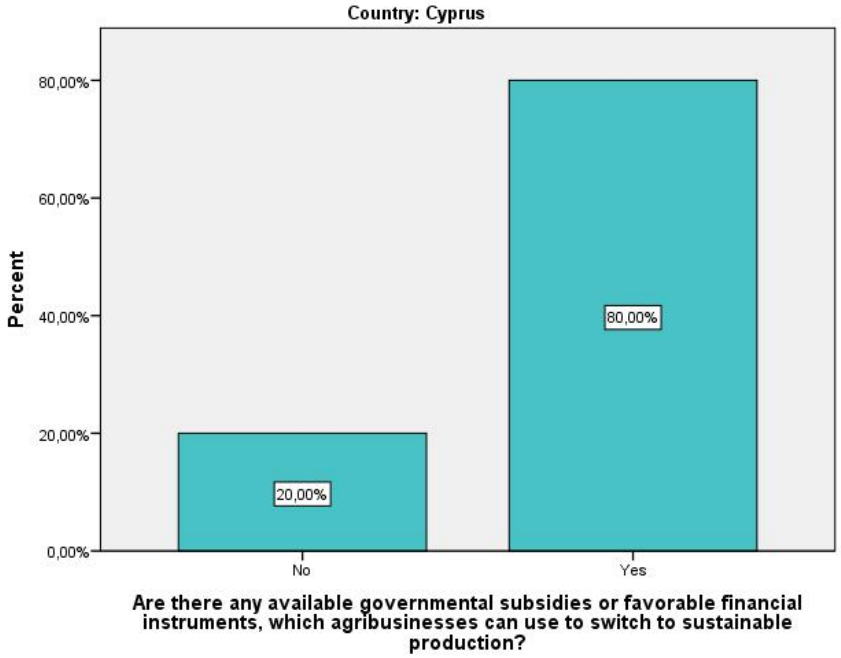


Figure 52. Answers to the question whether the interviewees of TG-2 know if there are any available governmental subsidies or favourable financial instrument, which agribusinesses can exploit to switch to sustainable production.

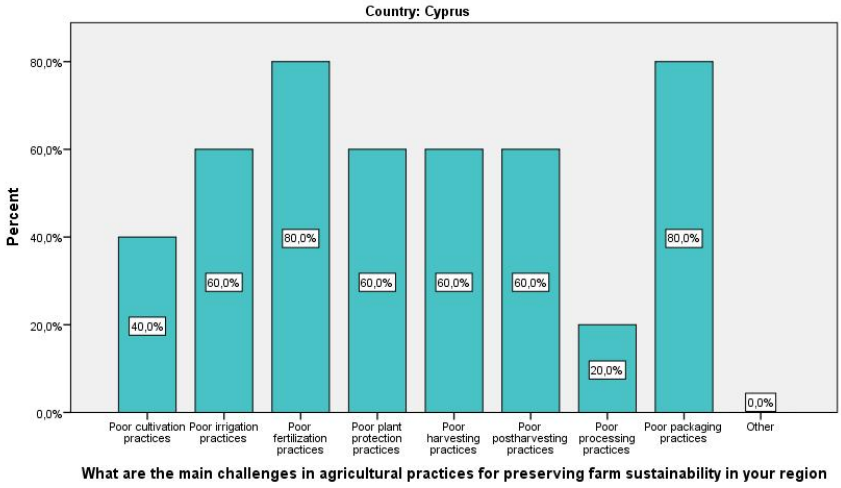


Figure 53. Answers to the question about what are the main challenges in terms of agricultural practices for preserving sustainability.

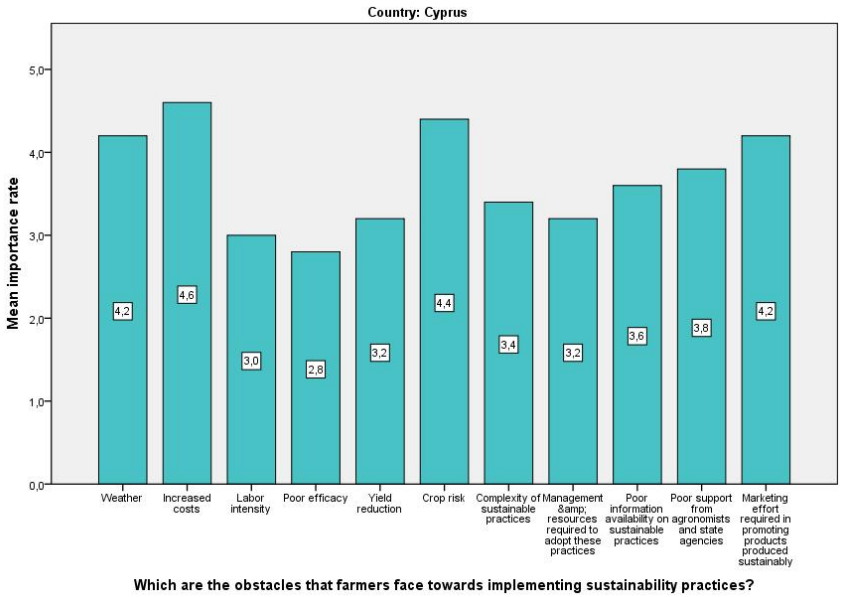


Figure 54. Answers regarding the factors that the interviewees of TG-2 consider as obstacles for producers to implement sustainable practices.

As far as which challenges policy makers see as critical for preserving farm sustainability in Cyprus (see Figure 53), these are in agreement with the perception of farmers. The main obstacles identified for the implementation of sustainable practices by producers are summarized in the following (see Figure 54): (a) weather, (b) increased costs, (c) crop risk and (d) the marketing effort required in promoting products produced sustainably. These contradict the obstacles identified by farmers which relate to the complexity of sustainability practices and their lack of knowledge over the subject. It becomes clear that there is a gap between the perception of policy makers and farmers, so it is crucial for this gap to be bridged in order the right policies and measures to be adopted towards sustainable farming.

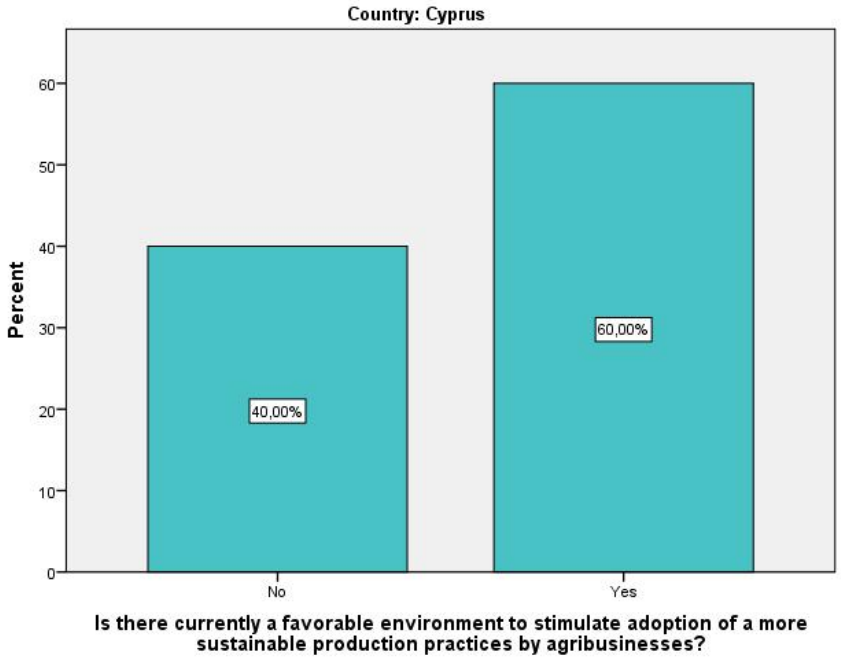


Figure 55. Answers provided to the question if there is currently a favourable environment to stimulate the adoption of more sustainable production practices.

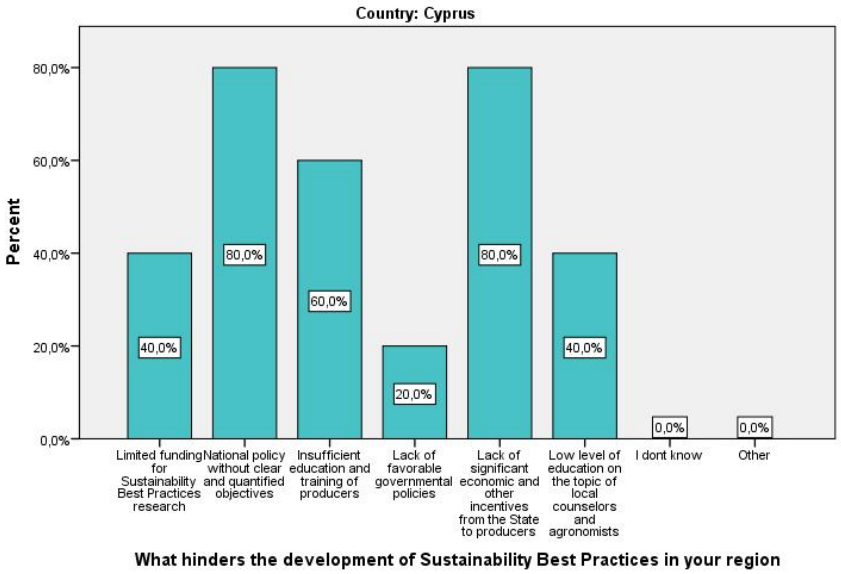


Figure 56. Answers provided by the interviewees of TG-2 to the question "what hinders the development of sustainability best practices at your region".

The above conclusion is further supported by the illustrations of Figures 55 and 56. Policy makers consider that there is a favorable environment for the adoption of sustainability practices on behalf of the producers whilst they disagree. Finally, policy makers consider that the lack of significant economic incentives hinder the development of sustainability best practices (which is in agreement with the farmers point of view) but also believe that Cyprus lacks a clear national policy with quantified objectives while farmers require increased

knowledge transfer over the subject of sustainable practices from policy makers and government authorities to the people in the fields, that rely mainly on experience gained throughout the years.

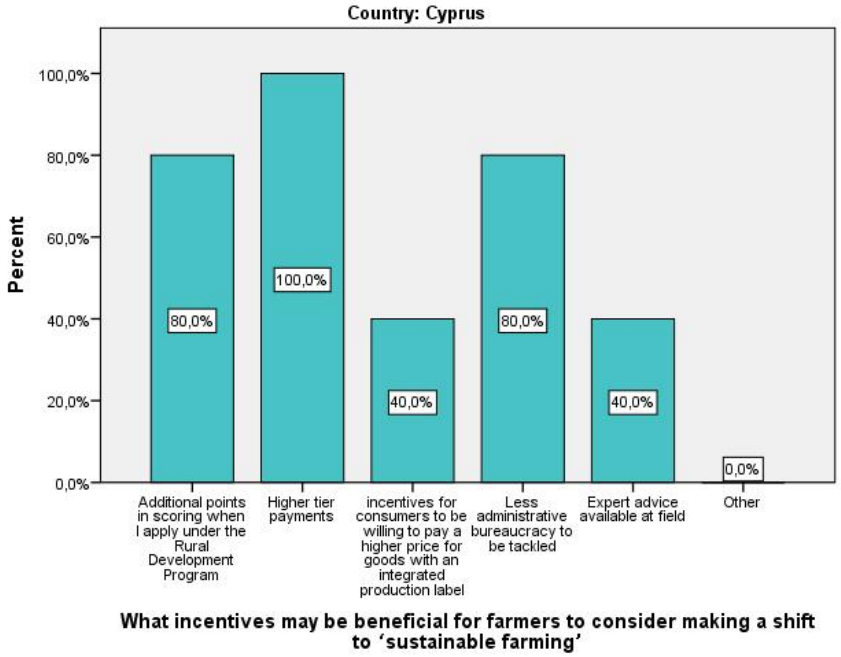


Figure 57. Incentives that the interviewees of TG-2 may consider beneficial in order farmers/agribusinesses to shift to sustainable farming.

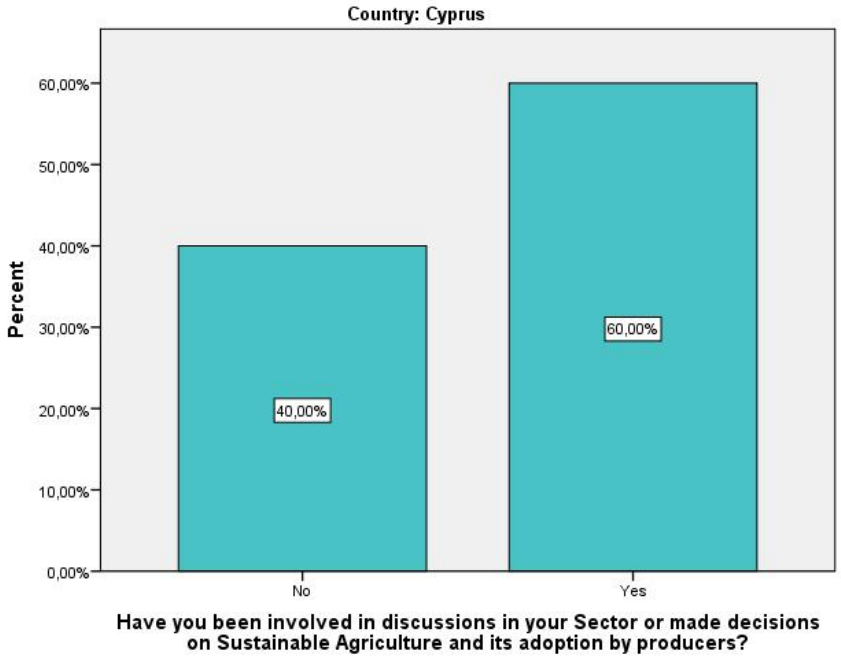


Figure 58. Answers provided by the interviewees of TG-2 regarding their involvement in discussions in their sector or participation in decision making on sustainable agriculture and its adoption by producers.

5 Conclusions

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

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

- The human workforce of the agriculture sector in Cyprus is gradually aging
- Cypriot farmers lack familiarity with new and emerging technologies, especially ICTs, which has a negative impact on them keeping up to date with new trends, practices, laws and regulations, etc.
- Cypriot farmers do not seem to fully comprehend the concepts of sustainable practices and circular economy, thus fail to understand the benefits of adopting and implementing sustainability best practices.
- Farmers in Cyprus consider the lack of knowledge on the subject of sustainability far more important than climate change, weather and the lack of subsidies.
- It is evident that there is a lack of dissemination mechanisms that would help the transfer of knowledge from the policy makers' level to the farmers' level

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