Farming 4.0

Co-funded by the Erasmus+ Programme of the European Union

FOCUSED NEEDS ANALYSIS REPORT

Identifying the specific needs of the target audience

Prof Dr. Kemal Celik – COMU

Prepared by Canakale Onsekiz Mart University
in Canakale – TR 18.03.2019

1 Table of Content

2 Output Number 1

Output Title: Focused Needs Analysis

Output Description: Studies / analysis – Questionnaire development and survey implementation

The purpose of the Focused Needs Analysis is to identify the specific needs of the target audience in the project (high school students, farmers, advisors and teachers). This activity will enable creating crucial input information for development of the curriculum for ICT knowledge and skills in VET agriculture. The reason of conducting the survey is to know to which extent the target audience (*high-school students, farmers, advisors, and teachers*) have the need for gaining knowledge and skills regarding ICT usage in Agriculture, and what are the main elements and barriers for implementing such technologies.

3 Methodology

The methodology used in this analysis is in the form of a survey. For conducting the analysis 4 different questionnaires were developed focusing on the specific target audience (*high-school students, farmers, advisors, and teachers*). The questionnaires were made of **multiple-choice questions, short answer questions and open-ended questions** all with the purpose to understand their level of ICT knowledge and skills and the level of ICT implementation in their everyday life and in their professional careers.

- The questionnaire meant for the farmers was made out of 25 questions about demography, years of experience, involvement in agricultural sub-sectors, usage of different digital tools, usage of specialized forms (software/application) for agricultural production, past training and adaptability of owned mechanization for implementation of elements of precision agriculture.
- The questionnaire that was made for the students involves 19 questions regarding different ICT implications during their educational period and everyday life, as well as, the level of knowledge and awareness for the existing techniques of agricultural production with the help of ICTs.
- The teacher's questionnaire was made out of 39 questions to make an assessment of their current agro-informatics competence levels, the knowledge of e-agriculture and related technologies, and to which extent VET schools are currently teaching e-agriculture and related technologies
- The questionnaire that was made for the agricultural advisors was constructed from 18 questions to determine the involvement of ICTs in their delivering of advisory services, and the restricting factors of such ICT implementation for delivering advisory services.

3.1 Thematic parts in surveys

All of the created questionnaires are divided into thematic parts in order to define the specifics that are required for the conclusion of this survey.

Here are the following sections in each questionnaire for each target audience:

- Farmers perspective
  - Demography

- The capacity of ICT implementation
- Technological capacity for ICTs
- Mechanization adaptability for ICTs

➢ Students perspective
- Familiarity with ICTs

➢ Teachers perspective
- Demography
- Agricultural education and ICT tools

➢ Advisors perspective
- ICTs and Advisory services

4 Overall Demographics

After the Kick off meeting of **Farming.4.0 project**, a survey was carried out among **320** farmers in **Bayramiç, Lapseki Biga, Yenice and Çanakkale** with two dominant sectors: fruit production and cattle farming.
The questionnaires were applied to the farmers by the Faculty of Agriculture of ***Çanakkale Onsekiz Mart University*** **and** ***Bayramiç Agricultural Chamber***
For the purpose of the project **150 students** from ***Çanakkale Onsekiz Mart University Agricultural Faculty***, ***Adnan Menderes University Agricultural Faculty***, **and** ***Lapseki Vocational High Scool*** were part of the survey.
Also, **70 teachers** from 7 different institutions (***Çanakkale Onsekiz Mart University, Balıkesir University, Adnan Menderes University, Ardahan University, Uludağ University, Namık Kemal University, Meslek Yüksek Okulları***) were part of the survey.

As the last target audience, **60 agricultural consultants/advisors** were reached from the region of ***Çanakkale, Balıkesir, Aydın*** and their districts.

Demographics of respondents	Total Number
Gender	
Male	**381**
Female	**52**
Total	**433**[1]
Education	
High School	**164**
University degree	**97**
Master	**62**
PhD	**12**
Elementary education	**265**
Position	
Student	**150**
Farmer	**320**
Advisor	**60**
Teacher	**70**

[1] This number only represents the male and female structure from the teacher and farmer questionnaire. This gender structure was not represented in the remaining two questionnaires

Figure 1 Demographics of respondents (Gender)

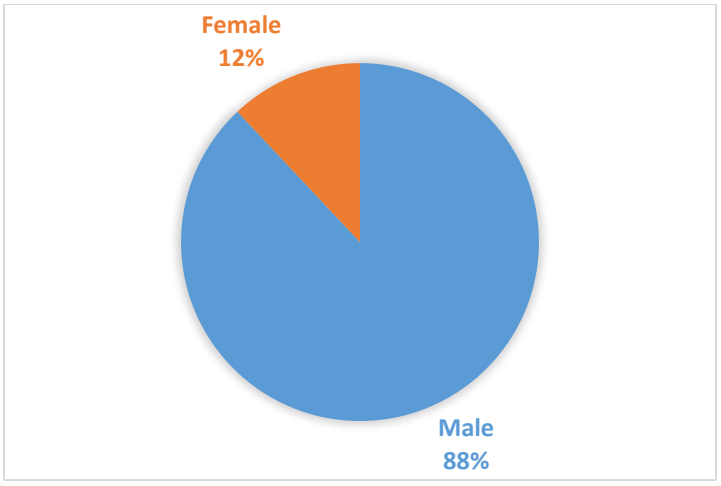


Figure 2 Demographics of respondents (Education)

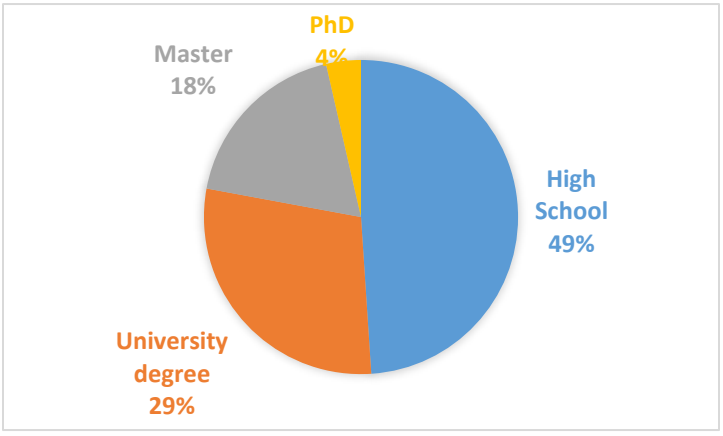
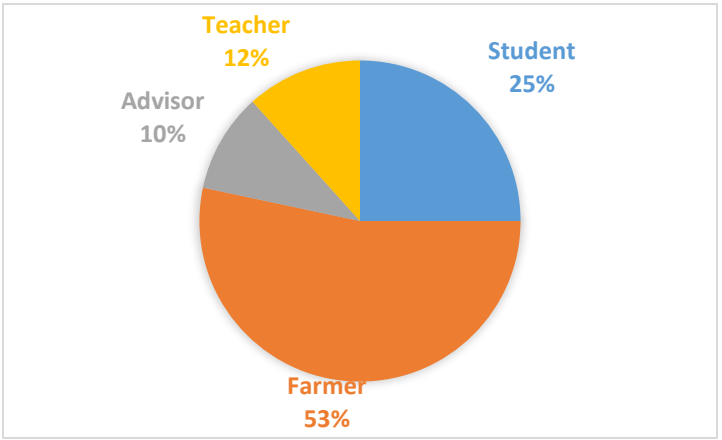


Figure 3 Demographics of respondents (Position)



Survey Results – Farmers Perspective

4.1 Farmer Demography

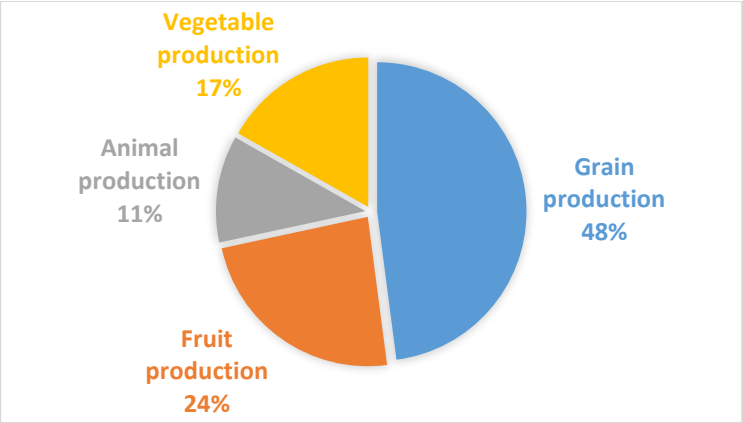
In the analysis of the target group "farmers", 400 farmers from the region **Bayramiç**, **Lapseki Biga**, **Yenice** and **Çanakkale** were contacted.From those 400 targeted farmers, **320 farmers** gave a positive reply. The main characteristics of the survey sample from the demographic point of view are the following:

- ***93%*** *of the surveyed farmers were* ***male***
- ***51%*** *of the surveyed farmers were in the age group between* ***45-54 years***
- ***73%*** *of the surveyed farmers have an only* ***elementary education***
- ***76%*** *of the surveyed farmers have more than* ***10 years of experience*** *in agricultural production*

We can conclude that we have a significant representation of all relevant sub-sectors in the region that was the subject of the survey.

1. In what agricultural sector does your company belong?

Grain production (48%)
Fruit production (24%)
Vegetable production (17%)
Animal production (11%)



4.2 Capacity for ICT implementation

One of the crucial questions of the survey is "How do you keep records for carrying out farm operations?" This question is important because it gives an initial indication of the knowledge and the extent of usage of ICTs for agricultural purposes in the target group/farmers. From the survey answers, 284 farmers out of 320 farmers **(88%)** responded that they use written form and only 14 farmers were using some kind of a software/application. In the context of this question, *software means a specially developed application that assists the farmers for their decision-making process throughout the whole agricultural process of production.*

The extent of farmers' usage of the different type of software tools is presented in Figure 1. It is important to emphasize that this question deals with the general usage of ICTs/software and not only specific agricultural applications. The following graphics show to what extent the farmers are using digital technologies for their daily work (*Figure 4*) and to perform operations on their farm (*Figure 5*).

The data in Figure 1 shows that the use of a software application in a different type of business activities (online ordering, financial payments, access to new information, e-mail) is significantly low. The result showed the software apps that are most commonly used are online ordering **(55 farmers)** and online payment (to the suppliers) **(56 farmers).** In general, we can conclude that the usage of ICTs, in this case software, it is on a very basic level, not covering complex operation within the farming business. One final conclusion that shows poor implementation of ICTs is very low usage of e-mail communication **(44 farmers)** which shows that the majority of the farmers do not have the elementary knowledge for implementations of a different kind of ICTs.

The part of the survey dealing with the understanding of the usage of ICTs specifically with farming operation has also shown very low awareness and knowledge of using this technology on the farms. The data in Figure 2 shows slightly higher awareness in e-commerce **(15%)**, weather forecasting **(12%)** and irrigation control **(12%).** The percentage of usage of ICTs is directly correlated with the complexity of the activities covered by this technologies, meaning, farmers have shown lowest awareness and knowledge of using ICTs for more complex operations on farms (e.g., only **3.5 %** of the farmers are using ICT for monitoring the status of vegetation)

1. Number of employees on the farm:

Full time employees	**Part-time employees**
< 4 employees: 220	< 10 employees :7
5-10 employees: 64	10-20 employees :21
10-20 employees:23	20-30 employees:9
>20 employees:4	>30 employees: 15

2. Number of specialist:

a) Grain production 166

b) Fruit production 105

c) Vegetable production:64

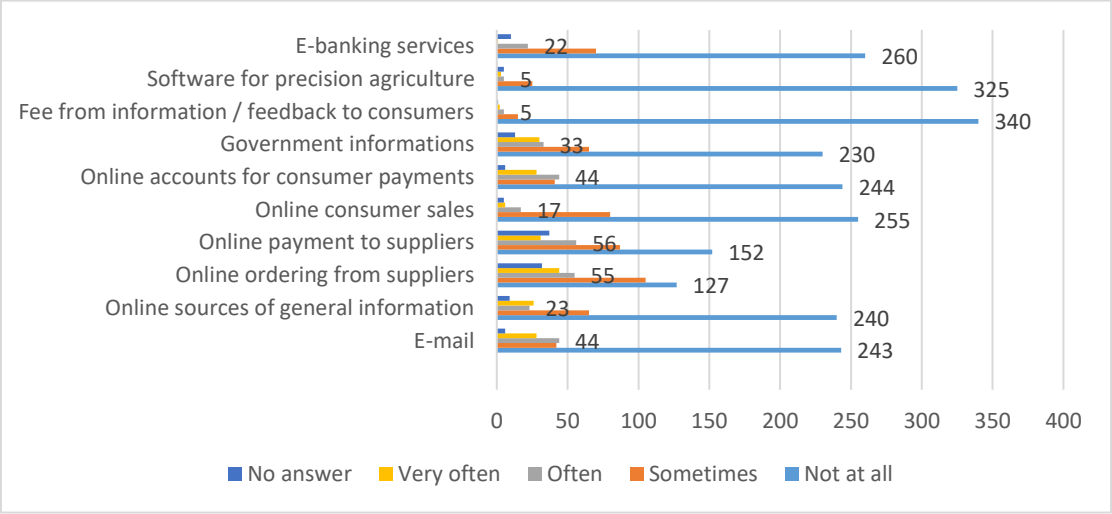
d) Phytopatologist: 28 (Agricultural Engineers)

3. How do you keep records for carrying out farm operations?

Electronic form: 6
Excel table: 59
Specialized form defined by software: 14
Writing form: 284

4. To what extent are the following DIGITAL TECHNOLOGIES tools found in your daily work? (Mark the square)

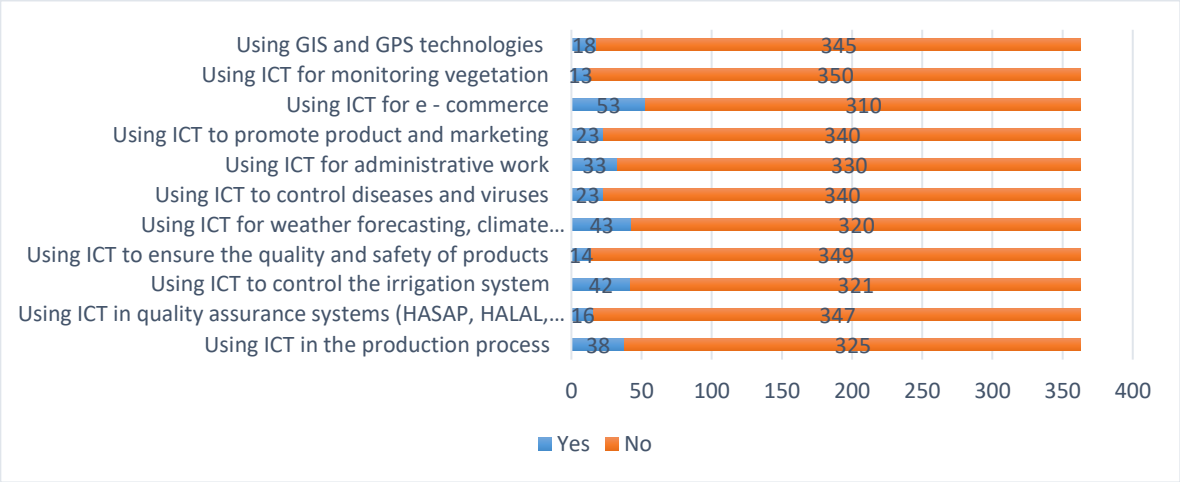
Figure 4 ICT usage in daily work



Source: 1 Farming 4.0

5. Which of the following DIGITAL TECHNOLOGIES tools are used to perform operations on your farm?

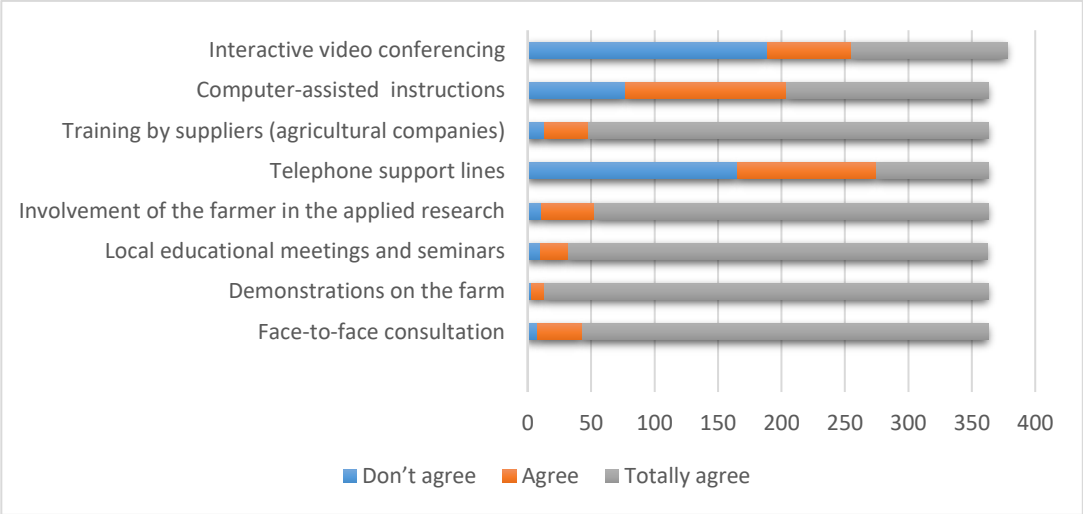
Figure 5 ICT usage for farm operations



Source: 2 Farming 4.0

6. In which way do you provide or would like to provide knowledge / support or information on the use of digital technologies in agriculture?

Figure 6 Ways of providing knowledge and support for ICT usage in agriculture



Source: 3 Farming 4.0

4.3 Technological capacity for ICTs

Within the section of technological capacity for ICTs, the analysis included 10 questions, dealing with the issue of determining the technological capacities of accepting and using ICTs.. In this section the survey is focusing not only with ICT equipment and software but also attention is given to understand if farmers are performing activities which are important for producing data for "feeding" different type of digital instruments and software assisting the farming processes. In this context, the survey was analysing if farmers have the practice of different performing activities such as analysis of soil, water, weather and similar to that. This is important for the topic of understanding the technological capacities because performing this type of analysis produces data that can be further used for conducting complex agricultural algorithms that enables making accurate decisions in the agricultural processes.

- **23%** of the farmers are using irrigational systems for their agricultural production and only **1%** of them had performed analysis of the water that they are using for irrigation;
- **5%** of the farmers have performed soil analysis;
- For the question "*Do you have tools for measuring soil moisture*" **6%** of the farmers have answered that they have the equipment for monitoring soil moisture
- **1%** of the farmers have their personal weather stations on their farm

From the answers above, it can be concluded that the percentage of performing important analysis needed for more accurate decisions including using ICTs for generating important data in this context, is very low.

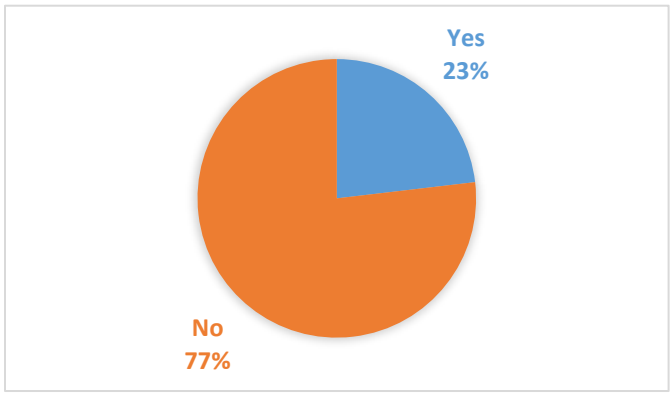
This section consists of several questions dealing with their previous involvement of farmers in training and workshops in the area of digital technologies in agricultural production. The idea of this group of questions was to understand if the target audience has some kind of previously obtained knowledge that can play a solid ground for easier introduction and acceptance of ICTs in the farming business.

- Only **5%** of the surveyed farmers have been through some kind of training in the area of ICT use in agricultural purposes;
- **67%** of the surveyed farmers currently are in the process of accepting and implementing of some kind of new practices and technologies in agricultural business;
- **39%** of the surveyed farmers are willing to invest in ICT use in agricultural production

From these responses, the techniques used for cultivating crops is mainly based on conventional production (writing forms, visual inspections) and the decisions are strictly depended on the farmer's senses and experience in farming. With the on-going trends like Agriculture 4.0, the introduction of automation processes, robotics, and smart farming, there is great potential for the surveyed farmers to adopt the mentioned technologies and concepts.

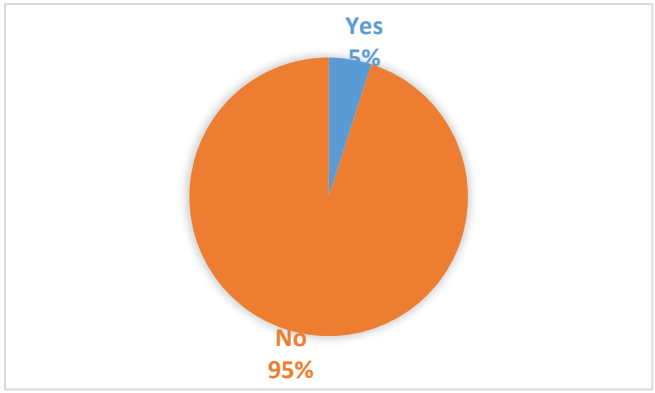
1. Do you have irrigation systems:

Yes 84 No 279



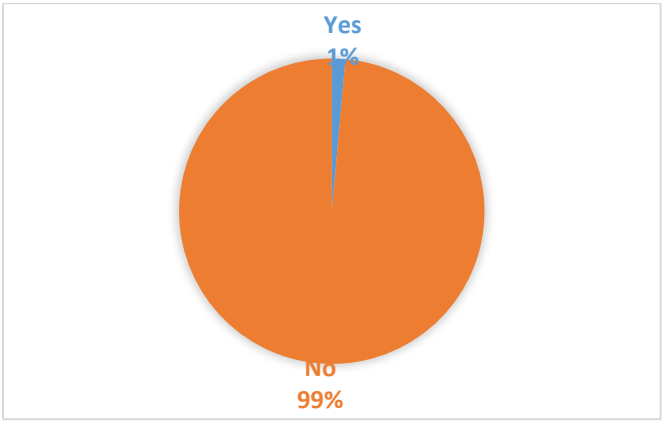
2. Do you perform soil analysis:

Yes 18 No 345



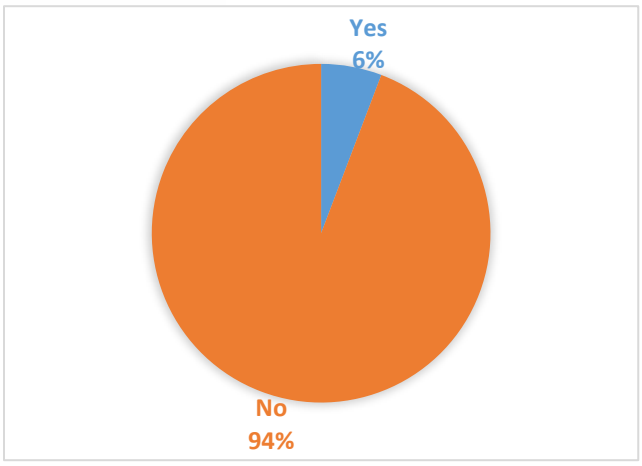
3. Do you make an analysis of irrigation water:

Yes 5 No 345



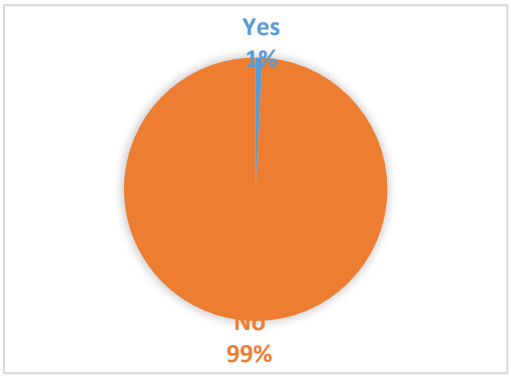
4. Do you have tools for measuring soil moisture?

Yes 21 No 342



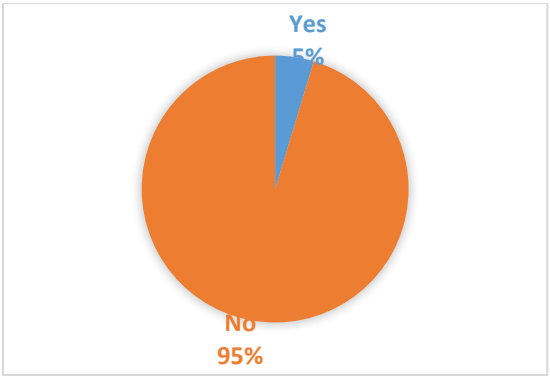
5. Have you set meteorological stations:

Yes 3 No 360



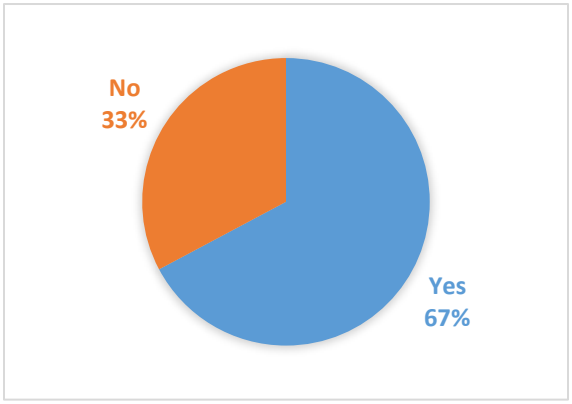
6. Have you had any type of training in the past that involves the use of digital technologies in agriculture?

Yes 17 No 346



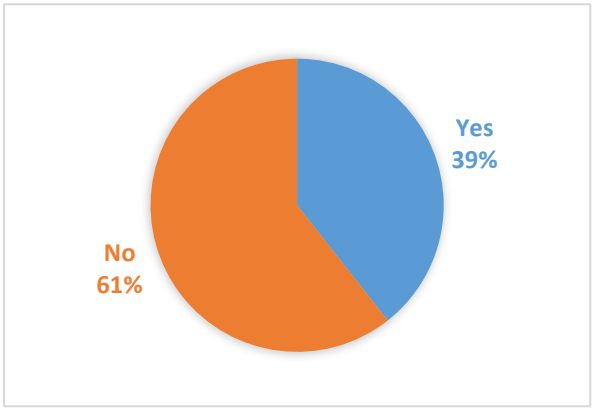
7. Are you currently in the process of accepting and implementing new practices and technologies?

Yes 244 No 119



8. Are you planning and investing in the future for the adaptation and implementation of DIGITAL TECHNOLOGIES in the production process of your farm:

Yes 143 No 220



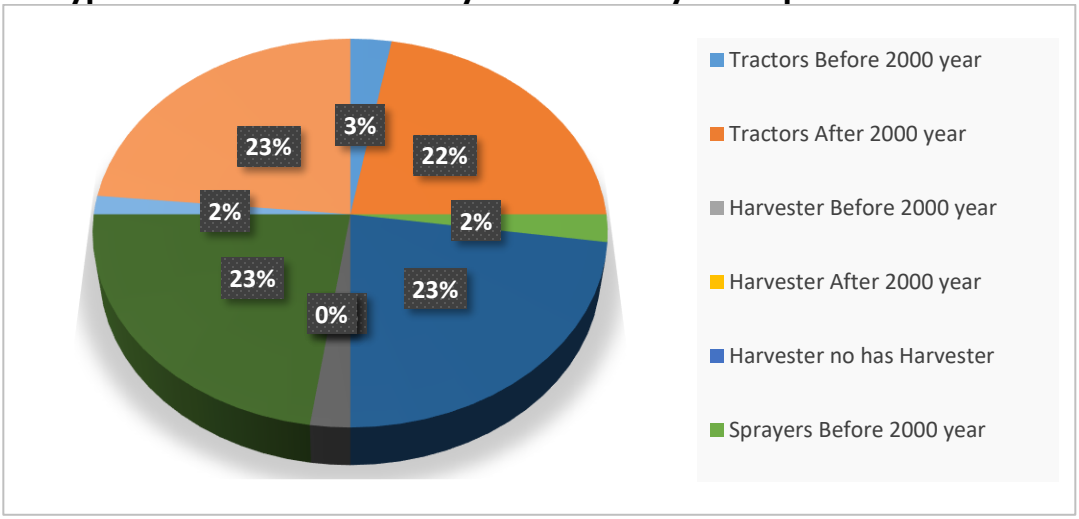
4.4 Mechanization adaptability for ICTs

The last section from the questionnaire developed for farmers, we were able to determine whether the owned mechanization of the farmers is suitable for implementation and upgrade the existing machinery with elements of Precision Agriculture, which are highly reliant on the information and communication technologies.

From the answers provided by the farmers:

- **89%** of the owned **tractors** are suitable for upgrade and implementation of different elements regarding Precision Agriculture equipment and techniques. There is a great possibility for farmers to adopt GPS navigation, automated steering, and smart paths for minimal fuel consumption.
- **90%** of the owned **sprayers** are suitable for implementation of VRT (Variable Rate Technology) for minimal drifts, consumption efficiency, as well as, overlapping and environment protection
- **94%** of the owned **spreaders** are suitable for implementation of the mentioned VRT for creating management zones, reducing the rates of the applied fertilizers, as well as, slowing the degradation processes of the soil and reducing the risk of leaching chemicals into the deeper layers of the soil.

1. What types of mechanization do you have and year of production:



Survey Results – Student Perspective

5 Survey results – Students Perspective

For the purpose of the project, **150 students** from 3 different Institutions (*Çanakkale Onsekiz Mart University Agricultural Faculty*, *Adnan Menderes University Agricultural Faculty*, and *Lapseki Vocational High School)* were surveyed. The techniques and teaching methods implemented by these mentioned institutions rely on theoretical and practical training. This kind of teaching provides a steady ground for implementation of specific changes in using digital technologies in VET education.

5.1 Familiarity with ICTs

The questionnaire that was part of the analysis was specifically designed for the students and it was consisted of 19 questions that describe to which extent the students are familiar with the use of different ICTs in their everyday life and their familiarity with specialized forms of ICT that are used in agricultural production.

- For the question "*If they use online education platforms for your educational activities (e.g. Moodle, Canvas, Edmodo, Kahoot, etc.)?"* 105 students **(70%)** out of 150 students reported that they are using educational platforms and **90%** of the students responded that they are familiar with ICT usage.
- **96%** of the students responded that they did not have any kind of ICT training in the past.
- **71%** of the students responded that their familiarity with ICTs is on an intermediate level.

From the students responses, as a potential group for obtaining new knowledge and adopting new technologies, we can say that this target group needs special training for ICTs. Having in mind the high development of new technologies in the everyday environment, as well as, in the agricultural production processes, it is crucial for the students to have a higher capability of working and implementing ICTs.
The students had the opportunity to put an accent on different type of problems and obstacles regarding ICT use in their everyday life, lectures and agricultural production. The information gathered is represented in the following chart *(Figure 7).*

From the answers provided in **Figure 3**, the utmost obstacle represents the lack of support from the authorities and lack of ICT support services. Another problem represents the language,**92%** of the students expressed that the language presents an obstacle for using ICTs. A great number of software programs, applications, and literature for studying and practicing different forms of ICTs are created in English and the students find this as a major restricting problem, which unables them for further upgrading their knowledge. There are two possibilities for this issue, changing the VET curriculum for learning a foreign language or adapting the curriculum with translated content suitable for learning.
A specific part of the questionnaire was made for the students to share their opinion about the ICT usage in agriculture:

- **65%** of the students think that ICT use will have a high contribution in raising productivity and agriculture development
- **85%** of the students support the adoption and use of ICTs within farm activities
- **77%** of the students agreed that with the use of ICT can increase the added value to farm production

The last part of the questionnaire was made to determine their knowledge and awareness in the implementation of ICT in different areas of agricultural production (*navigation and automatic steering, different sensors, robotics, imaging*).

- For the question "*Do you know about navigation and automatic steering, the benefits and possible use?*" only **24 %** responded that they are familiar with this type of ICT implementation.

- For the question "*Do you know how different sensors are used in precision agriculture*?" only **13%** of the students gave a positive answer for implementation of IoTs in agriculture.
- For the question "*Are you aware of the use of robotics in agriculture?*" **31%** of the students understand the application of robotics in agricultural production.
- For the question "*Do you know what Copernicus and LandSat are?*" only **11%** of the students know about satellite imaging implementation in agriculture.

The answers provided by the students' shows that their knowledge and awareness in the implementation of ICT in different areas of agricultural production is not on a satisfactory level. The students from their rudimentary knowledge know that ICTs could have a great impact on the agricultural production, but the fact is that there is a deficiency in the study material for different ICTs applications in agriculture. There is a need for updating the study material to have state-of-the-art information in order to keep up with the 4.0 trends that are happening right now.

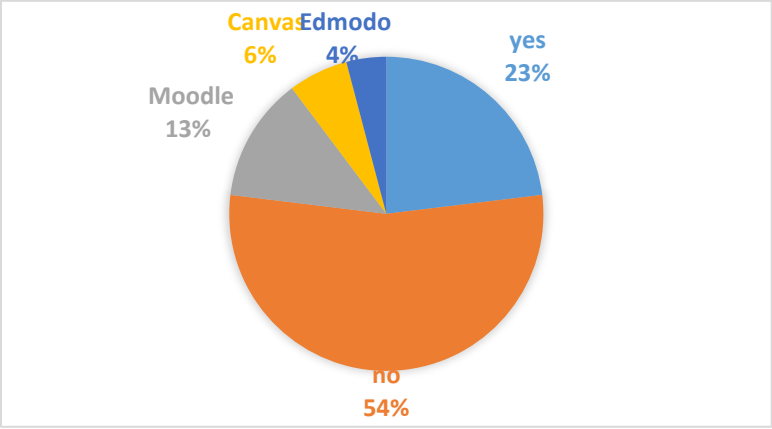
The students were asked if they want to attend a training course for the use of ICT tools and technologies regarding agricultural production and 143 students (95%) responded positively. This shows us that the students want and have the need for learning new materials regarding the development and applicability of digital technologies in agricultural production.

1. **Do you use online education platforms for your educational activities (e.g. Moodle, Canvas, Edmodo, Kahoot, etc.)**

Yes 45

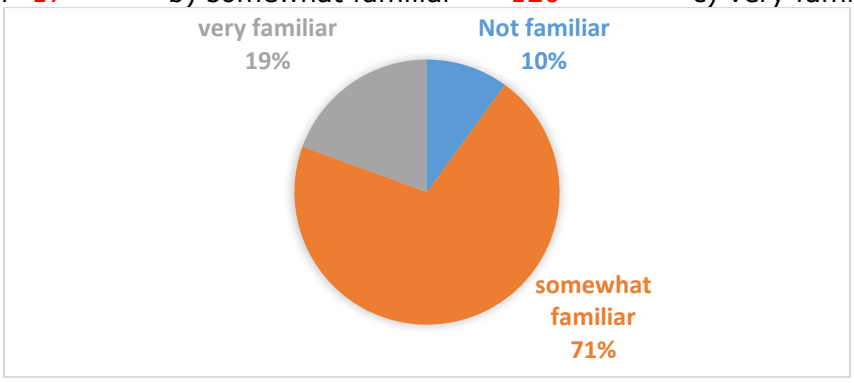
No 105

If 'yes', describe which ones you use.
we use Moodle 25
we use Canvas 12
and know Edmodo 8



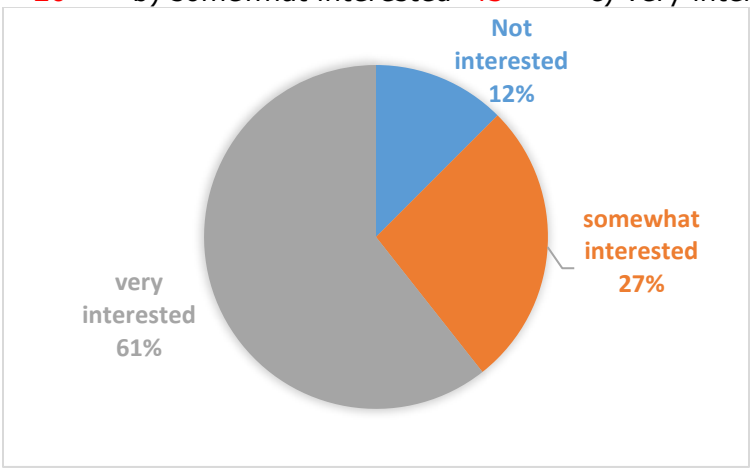
2. Familiarity with ICTs

a) Not familiar 17 b) somewhat familiar 120 c) very familiar 33



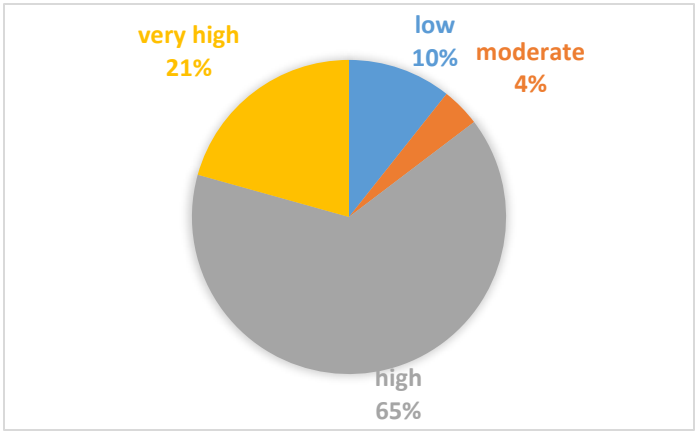
3. Your interest in using ICTs

a) Not interested 20 b) somewhat interested 43 c) very interested 97



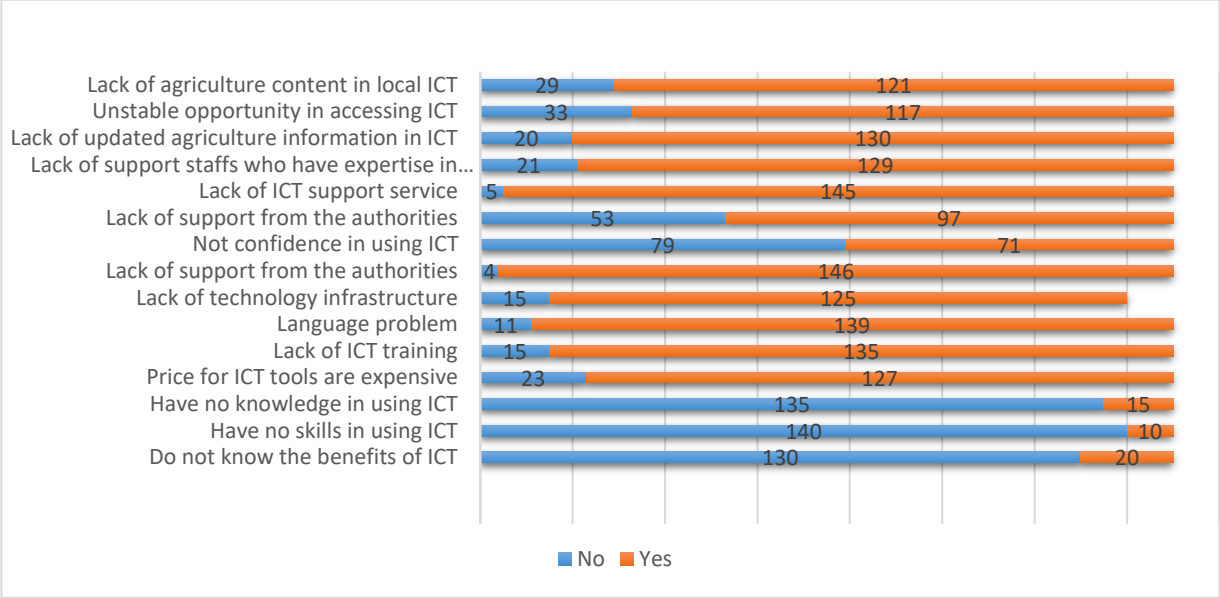
4. What do you think is the level of ICT contribution in raising productivity and agriculture development?

a) low 16 b) moderate 6 c) high 97 d) very high 31



5. What do you think are the problems and obstacles in using ICT

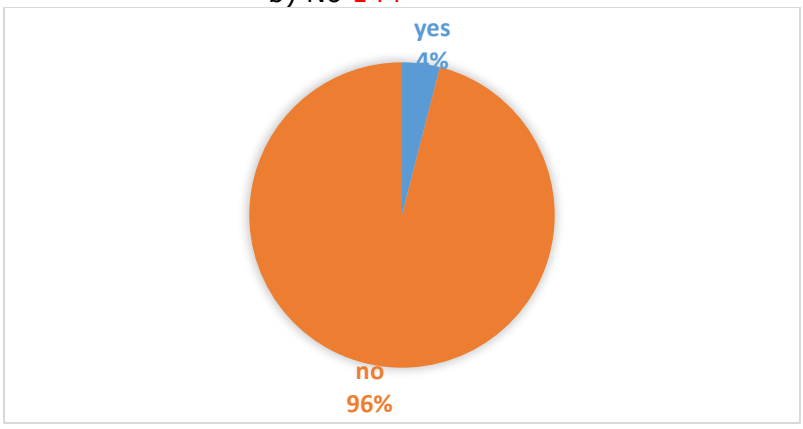
Figure 7 Problems and obstacles in using ICT



Source: 4 Farming 4.0

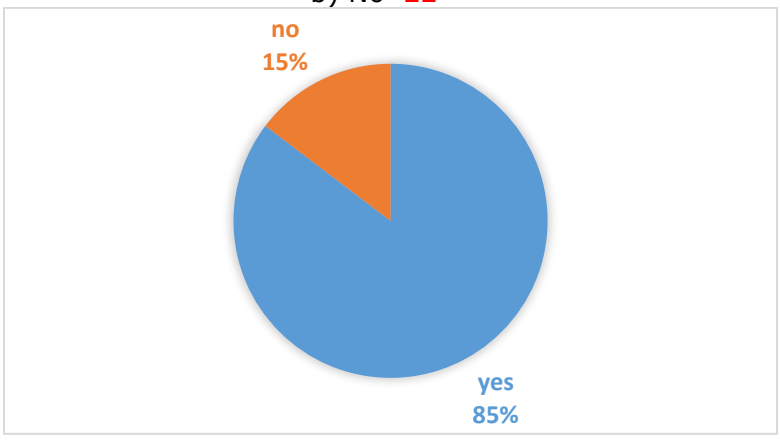
6. Have you ever received any ICT training in the past?

a) Yes 6 b) No 144



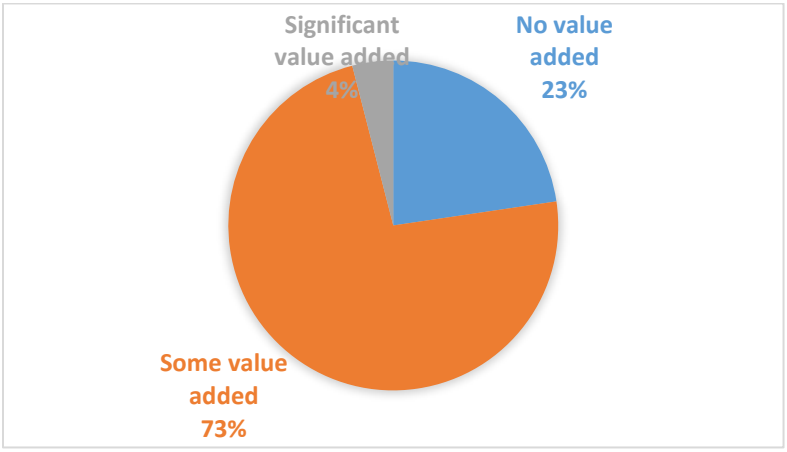
7. Do you support the adoption and use of ICTs within the farm activities?

a) Yes 128 b) No 22



8. Overall, to what extent do you feel that using ICT would increase the value added to far production?

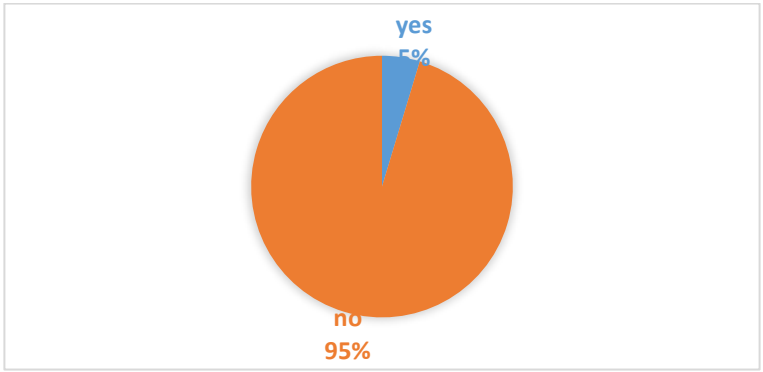
a) No value added 34 b) Some value added 110 c) Significant value added 6



9. Would you attend a training course to prepare you how to use agricultural ICT tools and technologies?

a) yes 143

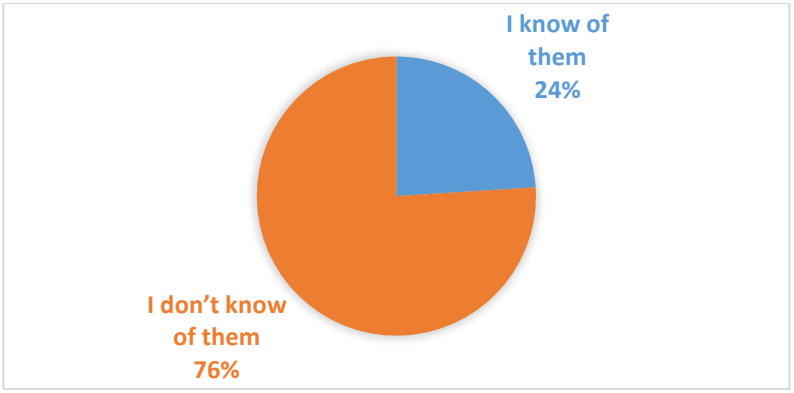
b) no 7



10. Do you know about navigation and automatic steering, the benefits and possible use?

a) I know of them 36

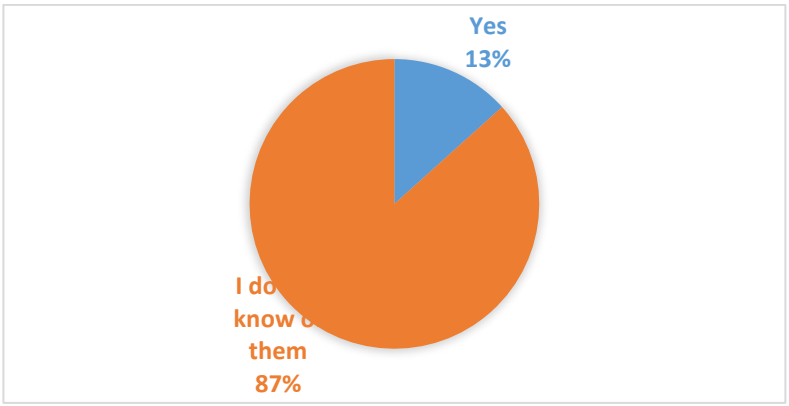
b) I don't know of them 114



11. Do you know how different sensors are used in precision agriculture?

a) Yes, 20

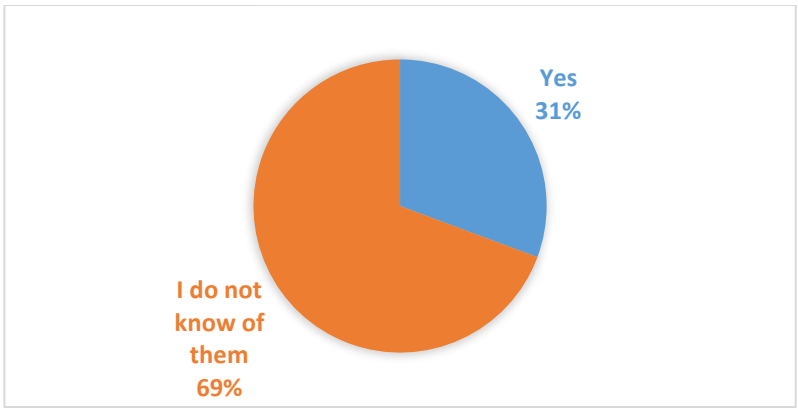
b) I do not know of them 130



12. Are you aware of the use of robotics in agriculture?

a) Yes 46

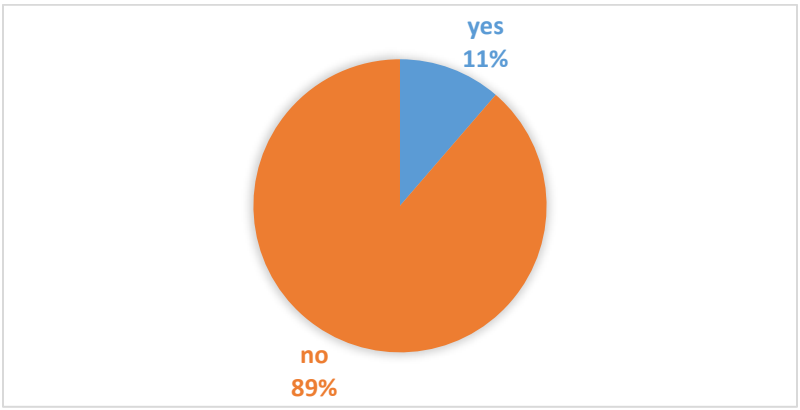
b) I do not know about this 104



13. Do you know what Copernicus and LandSat are?

a) Yes 17

b) No 133



Survey Results – Teachers Perspective

6 Survey results – Teachers Perspective

The third target audience, the teachers, had to answer a specifically created questionnaire with 39 questions. 70 teachers answered the questionnaire from seven different institutions (*Çanakkale Onsekiz Mart University, Balıkesir University, Adnan Menderes University, Ardahan University, Uludağ University, Namık Kemal University, Meslek Yüksek Okulları*)

6.1 Demography

The techniques and teaching methods implemented by these institutions depend on theoretical and practical training. The teachers that were part of the analysis have different ages, varying from 20-25 years old to 46-50 years old. It is important to mention that the teachers have different titles and professional involvement regarding the school activities (*as a research assistant, lecturer, Assistant Professor, Assoc. Prof., Full Professor, Agricultural Vocational High School teachers*). Their highest qualification regarding education was MSc (**71%**) and Vocational school (**29%**) in several different areas of expertise (*crop production, horticulture, livestock farming, and agricultural engineering*).
When the teachers were asked about whether their current curriculum includes **Vocational English for ICT lessons**, only **11%** of the teachers' responded positively. This answer explains the language as a problem for adopting ICTs among students.
There is a great need for adaptation of the existing curriculum with the subject for English language or adapting the vast amount of English literature to a form that can be understandable for the students in order to learn about the different ICT application in agricultural production. Additionally, when asked how ICT supports the functioning and development of their institutions **79%** of the surveyed teachers responded that it is indispensable for the functioning and development of the institution.

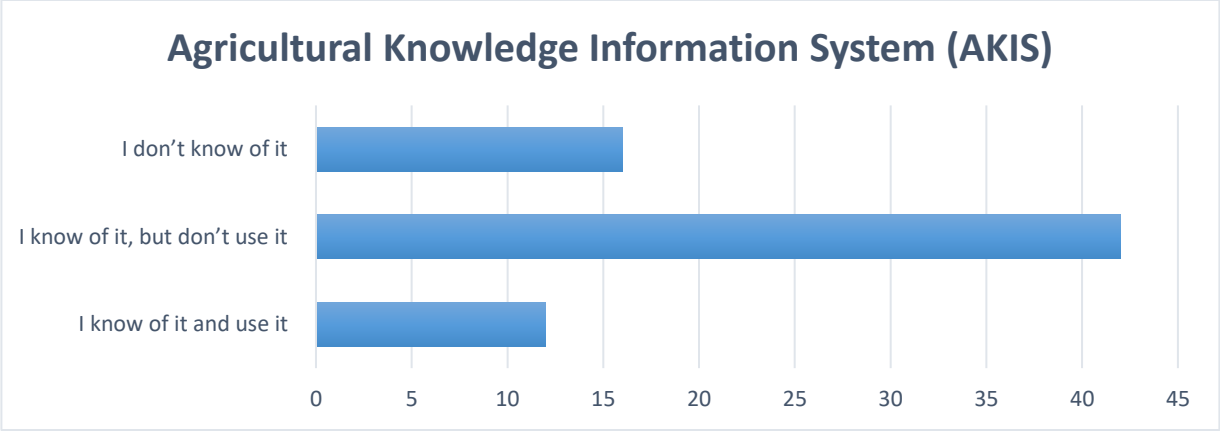
1. Please indicate your education

Vocational School	University / MSC
50	20

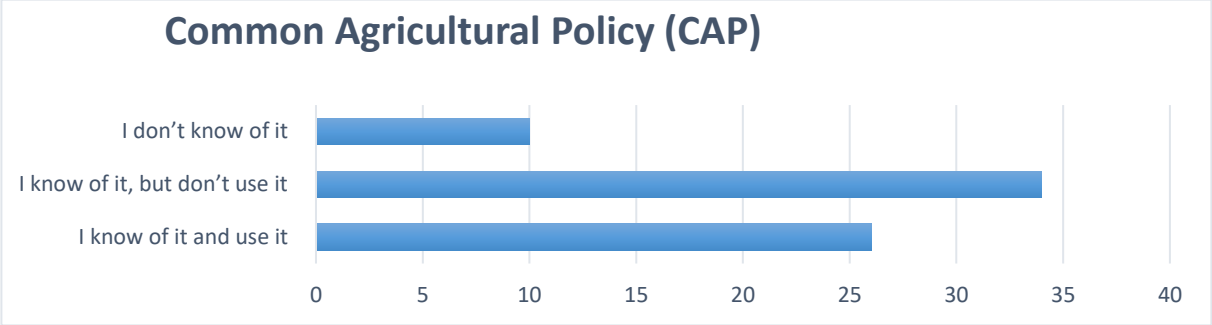
2. What is your area of expertise:

a) Crop production	10
b) Horticulture	20
c) Livestock farming	25
d) Agricultural engineering	15

3. Are you familiar with the term Agricultural Knowledge Information System (AKIS)



4. Do you know what the term Common Agricultural Policy (CAP) means?



6.2 Agricultural education and ICT tools

A series of questions were asked regarding the involvement of ICT tools in their agricultural education:

- For the question "*Do you use ICT tools related to agriculture in education*?"- **24%** of the surveyed teachers responded that they use agriculture-related ICT tools.
- For the question "*Do you use online education platforms for your educational activities (e.g. Moodle, Canvas, Edmodo, Kahoot, etc.?*)- **31%** of the surveyed teachers responded positively about the use of online educational platforms.
- For the question "*Do you include knowledge about agricultural information technologies in your curriculum/syllabus*"- **84%** of the surveyed teachers responded that they include knowledge about agricultural information technologies in their curriculum/syllabus.
- For the question "*Do you think that current curricula contain up-to-date, and sufficient, knowledge of agricultural ICT tools*"- **77%** of the surveyed teachers responded that the current curriculum contains some knowledge, but it is not enough for today's student.
- For the question "*Which factors hinder you most about incorporating knowledge and use of agricultural ICT tools into your teaching materials?*"- **39%** of the surveyed teachers responded that the main factor is the lack of online educational materials and **27%** responded that they lack understanding regarding ICT use and knowledge.

As the main source for enhancing their ICT competencies, the teachers use online resources, including OER (**Open Educational Resources**) study materials. Almost, all of

the teachers agreed about that is necessary to ensure that students need to become familiar with the latest technologies and the students need to have mandatory lessons for usage of agricultural ICT tools. If they had the opportunity, the results showed that **100%** of the teachers would incorporate the teaching of agricultural ICT tools into their curriculum.

The teachers needed to answer about their familiar concepts regarding ICT use and agriculture. The following answers are represented in the next graphic (Figure 4)

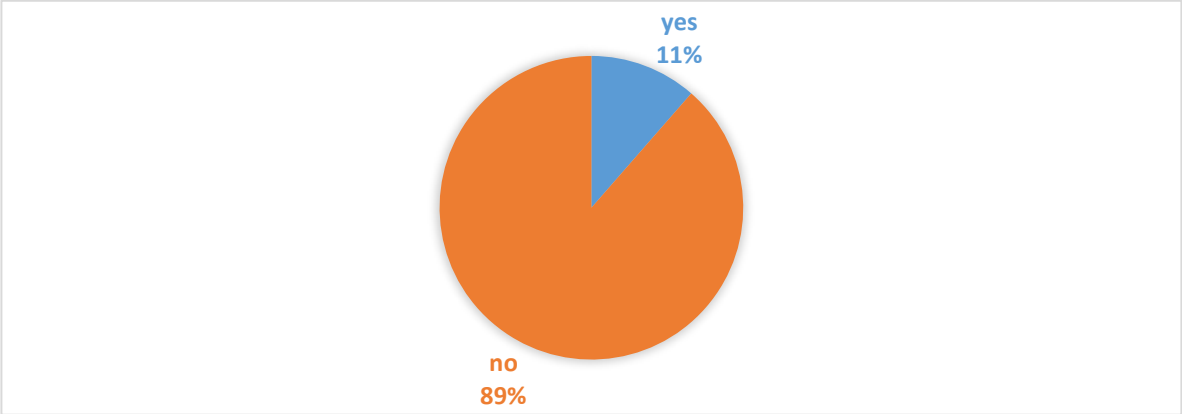
From the graphic, we can determine that the most familiar concept is Farming 4.0. The familiarity of this concept gives us a favorable situation for developing a curriculum with contents about the application of digital technologies in agriculture.

The second part of the questionnaire was about the teachers' knowledge of state-of-the-art agricultural technologies that are used in agricultural production:

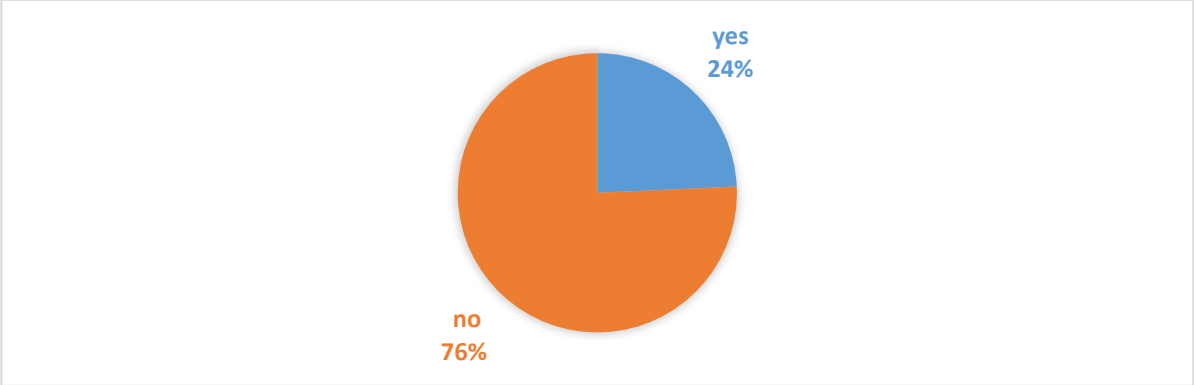
- "Navigation and automated steering"- **93%** gave a positive answer
- "Application of different sensors"- **48%** gave a positive answer
- "Different navigational systems"- **43%** gave a positive answer
- "Robotic applications"- **62%** gave a positive answer
- "Antenna and remote sensing"- **43%** gave a positive answer
- "Geographic Information Systems"- **85%** gave a positive answer
- "Software for remote sensing data analysis"- **6%** gave a positive answer

While the statistics of the teachers are showing moderate knowledge for the state-of-the-art technologies regarding agricultural production, we must have in mind that not all of the teachers are specialized for production processes that occur in agriculture. From this, we can conclude that the teachers' knowledge about above-mentioned technologies and concepts is on an adequate level, suitable for further development of the curriculum and incorporation of new material regarding ICTs involvement in agriculture and its processes.

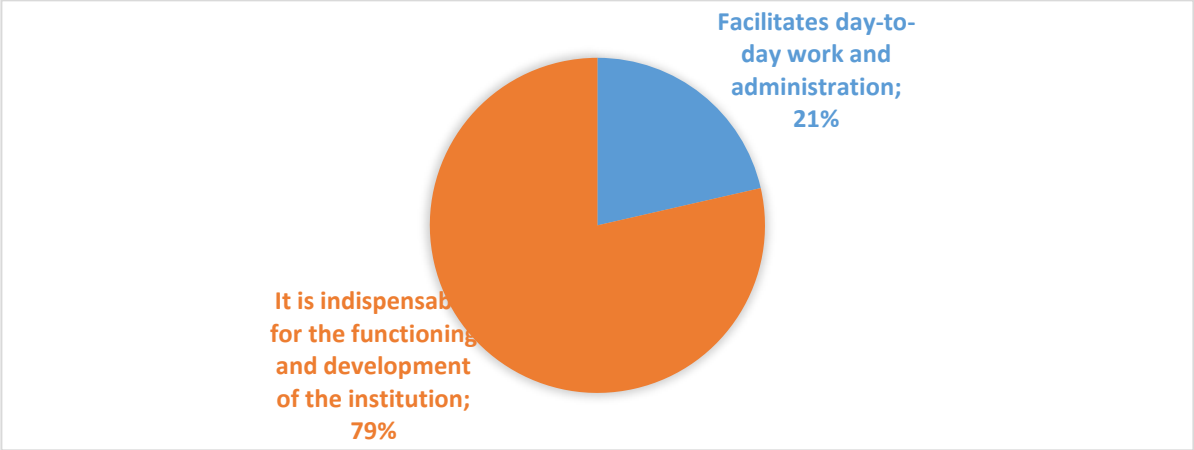
1. **Does the current curriculum in your school include Vocational English for ICT lessons?**



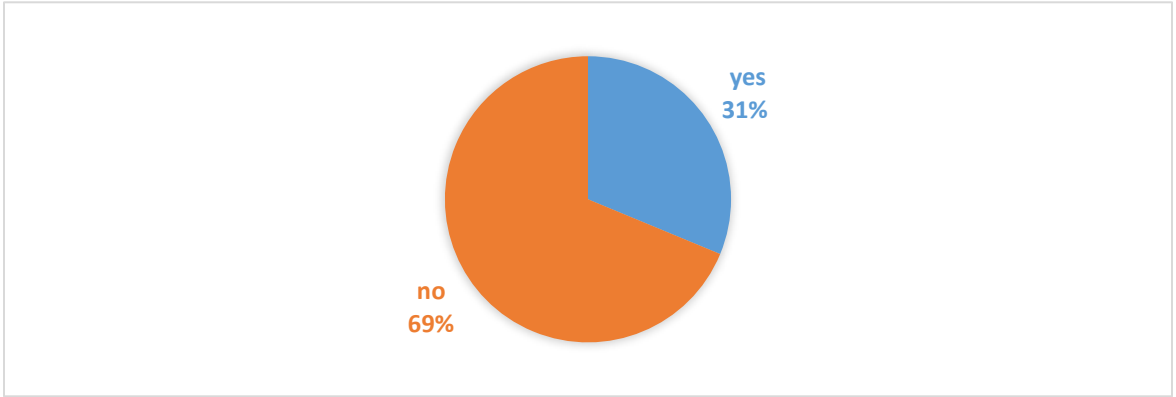
2. **Do you use ICT tools related to agriculture in education?**



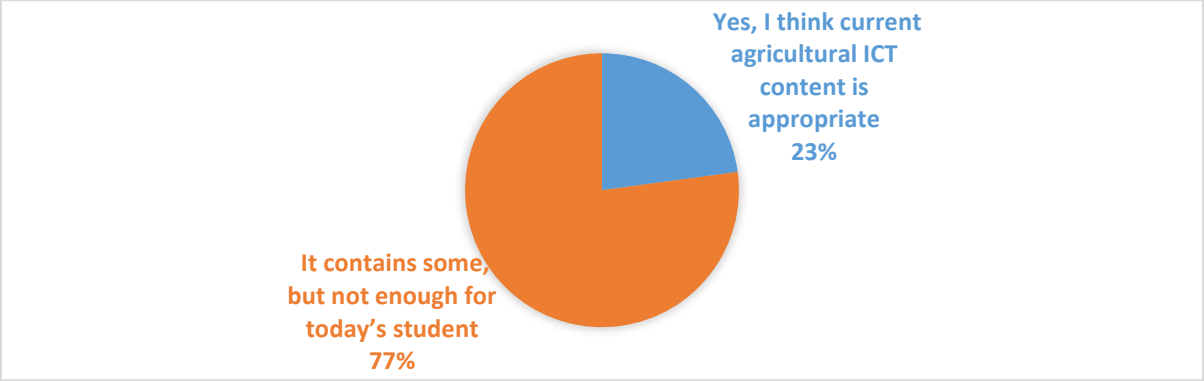
3. **How does ICT and technology support the functioning and development of your institution?**



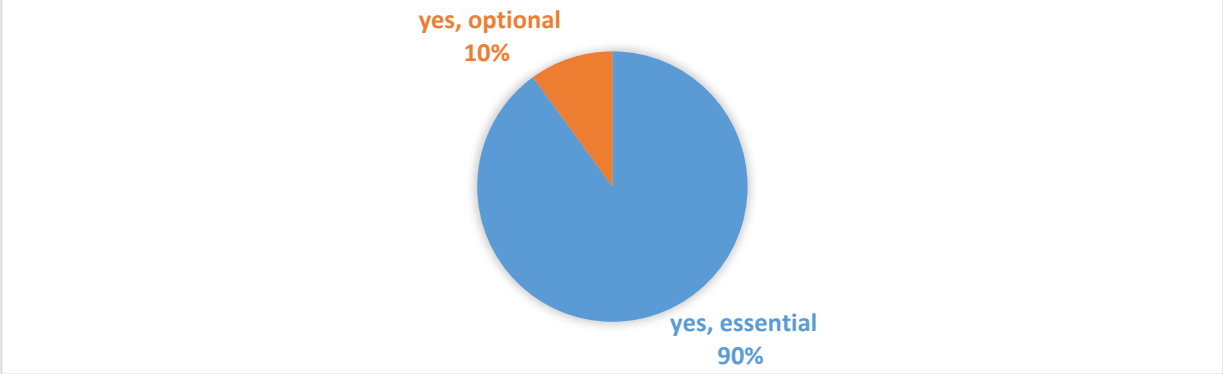
4. **Do you use online education platforms for your educational activities (e.g. Moodle, Canvas, Edmodo, Kahoot, etc.)**



5. **Do you think that current curricula contain up-to-date, and sufficient, knowledge of agricultural ICT tools?**

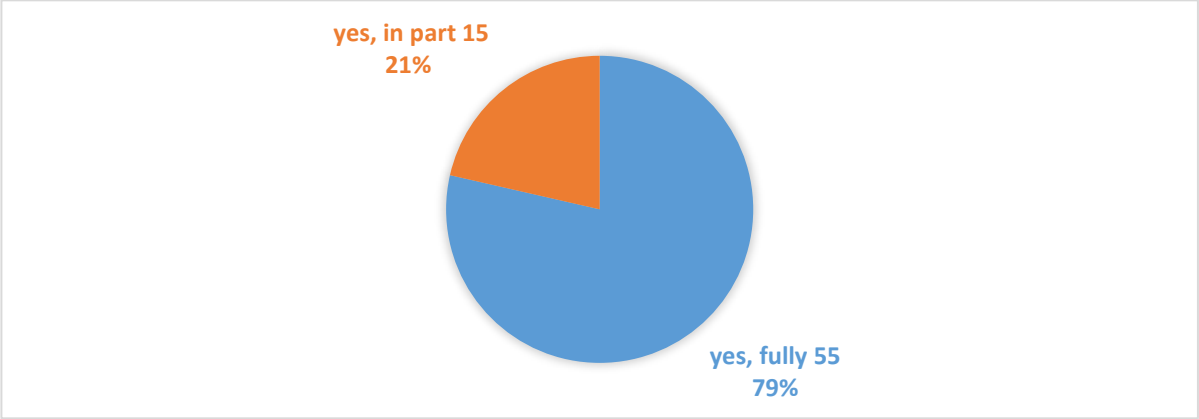


6. **Do you think that teaching students how to use agricultural ICT tools should be mandatory?**

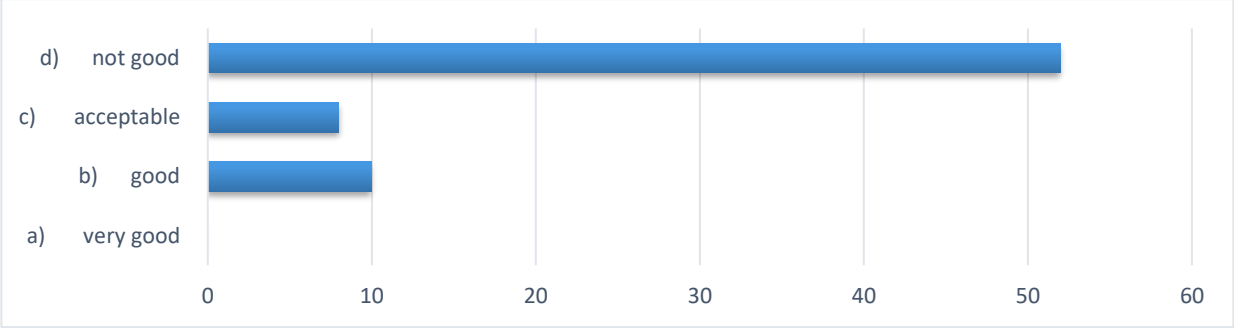


7. **Do you think it necessary to ensure that students become familiar with the latest technologies?**

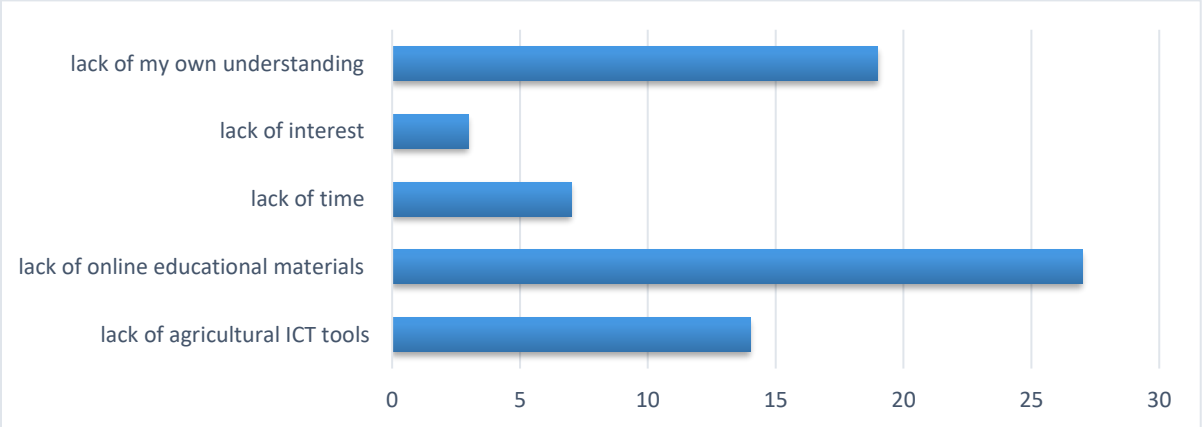
8. If you had the opportunity, would you incorporate the teaching of agricultural ICT tools into your curriculum?



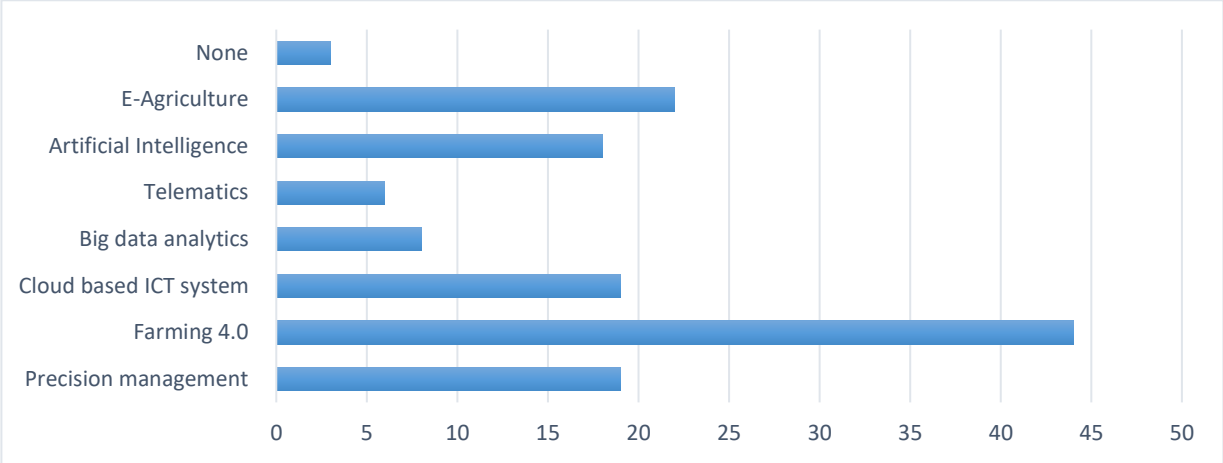
9. What is the quality of your school's Vocational English for ICT teaching



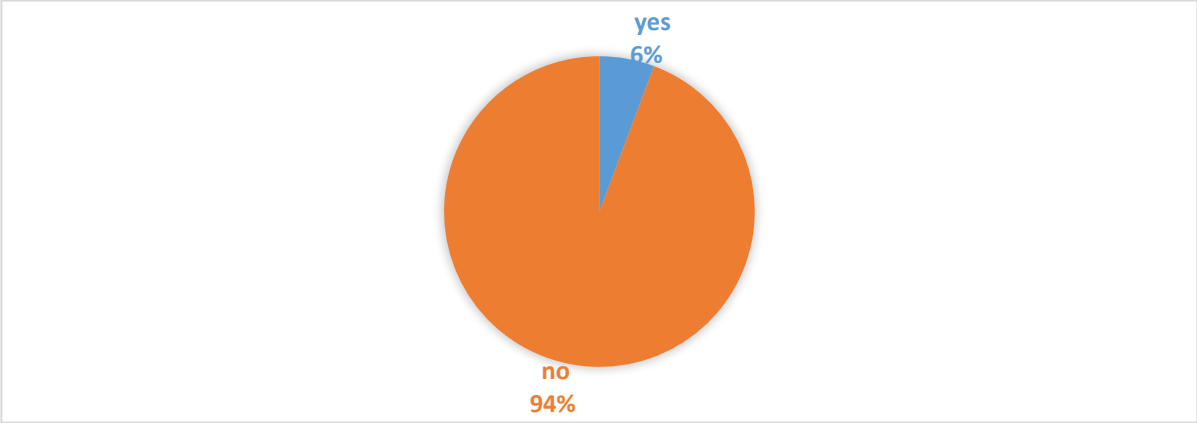
10. Which factors hinder you most about incorporating knowledge and use of agricultural ICT tools into your teaching materials?



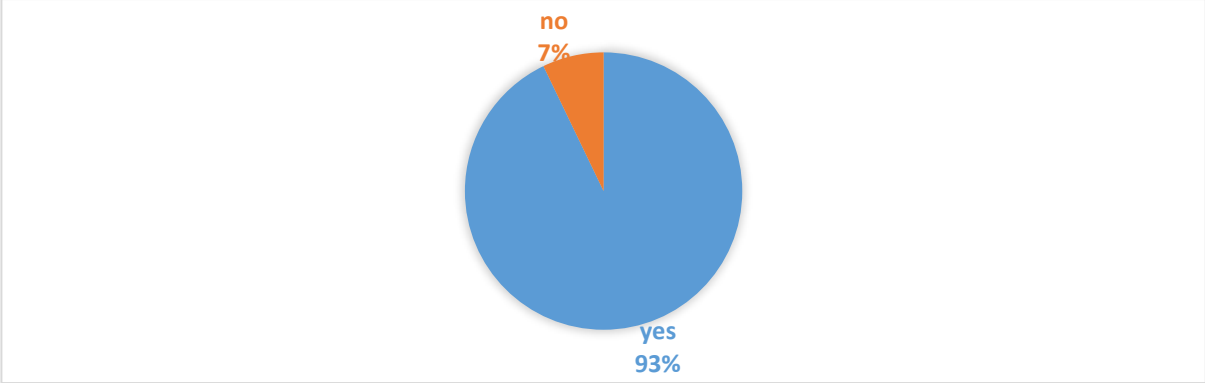
11. Identify which of the following concepts you know



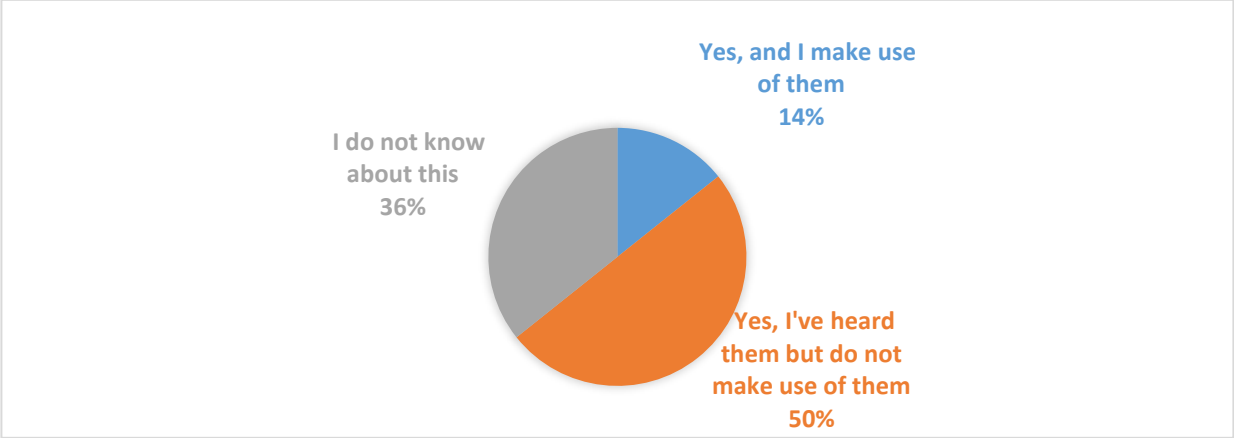
12. Do you use software for remote sensing data analysis?



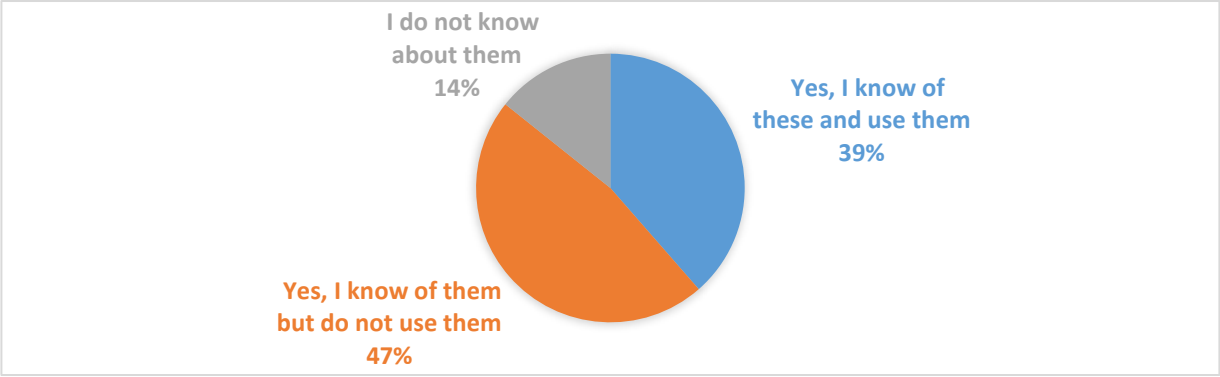
13. Do you know about navigation and automatic steering, the benefits and possible use?



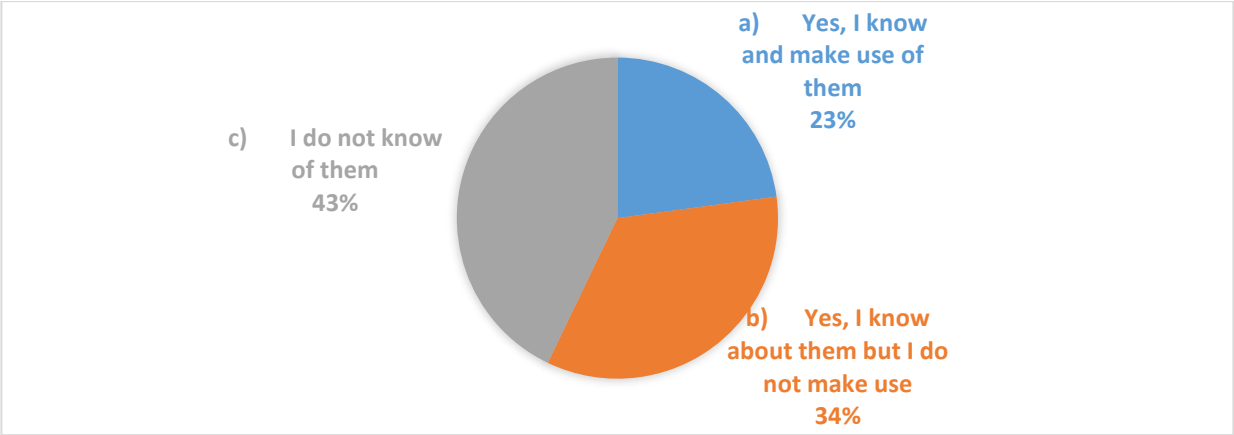
14.Are you aware of the use of robotics in agriculture?



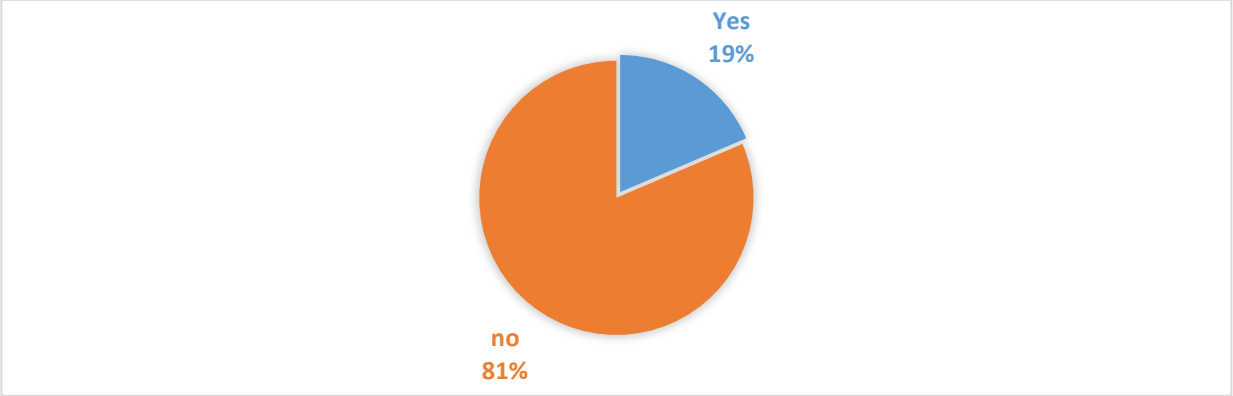
15.Do you know about Geographic Information Systems



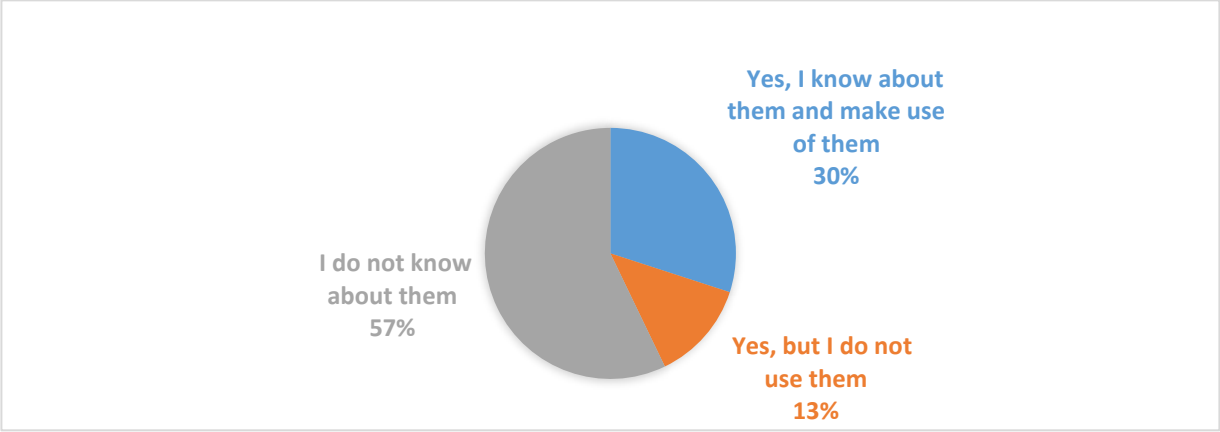
16.Do you know how different sensors can be used in precision agriculture?



17.Do you know what Copernicus and LandSat are?



18.Do you know how to use antenna and remote sensing?



Survey Results – Advisors Perspective

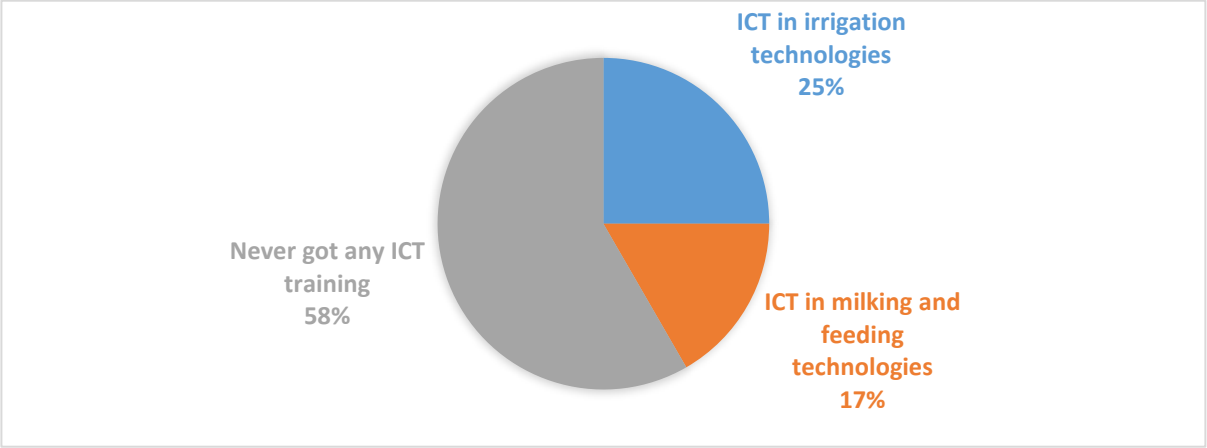
7 Survey results – Advisors Perspective

For the purpose of the project, 60 agricultural consultants were reached from the region of *Çanakkale, Balıkesir, Aydın* and their districts.
The questionnaire was consisted out from 18 questions, in which the agricultural advisors gave answers based on their experience, what are the limiting factors, impacts, and problems for introducing and implementing ICT technologies in the process for delivering advisory services.
The structure of the surveyed advisors was the following:

- 25 Freelance engineers
- 20 Public workers
- 15 Cooperative and employees in agricultural chambers

Advisors areas of expertise are mostly livestock, fruit and vegetable production and each advisor can serve approximately from 12 to 20 farmers (depending on the institution where they work). From the survey, **58%** of the advisors never had any type of ICT training, while **25%** of the advisors had training for implementation of ICT in irrigation technologies and **17%** of the advisors had training for ICT usage in milking and feeding technologies.

1. What type of training related to ICTs for advisory purposes, if any, has been provided to you as advisor, in the last 5 years



7.1 ICTs and Advisory services

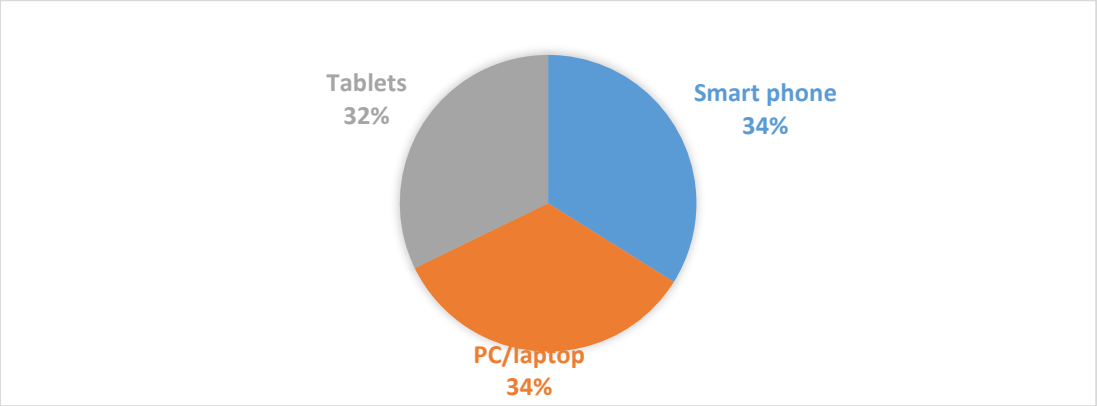
Most of the advisors **(75%)** are using ICT tools for delivering advisory services in milking and feeding technologies (*Robotic Milking*), while the other advisors (**25%**) are using ICT tools in advisory services in agricultural technology (*pest management, plant nutrition, water management etc*.)

With the help of the questionnaire, we discovered that the main problems for introducing ICTs in the process for delivering advisory services was the **financial aspect,** and based on their experience, the limiting factors that prevent advisors to use ICTs and adopt them faster in the process for delivering advisory services are:

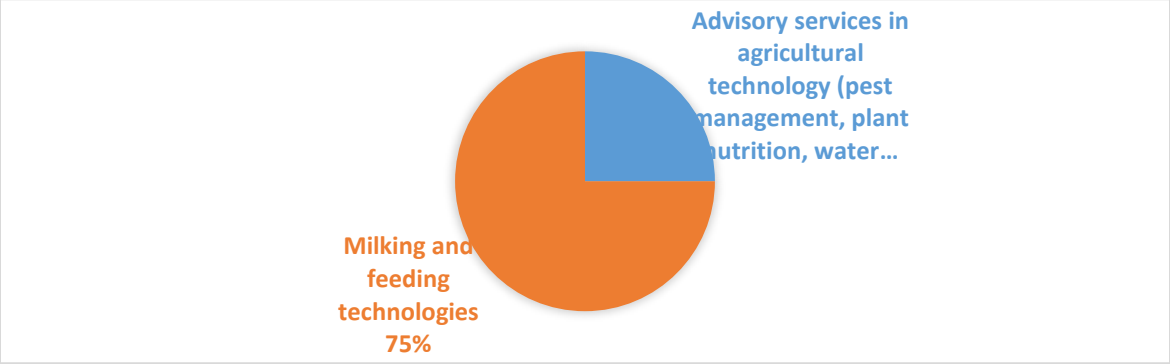
- deficiencies on educational level,
- lack of ICT education,
- fear of not knowing,
- disbelief without seeing the importance of ICTs

As the highest limitation factors that prevent farmers to use ICT in delivering advisory services (based on the advisor's experience), represent the **farmers' age** and the **farmers' educational level**. As a target group that can use and benefit from ICT based advisory services are in particular the young progressive farmers, entrepreneurs, and businessmen. These types of professionals have a great predisposition of adopting ICTs in their work, as well as, using ICTs for further upgrading and improvements of their processes by receiving ICT based advice. Possible measures that need to be undertaken, from the advisors perspective, for stimulation of farmers to adopt such technologies is through serious researches on Agriculture 4.0.

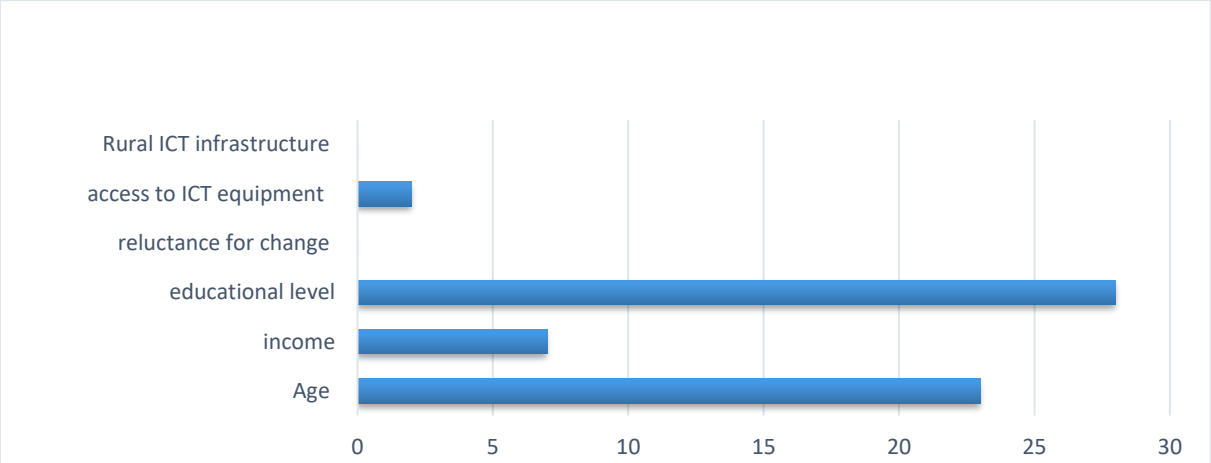
1. **What kind of ICT tools do you use in providing the services that you are responsible for**



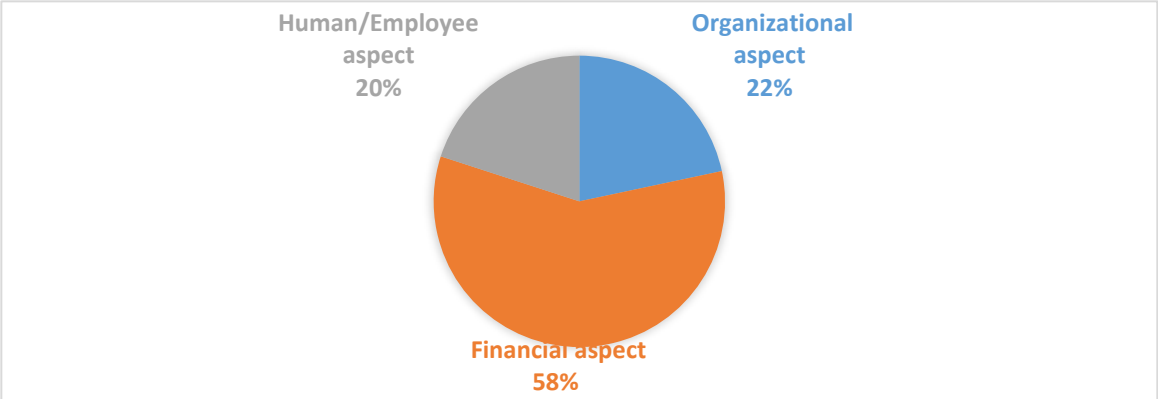
2. Where do you use ICTs in delivering advisory services



3. According to your experience, what are the limitation factors that prevents farmers to use ICT in delivering advisory services and adopt them faster



4. What type of problems did you face with when you started to introduce ICTs in the process for delivering advisory services



1. **Based on your experience, what are the limitation factors that prevents advisors to use ICTs and adopt them faster in the process for delivering advisory services (example: level of education; reluctance for changes; low interest; low motivation; etc.)**

The factors such as education level, lack of ICT education, fear of not knowing, and disbelief without seeing are important

2. **Based on your experience what is your position about the future of ICTs in delivering advisory services? Do you see more intensive usage of ICTs in Agricultural Extension in your country and on global scale?**

In particular young entrepreneur farmers and businessmen tend to have a high degree of predisposition to ICT the problem is that a significant number of farmers are primary school graduates and average 55 years of age.

3. **What are the factors (outside of you institution) that can stimulate or limit more dynamic adoption of these technologies in the process for delivering advisory services?**

Economic promotion of the stale (Ministry of Agriculture and Forestry) is very important, it is important that the ICT devices are at a price that can be purchased for farmers. And also the services of companies that market these devices and programs are also important

4. **What type of measure (as institution) do you take to overcome these challenges? (example: awareness campagnas, trainings etc.)**

Demonstration and regular service are especially important for Turkish farmers. In general, the Turkish farmer does not buy and use the application without seeing it.

5. **What type of measures, if any, I taken by your local and central government for usage of ICT for agricultural purposes, on farmers levels, thus usage of ICT in agricultural extension? Are there any policies for stimulation of adoption?**

The Ministry of Agriculture and Forestry, Scientific and Technological Research Council of Turkey, some Technical University (Konya Food and Agricultural University) to have serious research on agriculture 4.0 and motivating farmers and researchers.

8 Conclusion

Farming 4.0 as a global trend represents a concept, which is constantly changing, dynamic and fast evolving. To meet this demand the farmer and all the people that are involved in the agricultural production and processing must comply with the challenges of the introduction of new digitalized technologies and state-of-the-art concepts. This means that the people who want to adopt this trend need to be properly educated in the context of the principles of digitalization, to understand the concept of integration of IoTs in the agricultural processes, as well as to interpret the huge amount of data generated from the farm for their own financial benefit and preserving the ecosystem.

The advisor's responses, from the focused needs analysis based on their experience, showed that the main limiting factors for delivering advisory services through ICT are the poor educational level of the farmers and the farmer's age. From the questionnaire meant for the farmers, 51% of the surveyed farmers were in the age between 45-54 years and 73% of the surveyed farmers had an only elementary education.

This shows that the farmers' ability to learn new innovative concepts is very low. The use of ICT while performing agro-technical operations and daily tasks among the farmers is extremely low. With their poor ability for learning new innovative concepts, and their minimal understanding of ICT, (78% of the surveyed farmers use writing form as the main way of keeping records for carrying out farming operations) the farmers who want to implement the concepts of Farming 4.0, need to have constructive trainings, for introducing them to the beneficial characteristics of using ICT in the agricultural processes. Also stated, the advisors consider that demonstrations and regular services from the providers of different ICT tools are especially important for the farmers.

The students' responses are describing the same situation:

- **96%** of the students responded that they did not have any type of ICT training in the past
- **89%** of the students responded that there is a lack of technology infrastructure
- **87%** of the students responded that there is a lack of updated agriculture information in ICT

The student opinion for ICT use describes the following situation:

- **65%** of the students think that ICT use will have a high contribution in raising productivity and agriculture development
- **85%** of the students support the adoption and use of ICTs within farm activities
- **77%** of the students agreed that with the use of ICT can increase the added value to farm production

Despite the poor situation of uses and education about ICT in agriculture, the students have very positive thinking and support for the introduction of ICT in the agricultural processes. Associated with the positive opinion of the students regarding ICT, the surveyed teachers are sharing the same attitude that the current curriculum contain some information about digital technologies, but needs serious improvements with the latest basics, principles, and concepts concerning digital knowledge.

In the analysis of the infrastructural capacity for implementation of ICTs the results have shown that the sample has high infrastructural ability for implementation of basic and complex digital technologies that can play a significant role in the development of the farming business as well as in increasing of the efficiency and effectiveness of the farming operations. Almost all crucial mechanization among the surveyed farmers is produced after the year of 2000. More specifically the mechanization owned and produced after the year 2000 has the capability of adopting important digital technologies for modern agricultural production (Precision Agriculture), such as GPS, GNS, zoning, VRT in plant nutrition, seeding, and harvesting.

A significant amount of data, needed for the aim of the project, was gathered from the executed survey. This data will be a baseline for future decisions regarding the project and its aims toward the target audience.

The main conclusion from this focused needs analysis represents the fact that there is a lack of education for using digital technologies in agricultural schools and in the processes of agricultural production. On another hand, the advisors cannot provide suitable forms for the process of delivering advisory services, because of the same matter (lack of knowledge and skill for using ICTs among the target audience).

From this information, we can say that the results from the questionnaires are satisfactory to our project goals and help us define the specific needs of the previously mentioned target audience.