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INTERNATIONAL CENTER FOR AGRIBUSINESS RESEARCH AND EDUCATION

Baseline Assessment of Fruit Production Sector

"FRUITENIA" project

fruitenia

Yerevan, 2020

ACKNOWLEDGEMENT

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We believe that the project, once it achieves its goals, will become the driving force of the progress in the development of fruit production sector.

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ACRONYMS

ADA	-	Austrian Development Agency
ICARE	-	International Center for Agribusiness Research and Education
ANAU	-	Armenian National Agrarian University
AP	-	Academic program

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01. Introduction

Agriculture is one of the main sectors of the economic activity in Armenia and the main source of income for rural communities. Just like in the rest of the world, the Armenian agriculture is experiencing rapid growth. Availability of modern technologies, as well as agricultural practices create a need for highly qualified specialists in the labor market equipped with new knowledge, skills and abilities. The situation described is typical for the horticultural sector as well. The Armenian National Agrarian University (ANAU) as well as the agricultural colleges are the main responsible parties for training specialists in this field. The momentum of this field nowadays has created an urgent necessity to modernize vocational programs.

Considering the imperative, the International Center for Agribusiness Research and Education (ICARE), through funding from the Austrian Development Agency (ADA), has initiated the "Fruit Production Sector Development" ("FRUTENIA") project, thus striving to increase the competitiveness of the fruit production sector in Armenia.

The main goal of the project is to modernize the vocational education in the ANAU Department of Agronomy through improvement of the content of horticultural courses and creation of a modern Armenian-language professional literature.

Educational component of the project targets the professional training of the faculty for not only ANAU, but also for the agriculture-oriented colleges. In addition, it is envisaged within the project to create an informational platform for the industry representatives, establish an intensive demonstration orchard, develop and implement short courses for agronomists and other industry representatives aimed at the successful implementation of the project components.

A baseline assessment was conducted to ensure the success of FRUTENIA project, results of which are summarized in this report. The purpose of the baseline assessment was to study professional needs and industry gaps in the horticultural sector, elaborate a package of suggestions aimed at the successful implementation of the project components.

02. Baseline assessment methodology

This assessment has been carried out in February-March, 2020, in the scope of the for-year FRUTENIA project. The project is implemented by the International Center for Agribusiness Research and Education and funded by the Austrian Development Agency (ADA).

Due to the measures to prevent the spread of COVID-19 pandemic, all initial field assessment works have been carried out distantly.

In order to distinguish professional needs, educational gaps, and perspectives for the development of the fruit production sector, the assessment focused on the following aspects:

- Professional needs of the industry (lack of necessary narrowly focused specialists, *lack of professional skills of available specialists, issues regarding professional consultation in the sector)*
- Comparability of the requirements set by the representatives of the field towards horticulturists to the curriculum of the "Agronomy, Selection, Genetics" academic program,
- Fruit production -related professional potential and needs in active agricultural colleges in Armenia.
- Adjacent infrastructures contributing to the increase of the competitiveness of the sector:
    - Experimental and intensive demonstration orchard,
    - An e-platform containing materials on the fruit production industry.

A special attention was paid to peculiarities of inclusiveness. In particular, position of employers towards female, disabled, foreign and young employees and specialists in the sector was examined.

An online survey, as well as phone interviews with sector representatives (including employers, investors, NGOs, a company specialized in planting orchards, a consultant, nursery, orchard owner, etc.) were conducted in order to understand the current status of this sector. The online survey was conducted using the "Google form" tool, visibility of the survey was ensured on the online platforms of the agricultural community, as well as snowbank approach was used.

During the study, the following methods were used to ensure the participation of stakeholders in data collection and evaluation.

Individual qualitative interviews with the following groups:

- ANAU representatives (6 interviews), particularly:
    - Director of Center for Quality Assessment and Assurance,
    - Head of Career Development and Lifelong Learning Division,
    - Dean of the Department of Agronomy,
    - Chair of Horticulture and Plant Protection,
    - Chair of Crop Cultivation and Soil Science,
    - Lecturers of the Department of Agronomy,
- Orchard owners (9 interviews), the following criteria were considered for orchard selection:
    - Legal organizational form (self-employed/registered organization)
    - Area occupied by the orchard (small, medium, large),

- Cultivation method (intensive, organic and conventional orchards, as well as orchards containing attributes of "smart" agriculture[1]),

- Nursery owners (2 interviews) .
  - Owner of an organic nursery,
  - Owner of a conventional nursery,
- Head of an orchard design and planting organization (1 interview),
- Fruit production sector experts (2 interviews),
- Representatives of agricultural colleges (10 interviews).

Online survey (129 answers in total): The online survey was conducted among individuals who were in some way related to the fruit production sector (own an orchard, work in an orchard, experts/ consultants/ lecturers). It is worth noting that the survey did not ensure representativeness; however, answers were collected from all marzes of Armenia (characteristics of respondents are provided in Annex 1.1).

Document study – A study of curriculum of the "Agronomy, Selection, Genetics" academic program was carried out.

Online validation of evaluation results – was implemented together with representatives of the Department of Agronomy. As a result of the evaluation, sector representatives articulated requirements for horticulturists, which subsequently were validated by representatives of the Chair of Horticulture and Plant Protection and the Chair of Crop Cultivation and Soil Science of the Department of Agronomy (18 representatives, 6 of which had mentioned that they lectured the "Fruit Growing" course).

Toolkit of the evaluation is presented in Annex 4.

[1] In particular, availability of a drone and a meteorological station was mentioned.

03. Results of the study conducted among representatives of the fruit production sector

Issues in fruit production sector

The study has shown that professional gaps in fruit production are mainly expressed in design and planting, and later on, in the maintenance of the orchard.

Orchard design and planting

In case of the orchard planting for industrial use, an investor and/or investing organization needs to have confidence that they will not lose investments due to imprecise or incomplete consultancy. In these circumstances it was noted that local specialists and specialized organizations avoid giving any guarantees, which tampers the investor to cooperate with specialized foreign organizations.

The next problem in this phase would be the fact that the number of **specialized organizations** providing comprehensive orchard planting services and, starting from orchard design, could provide guaranteed consultancy throughout all the phases, is limited in the country. **In this regard, the sector is open for the development of specialized organizations providing comprehensive services for orchard planting.**

The following **issues** regarding the establishment phase of the orchard were outlined by sector representatives:

- There is a shortage of nurseries specializing in different varieties in the country.
- The country lacks nurseries which provide certifications of **countries of origin** for rootstocks: on the one hand, local nurseries are not reliable; on the other hand, any individual can sell rootstocks, thus complicating the operation of nurseries.
- Nurseries find it difficult to produce rootstocks of **new and different** varieties, as the grafting of each variety requires an import of vaccines from abroad, as well as availability of **limited professional knowledge and experience** for vaccination of a given variety.
- Due to the lack of narrowly focused specialists, investors avoid establishing specialized nurseries for the time being (the owner of an orchard mentioned that he had imported his walnut trees from Italy, having paid 14-15 Euros per rootstock, and also believed that if there was a local production, he would have been able to purchase the very same rootstock for 3 Euros).
- In case of importing rootstocks, there are obstacles at the border: the examination process is specifically lengthy (might take days), during which, due to shelf life expiration, rootstocks may take damage and never intergraft.
- After successfully importing the rootstocks there is a need for **skilled specialists for cultivation of a specific variety before planting** (root disinfection, cutting, proper pruning of branches), also there are nuances depending on varieties,
- In case of large quantities of rootstocks, number of "**taskmasters**" with extensive knowledge in fruit production and orchard planting, who could manage groups conducting fieldworks, take correct cues through project/coordinates, correctly determine the distance between trees, be aware of tree varieties, pruning of a specific variety, etc., is low.

In case of establishing intensive orchards, there is a lack of information, in particular, on supporting aids.

- **Anti-hail nets (correct height, mesh fiber density, type),**
- **Related technologies** (application of renewable/solar energy in orchards).

Box 1: Information needs in fruit production sector

In the orchard design phase, in addition to professional potential, the industry also needs **reliable data**, particularly:

- Available information on soil classification, designation, as well as status (occupied/ free),
- Availability of annual weather forecast time series data for each region/ settlement,
- Information on relevant soil types for each region/ settlement based on soil characteristics and topography.

Orchard maintanence

The study has shown that there is a lack of knowledge and expertise in case of **intensive orchard maintenance** as well. **Diagnosis of diseases**, **treatment**, **pruning**, **plant nutrition**, and **soil fertilization** are particularly problematic for fruit trees of each variety.

Gardens suffer because of troubles in diagnosing diseases. As the respondents mentioned, there are cases when trees just dry down, reasons of which they never find out. In this respect, each variety again requires a special approach and narrow professional knowledge.

Those who own traditional orchards are interested in professional advice on how to transform the garden from **conventional to intensive**.

Professional gaps and development needs in fruit production sector

The study has shown that there is a shortage of narrowly focused specialists in the field. In particular, the following specialists were mentioned:

- narrowly focused specialists (consultants) for walnut trees: as mentioned by sector representatives, even a good agronomist is not aware of walnut trees, specifically about **pruning nuances or pollination**,
- grower specialized in walnut trees,
- specialist in modern methods of obtaining organic rootstocks and grafting,
- specialist in mechanization and management of smart orchards, who will be able to mechanically implement diagnosis of diseases and hydration,
- evaluators of climate impact on fruit trees,
- crisis sales planner,
- specialist in new varieties (e.g. fig, peach, blueberries), which have great yielding potential in terms of exports,
- intensive greenhouse orchard specialist.

The study has shown that although there is no shortage of agronomists with general specialization in the sector, **available specialists still have little knowledge and experience in intensive orchards**. According to sector representatives, specialists in this field should develop their professional knowledge and skills in the following directions:

- Full knowledge of the biological stages of the plant, especially new dwarf and semi-dwarf fruit trees;
- Diagnosis of plant disease, necessary treatment, correct application of medicinal substances, plant nutrition, soil fertilization;
- Appropriate pruning for each variety;
- Determining the right variety based on the climatic conditions of the terrain.

Participants mentioned that they do not always find well-grounded consultancy on intensive orchards, for instance, "pole height must be four meters; when you ask them why, you never get a reasoned explanation". Horticultural employers nowadays need proven and guaranteed consultancy.

While speaking of professional gaps in the sector, respondents mentioned several main reasons, such as:

- "Low quality" of the education provided by the Agrarian University;
- Low salary level in the sector;
- Preference given to foreign specialists by investors.

Sector representatives also mentioned about the difficulties in getting information about available specialists.

Box 2: Expectation of orchard owners from application of innovative approaches

The study showed that growers are interested in innovative approaches that will help achieve the following results:

- Improve qualitative characteristics of soil;
- Increase the yield of orchard;
- Improve the product appearance in the market.

In this regard, industry representatives are interested in new varieties that will be highly productive and will conform to climatic conditions in the country.

Validation of requirements for horticulturists with the participation of the representatives of ANAU Department of Agronomy

Based on participatory principles of the project, for the purpose of improving the curriculum of the "Agronomy, Selection, Genetics" academic program, different stakeholders have been engaged in the baseline assessment. As a result, professional needs in the sector and/or requirements for horticulturalists were identified and grouped. A total of 35 requirements for horticulturists have been rendered and presented to the faculty of the chairs of Horticulture and Plant Protection and Crop Cultivation and Soil Science of

the ANAU Department of Agronomy with the statements made during the study process of the validation stage.

For the purpose of comparison of the "Agronomy, Selection, Genetics" academic program and the rendered 35 Requirements each chair has recommended 12 lecturers related to the specialty of fruit production. Consequently, 18 out of recommended 24 lecturers have participated in the assessment, 11 of which are with the Chair of Horticulture and Plant Protection (6 of which had stated that they teach fruit production), and 7 are with the Chair of Crop Cultivation and Soil Science. Heads of the two chairs also participated in the validation.

Due to limitations related to COVID-19 pandemic, validation has been implemented online. In some cases, when lecturers were not able to participate due to failures in home internet connection, interviews were conducted via phone discussions instead.

Regarding each of the 35 requirements for fruit production specialists, lecturers have responded to the following questions:

- Through which syllabus/syllabi of the "Agronomy, Selection, Genetics" academic program is the needed knowledge/ability/skill formed to meet a specific requirement?
- What topics, included within the course taught and corresponding to their competency, contribute to the formation of a knowledge/ ability/ skill?
- What literature is used during the formation of a specific knowledge/ ability/ skill?
- In their view, how important is a knowledge/ ability/ skill for the profession of "Fruit Production"?

During the outcome analysis, the weighted average grade of the requirements for the horticultural specialist has been calculated based on the following principle:

Weighted average = V1*0.5 + V2*0.25 + V3*0.25

V1 = Arithmetic mean of grades marked by the lecturers of the "Horticulture" subject
V2 = Arithmetic mean of grades marked by the lecturers of the Chair of Horticulture and Plant Protection (excluding the lectures of the "Horticulture" subject)
V3 = Arithmetic mean of grades marked by the lecturers of the Chair of Crop Cultivation and Soil Science

It is noteworthy that 33 of the 35 requirements identified as a result of the baseline study received an average weighted score of 3.3 in importance out of the 4 maximum, and the lowest grade was at 3.0, which also corresponds to the "important" grade. **In other words, the vast majority of the faculty considered the requirements generated during the study as "important for the fruit production course".**

Participation of the ANAU faculty has allowed to present final outcomes of the general academic program out of the conclusive results of course training that lead to them (Figure 1):

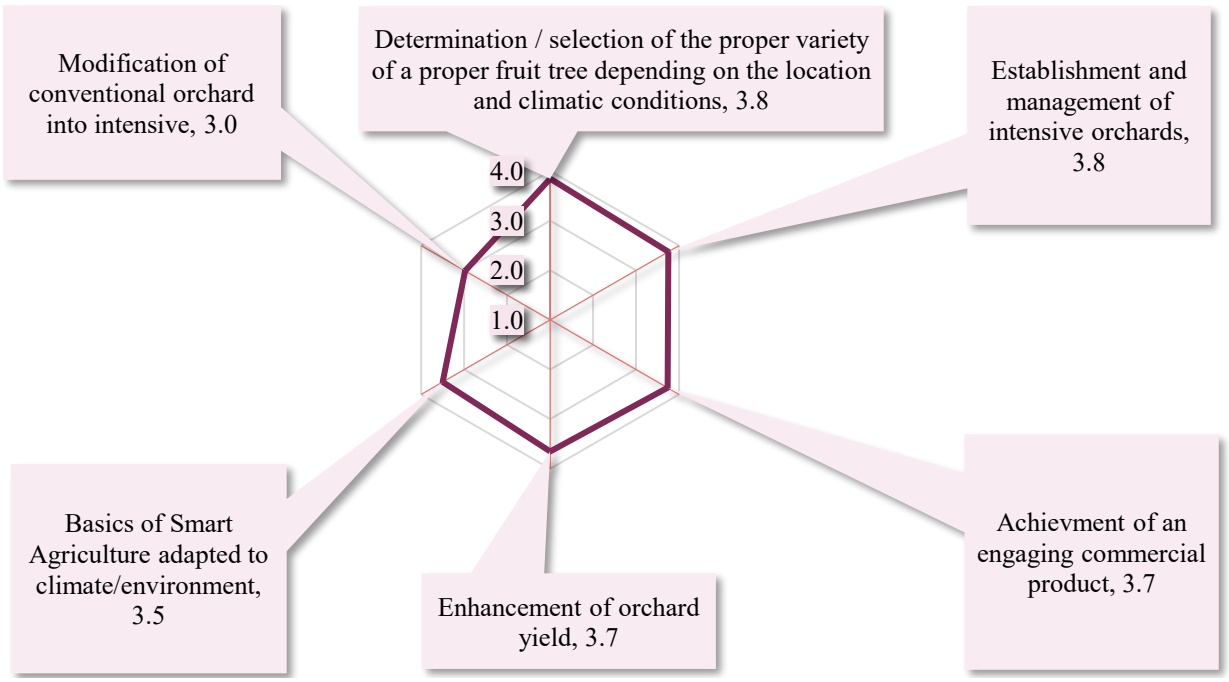


Figure 1. Average weighted score of the validity of requirements towards horticultural specialist (level of final outcomes of the academic program)

According to specialists, knowledge/ abilities/ skills presented in the aforementioned figure, are rather considered to be final outcomes of the academic program, formation of which should materialize as a result of the logical sum of outcomes of separate course learning outcomes. However, it is worth mentioning that in terms of feasibility, some employer needs, such as the "Modification of conventional orchard into intensive", has generated a contradictory position among lecturers of "Horticulture" course.

It should also be mentioned that the representatives of the Chair of Horticulture and Plant Protection emphasize the importance of "Enhancement of orchard yield" (3.6) and "Achievement of an engaging commercial product" (3.8) requirements as they are inclined to consider the orchard from industrial standpoint.

And now let's collectively address the demands of sector employers (for the list of weighted averages in descending order refer to Annex 3, Table 24).

1. Plant nursery. Representatives of the Department of Agronomy highly emphasized the importance of requirements/ needs, such as "modern nurseries" (weighted average of 3.9), "production of new seedling varieties in nurseries" (weighted average of 3.8). "Organic nurseries, grafting, organic plantlet-production" formulation scored relatively lower grades (weighted average of 3.5). Explanation behind this circumstance is that some experts do not consider it reasonable to produce organic seedlings in nurseries as they give a lot of credit to the growth and overall health of seedling in the nursery stage, and, according to experts, all possible outcomes will leave the plant before even planting.

According to specialists, in order for students to get the knowledge/abilities/skills necessary for meeting requirements/ needs of a given group, they should take the "Plant Nursery", "Horticulture" "Variety Studies of Fruits, Berries and Grapes", and "Basics of Organic Agriculture" course group. (Table 1):

Table 1: Courses relating to Plant Nursery and number of lecturers who have selected them

	Course	Number of lecturers (18 in total)	%
Requirement 1.1: modern nurseries			
	Plant nursery	17	94.4%
	Horticulture	12	66.7%
Requirement 1.2: Production of seedlings of new varieties in nurseries			
	Plant Nursery	15	83.3%
	Variety Studies of Fruits, Berries and Grapes	11	61.1%
	Horticulture	9	50.0%
Requirement 1.3. Organic nurseries, grafting, organic plantlet-production			
	Plant Nursery	13	72.2%
	Horticulture	13	72.2%
	Basics of Organic Agriculture	11	61.1%
	Variety Studies of Fruits, Berries and Grapes	6	33.3%

2. Establishing an orchard. As mentioned by the lecturers teaching Horticulture at the Department of Agronomy, within the syllabus of their course, students are informed on where to get information on soil in specific area (from Cadastre), as well as on weather conditions in previous years (from the meteorological station). From the perspective of the lecturers, it is essential for horticulturists to choose the right type and variety for rearing, leaning towards the available information on qualitative characteristics and climatic history of soil. This specific requirement has scored a weighted average grade of 3.8 for the "Horticulture" specialization. Courses addressing those requirements/needs, as well as number of lecturers selecting them, are presented in Table 2-ում.

Table 2: Courses relating to orchard establishment and number of lecturers who have selected them

	Course	Number of lecturers (18 in total)	%
Requirement 2.1: Calculation of tree spacing during the establishment of orchards depending on the variety			
	Horticulture	18	100.0%
	Variety Studies of Fruits, Berries and Grapes	7	38.9%
	Viticulture	6	33.3%
Requirement 2.2: Seedling maintenance before planting – pruning, root cutting, disinfection, etc.			
	Plant Nursery	13	72.2%
	Horticulture	13	72.2%
	Phytopathology	7	38.9%
Requirement 2.3: Orientation with projects and coordinates during orchard establishment			
	Horticulture	11	61.1%
	Plant Nursery	6	33.3%
	Viticulture	5	27.8%
Requirement 2.4: Determining the right type and variety of a fruit tree based on location and climatic conditions ***(academic program level)***			
	Horticulture	18	100.0%
	Variety Studies of Fruits, Berries and Grapes	15	83.3%
	Agrometeorology	11	61.1%
	Soil Science	9	50.0%

	Agrochemistry	8	44.4%
	Viticulture	8	44.4%
	Entomology	7	38.9%
	Phytopathology	7	38.9%
	Arable Farming	7	38.9%
	Plant Nursery	7	38.9%
	Plant Physiology Based on Biochemistry	6	33.3%
	Agroecology and Environmental Protection	6	33.3%
	General Principles of Artificial Selection	5	27.8%
Requirement 2.5: Establishment and management of organic orchards			
	Basics of Organic Agriculture	14	77.8%
	Horticulture	13	72.2%

3. Orchard maintenance: The following two requirements/needs received the highest score from this group:

- ♣ Diagnosis of plant disease, implementation of necessary treatment, proper use of medicines (4.0)
- ♣ Proper pruning meant for each variety (4.0).

It has emerged that the importance of plant health and proper pruning is equally emphasized both in labor market and in academic environment. Soil fertilization, plant nutrition, pest, weed and rodent control are also emphasized. It is noteworthy that the orchard owners who cultivate walnut trees give a lot of importance to the narrow specialization of walnut varieties. Courses for accommodating each of the requirements/needs are presented in the table below.

Table 3. Courses related to orchard maintenance and number of lecturers selecting them

	Course	Number of lecturers (18 in total)	%
Requirement 3.1: Diagnosis of plant disease, implementation of necessary treatment, proper application of medicines			
	Phytopathology	15	83.3%
	Entomology	8	44.4%
	Horticulture	6	33.3%
	Variety Studies of Fruits, Berries and Grapes	5	27.8%
Requirement 3.2: Pest, weed and rodent control			
	Entomology	17	94.4%
	Phytopathology	10	55.6%
	Arable Farming	6	33.3%
Requirement 3.3. Proper pruning for each variety			
	Horticulture	18	100.0%
	Variety Studies of Fruits, Berries and Grapes	8	44.4%
	Plant Nursery	7	38.9%
	Viticulture	7	38.9%
Requirement 3.4. Modern pruning methods			
	Horticulture	17	94.4%
	Viticulture	6	33.3%

Requirement 3.5. Soil fertilization			
	Agrochemistry	14	77.8%
	Soil science	13	72.2%
	Basics of Organic Agriculture	9	50.0%
	Horticulture	7	38.9%
Requirement 3.6. Soil quality/ health improvement			
	Soil Science	17	94.4%
	Arable Farming	12	66.7%
	Agrochemistry	10	55.6%
	Basics of Organic Agriculture	8	44.4%
	Basics of Amelioration	8	44.4%
	Microbiology	6	33.3%
	Horticulture	5	27.8%
Requirement 3.7. Plant nutrition			
	Agrochemistry	14	77.8%
	Horticulture	10	55.6%
	Soil science	8	44.4%
	Plant Physiology Based on Biochemistry	6	33.3%
	Basics of Organic Agriculture	6	33.3%
Requirement 3.8. Nut trees (biological stages of the plant, pruning, maintenance, etc.)			
	Horticulture	18	100.0%
	Variety Studies of Fruits, Berries and Grapes	8	44.4%
	Plant nursery	7	38.9%

4. Productivity and yield: Lecturers who took part in the validation also emphasized the importance of productivity and yield requirements. Since orchards are often planted for industrial purposes, lecturers give a lot of credit to the need of increasing the yield of orchards (3.7), improving product appearance in the market (3.7), as well as proper storage and transportability of the yield (3.6). Table 4 lists the courses that meet the requirements of this group.

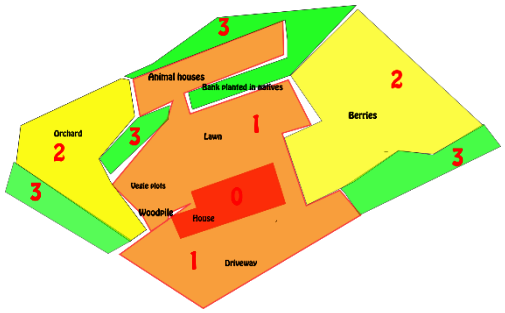
Table 4: Courses relating to the productivity and yield of the orchards and the number of lecturers choosing them

	Course	Number of lecturers (18 in total)	%
Requirement 4.1. Production of marketable product (academic program level)			
	Horticulture	13	72.2%
	Entomology	8	44.4%
	Phytopathology	8	44.4%
	Variety Studies of Fruits, Berries and Grapes	7	38.9%
	Agrochemistry	5	27.8%
	Basics of Organic Agriculture	5	27.8%
	Viticulture	5	27.8%
Requirement 4.2. Enhancement of orchard productivity (academic program level)			
	Horticulture	13	72.2%
	Agrochemistry	11	61.1%
	Variety Studies of Fruits, Berries and Grapes	10	55.6%

	Entomology	8	44.4%
	Phytopathology	8	44.4%
	Soil science	6	33.3%
	Agricultural Mechanization, Machinery and Equipment	6	33.3%
	Basics of Organic Agriculture	5	27.8%
Requirement 4.3. proper storage and transportability of the yield			
	Horticulture	11	61.1%
	Variety Science of Fruits, Berries and Grapes	6	33.3%

Plant nursery

- ♣ Modern nurseries (3.9)
- ♣ Production of seedlings of new varieties in nurseries (3.8)
- ♣ Organic nurseries, grafting, organic plantlet-production (3.5)



Orchard establishment

- ♣ Calculation of tree spacing during the establishment of orchards depending on the variety (3.8)
- ♣ Seedling maintenance before planting – pruning, root cutting, disinfection, etc. (3.6)
- ♣ Orientation with projects and coordinates during orchard establishment (3.5)
- ♣ Determining the right type and variety of a fruit tree based on location and climatic conditions (3.8) (academic program level)
- ♣ Establishment and management of organic orchards (3.5)

Orchard maintenance

- ♣ Diagnosis of plant disease, implementation of necessary treatment, proper application of medicines (4.0)
- ♣ Pest, weed and rodent control (3.7)
- ♣ Proper pruning for each variety (4.0)
- ♣ Modern pruning methods (3.8)
- ♣ Soil fertilization (3.8)
- ♣ Soil quality/ health improvement (3.6)
- ♣ Plant nutrition (3.7)
- ♣ Nut trees (biological stages of the plant, pruning, management, etc.) (3.7)

Productivity and yield

- ♣ Production of marketable product (3.7) (academic program level)
- ♣ Enhancement of orchard productivity (3.7) (academic program level)
- ♣ proper storage and transportability of the harvest (3.6)

Figure 2. From nursery to plant protection

Intensive fruit production

- Intensive orchard **design** (3.8)
- **Establishment and management** of intensive orchards (3.8) (academic program level)
- Intensive orchard **maintenance** (3.8)

- **Maintenance management, disease diagnosis, treatment and nutrition** of dwarf and semi-dwarf fruit trees (3.9)
- Full knowledge of **biological phases of the growth** of new dwarf and semi-dwarf tree varieties (3.7)

- Intensive greenhouse orchard (3.5)

- Modification of a conventional orchard into intensive (3.0) (academic program level)

Figure 1: Intensive fruit-production-related requirements

5. Intensive gardening: Almost all requirements/needs regarding this group also received a fairly high grade of importance for the profession.

"Intensive orchard design", "planting-management", and "maintenance" characterizations have received a 3.8 weighted average grade.

During a ZOOM meeting with the lecturers an opinion was voiced about the class hours of "Variety Studies" being insufficient, and that's precisely why students are not able to deeply study characteristics of fruit varieties.

It is remarkable that the non-identical perception of the idea of an intensive orchard is expressed in the case of fruit trees as well: in the case when an intensive orchard is identified with the dwarf graft of fruit trees among the employers, a claim was expressed that it is possible to establish an intensive orchard with non-dwarf fruit trees as well. From this perspective, a misunderstanding of terminology may occur between the sector employers and academic environment.

Perceptions about intensive greenhouse orchards and the switch from conventional into intensive orchards for lecturers are connected with their own experience and professional positions. Intensive greenhouse orchards are generally associated with the cultivation of perennial crops and berries. Also, some specialists find it impossible to switch from a conventional into an intensive orchard. Nevertheless, the last requirement/need is not expected to be addressed within the framework of bachelor education.

Courses relating to intensive fruit production are presented below.

Table 5: Courses relating to intensive fruit production and number of lecturers choosing them

	Course	Number of lecturers (18 in total)	%
Requirement 5.1: Intensive orchard			
	Horticulture	16	88.9%
	Basics of Amelioration	7	38.9%
	Variety Studies of Fruits, Berries and Grapes	6	33.3%
	Soil Science	5	27.8%
	Viticulture	5	27.8%
	Arable Farming	5	27.8%
	Agrometeorology	5	27.8%
	Plant Nursery	5	27.8%
Requirement 5.2: Establishment and management of intensive orchards (academic program level)			
	Horticulture	13	72.2%
	Variety Studies of Fruits, Berries and Grapes	9	50.0%
Requirement 5.3: Intensive orchard maintenance			
	Horticulture	15	83.3%
	Entomology	7	38.9%
	Phytopathology	7	38.9%
	Viticulture	6	33.3%
	Variety Studies of Fruits, Berries and Grapes	6	33.3%
Requirement 5.4: Maintenance management, disease diagnosis, treatment and nutrition of dwarf and semi-dwarf fruit trees			
	Horticulture	14	77.8%
	Phytopathology	14	77.8%
	Entomology	13	72.2%
	Variety Studies of Fruits, Berries and Grapes	7	38.9%
	Agrochemistry	6	33.3%
	Viticulture	6	33.3%
Requirement 5.5: Full knowledge of biological phases of the growth of new dwarf and semi-dwarf tree varieties			
	Horticulture	15	83.3%
	Variety Studies of Fruits, Berries and Grapes	12	66.7%
	Plant Nursery	9	50.0%
	Plant Genetics	5	27.8%
Requirement 5.6: intensive Greenhouse Orchard			
	Horticulture	12	66.7%
	Variety Studies of Fruits, Berries and Grapes	10	55.6%
	Agrochemistry	8	44.4%
	Plant Nursery	7	38.9%
	Plant Biotechnology	5	27.8%
Requirement 5.7: Modification of a conventional orchard into an intensive one (academic program level)			
	Horticulture	12	66.7%
	Variety Studies of Fruits, Berries and Grapes	6	33.3%

6. "Smart" and climate-oriented fruit production: Although smart or reasonable horticultural practices were not frequently mentioned in the study, they were nevertheless emphasized as research outcome since they were mentioned by experts and investors. The approach of precise agricultural measures, such as, for instance, determination of soil biomass through orchard mechanization, diagnosis of plant diseases, or distribution of necessary materials as needed, are mentioned as the future of fruit production in Armenia.

Nonetheless, the Department of Agronomy has given relatively lower grades to reasonable agricultural practices. In this manner, the "renewable energy means used in the orchard" employer requirement received a weighted average grade of 3.1, "Mechanization and management of smart (reasonable) orchards" and "Selection, characteristics and installation of anti-hail nets" both received 3.4.

"Assessment of climate impact on the orchard" received a high score among the faculty – a weighted average grade of 3.8.

Table 6: Courses relating to smart agricultural practices and number of lecturers selecting them

	Course	Number of lecturers (18 in total)	%
Requirement 6.1: Selection, characteristics, and installation of anti-hail nets (pole height, net type)			
	Horticulture	7	38.9%
	Agricultural Mechanization, Machinery and Equipment	6	33.3%
Requirement 6.2: Mechanization and management of smart (reasonable) orchards			
	Agricultural Mechanization, Machinery and Equipment	12	66.7%
	Horticulture	10	55.6%
	Viticulture	6	33.3%
Requirement 6.3: renewable energy means used in the orchard		2 -	
Requirement 6.4: Assessment of climate impact on the orchard			
	Agrometeorology	13	72.2%
	Horticulture	9	50.0%
	Agroecology and Environmental Protection	7	38.9%
	Variety Studies of Fruits, Berries and Grapes	5	27.8%
Requirement 6.5: Basics of Smart Agriculture, adapted to climate/ environment (academic program level)			
	Agroecology and Environmental Protection	10	55.6%
	Horticulture	8	44.4%

7. Information and management. As a result of the validation, information needs of the sector received a relatively low score, than, for example, pruning and plant protection. Nonetheless, the specialists noted that they inform students on where to obtain necessary information.

Importance of information about soils corresponded to a weighted average grade of 3.3, importance of weather forecast time series data got a 3.5, and based on those two types of knowledge, information on fruit species corresponding to each region and their varieties got a weighted average of 3.6.

Lecturers also emphasized the relevance of planning and organizing product sales in crisis situations (weighted average of 3.6), at the same time, noting that the crisis situation is not limited to COVID-19 pandemic.

[2] Frequency of any subject has not been higher than 2 in case of this requirement.

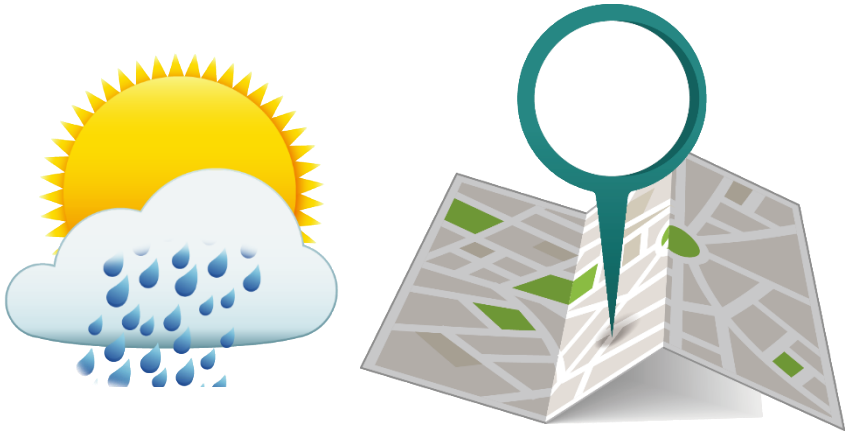
Table 7: Courses relating to information and management and number of lecturers selecting them

	Course	Number of lecturers (18 in total)	%
Requirement 7.1: Information on **fruit species and their varieties** corresponding to each region, conditioned by soil characteristics in a particular region and climatic characteristics of a terrain			
	Horticulture	14	77.8%
	Variety Studies of Fruits, Berries and Grapes	11	61.1%
	Soil Science	9	50.0%
	Agrometeorology	9	50.0%
	Agrochemistry	6	33.3%
	Viticulture	5	27.8%
Requirement 7.2: Retrieving information on weather forecast time series data for each region/ settlement			
	Agrometeorology	15	83.3%
	Horticulture	5	27.8%
Requirement 7.3: Retrieving information on **soil** classification, designation, as well as status (occupied/ free)			
	Soil Science	17	94.4%
	Agrochemistry	7	38.9%
	Arable Farming	5	27.8%
Requirement 7.4: Product sales planning and setup in crisis situations			
	Marketing and Management	13	72.2%
	Agricultural Economics	11	61.1%
	Financial Literacy	7	38.9%
	Horticulture	5	27.8%

“Smart” fruit production

- Selection, characteristics, and installation of **anti-hail nets** (pole height, net type) (3.4)
- **Mechanization and management** of “Smart” (reasonable) orchards (3.4)
- **renewable energy** means used in the orchard (3.1)
- Assessment of **climate impact** on the orchard (3.8)
- **Basics of Smart Agriculture**, adapted to climate/ environment (3.5) (academic program level)

Figure 3. Requirements related to "smart" fruit production



Information and management

- Information on **fruit species and their varieties** corresponding to each region, conditioned by soil characteristics in a given region and climatic characteristics of a locality (3.6)
- Retrieving information on **weather forecast** time series data for each region/settlement (3.5)
- Retrieving information on **soil** classification, designation, as well as status (occupied/ free) (3.3)
- Planning and organizing product sales in **crisis situations** (3.6)

Figure 4. Requirements regarding necessary information and management

Validation showed that there are courses that seem "overloaded" at first sight. For instance, if we consider the courses for each requirement for horticulturists selected by at least 5 lecturers, we can see that it is foreseen to form a corresponding knowledge, ability and/or skill for 32 requirements within the "Horticulture" course, or 19 requirements for the "Variety Studies of Fruits, Berries and Grapes" course. The table below represents the courses for meeting any requirement selected by five or more lecturers, as well as number of requirements adapted to them (Table 8).

Table 8: Workload of courses according to relevant needs/requirements

Course	**Number of Requirements**
Horticulture	32
Variety Studies of Fruits, Berries and Grapes	19
Viticulture	11
Plant Nursery	11
Agrochemistry	9
Soil Science	8
Phytopathology	8
Entomology	7
Organic Agriculture	7
Agrometeorology	5
Arable Farming	5
Agroecology and Environmental Protection	3
Agriculture Mechanization, Machinery and Equipment	3
Plant Physiology Based on Biochemistry	2
Basics of Amelioration	2
Agrochemistry	1
Plant Genetics	1
Plant Biotechnology	1
Agricultural Economics	1
Microbiology	1
Marketing and Management	1
General Principles of Artificial Selection	1
Financial Preparedness	1

Need for conceptual and terminological understanding

According to expert opinion, conceptual and terminological mutual understanding among stakeholders is one of the essential preconditions of sector development.

From the **concept** point of view, it is necessary to refer to the idea of an intensive orchard from an overall standpoint. Sector representatives do not share an equivalent idea about intensive orchards, thus in some cases there are contradictory voices about the content (under which circumstances is an orchard considered to be intensive?) and significance of orchards (why does an investor decide to establish an intensive orchard?).

The problem with **terminological** misunderstanding has vividly been expressed especially during the validation of requirements for horticulturists, with the participation of the ANAU specialists, when the latter addressed the incomplete or incorrect statements taken from interviews with employers. The specialists stated that in case the employer formulates their problem in a non-university, non-scientific language, a terminological misunderstanding may occur between the specialist and the employer.

In this regard, it is generally necessary to make the concept of an intensive orchard reachable to sector representatives.

Training potential of horticultural specialists by ANAU and professional needs

Potential of the ANAU Department of Agronomy

According to the interviews with ANAU staff, in order to strengthen the "fruit production" specialty, the university needs:

- narrow professional trainings for lecturers,
- creation of laboratory-class-orchard relationship,
- creating orchard farms specialized in innovative solutions,
- appropriate facilities for full implementation of laboratory and practical trainings – operating nurseries and adjacent experimental orchards,
- reequipping student laboratories.

The Department of Agronomy utilizes all ANAU infrastructures.

According to the representatives of the Department of Horticulture and Plant Protection, the university does not have the necessary toolkits for pruning, as well as supporting appliances, such as shoes suitable for working in the orchard, so it is difficult on their end to provide the practical part during the study.

Overall, according to the executive staff of the Department of Agronomy, they have the necessary personnel of specialists (there is a need for a narrow professional training). Although classroom conditions do not allow for a full-fledged student-centered environment (e.g. there are no round tables and portable desk chairs), they are still sufficient for organizing classes.

Professional needs of fruit-production-related instructors, based on the list of requirements for horticultural specialists

During the validation of requirements for horticulturists, lecturers also noted about their professional needs, based on the list of requirements. Below are the needs mentioned by at least five participants (Table 9).

Table 9: Professional needs with higher frequency

Need	Number of lecturers	%
Establishment and management of organic orchards	13	72.2%
Intensive orchard maintenance	10	55.6%
Diagnosis of plant disease, implementation of necessary treatment, proper use of medicines	9	50.0%
Modern nurseries	9	50.0%
Intensive greenhouse orchard	9	50.0%
Organic nurseries, grafting, organic plantlet-production	8	44.4%
Pest, weed and rodent control	7	38.9%
Modern orchard pruning methods	7	38.9%
Mechanization and management of Smart orchards	7	38.9%
Proper pruning for each variety (considering characteristics of each variety)	6	33.3%
Production of seedlings of new varieties in nurseries	6	33.3%
Determining the right variety of the right fruit tree based on climatic conditions and terrain (academic program level)	5	27.8%
Plant nutrition	5	27.8%
Producing marketable product (academic program level)	5	27.8%
Renewable energy means used in the orchard	5	27.8%
Basics of Smart Agriculture, adapted to climate/environment (academic program level)	5	27.8%

ANAU applicant engagement policy

In order to attract applicants, the ANAU uses the following approaches:

- Study tours for high school seniors showcasing the relevant infrastructure per professional preferences (Wine Depository, Agribusiness Teaching Center, Laboratory of the EVN Wine Academy, etc.),
- The university provides the means of transportation for the students to travel to remote communities,
- In some cases, delegations of the university conduct informational visits to schools themselves to provide academic guidance.

Over the course of one year, the university conducts tours for more than four hundred school students from different marzes of Armenia.

As mentioned by the ANAU representatives, there is a lack of awareness among applicants both in agricultural professions and about the ANAU. Yet, after informational visits to the university, students become more motivated. According to ANAU representatives, informational campaigns at the university are the most effective method of motivating and engaging applicants.

Training needs of representatives of fruit production sector

During the baseline assessment, professional needs of the representatives of the sector which they would like to fulfill were also studied.

Preference for short course topics

Around **92%** of online respondents mentioned that either they or their employees have a training need. Sector representatives are primarily interested in the following topics: (Annex 1, Table 20):

- Establishment and management of intensive orchards (79% of respondents),
- Pest, weed and rodent control (75% of respondents),
- Modern orchard pruning methods (75% of respondents),
- Basics of Smart Agriculture, adapted to climate/ environment (70% of respondents),
- Establishment and management of organic orchards (68% of respondents),
- proper storage and transportability of the yield (63% of respondents),
- Around 36% of respondents are interested in the "establishment and management of conventional orchards" course.

Several respondents are interested in the "Complete Value Chain/Supply Chain Management", "Marketing and Branding" courses.

Organization of a short course

Around 39% of survey participants prefer to participate in a week-long intensive training, while 33% prefers the course to be a month-long. (Figure 5**Error! Reference source not found.**). A 2-month-long training was also proposed (8-10 meetings in total), as well as a recommendation was voiced about implementing a "seasonal internship" or an online course. **72%** of respondents are more comfortable to participate in the course in the evening for 1-2 hours.

Around **93%** of those who wish to participate in the course are ready to pay up to 200,000 Armenian drams for the 4 month-long (2 days per week; 1-2 hours) course. **72%** of respondents expect that the training will help take care of their orchards using innovative methods, which will eventually lead to an **increase in orchard productivity**.

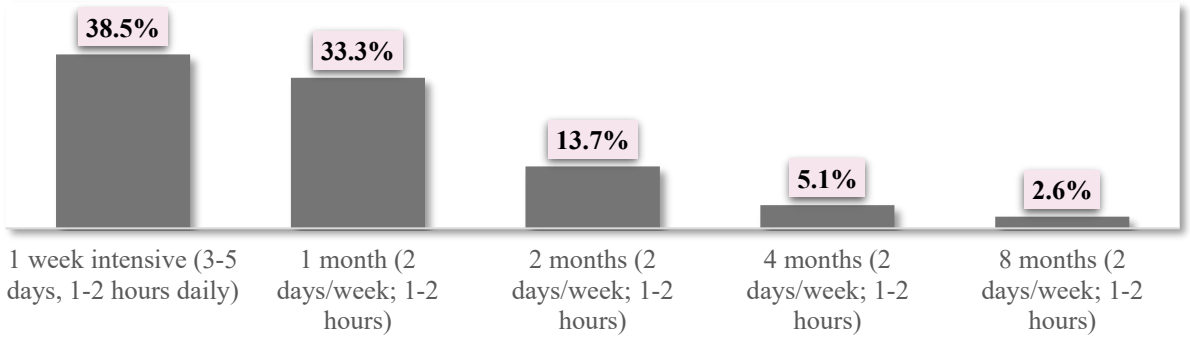


Figure 5. Proffered length and intensity of the short course

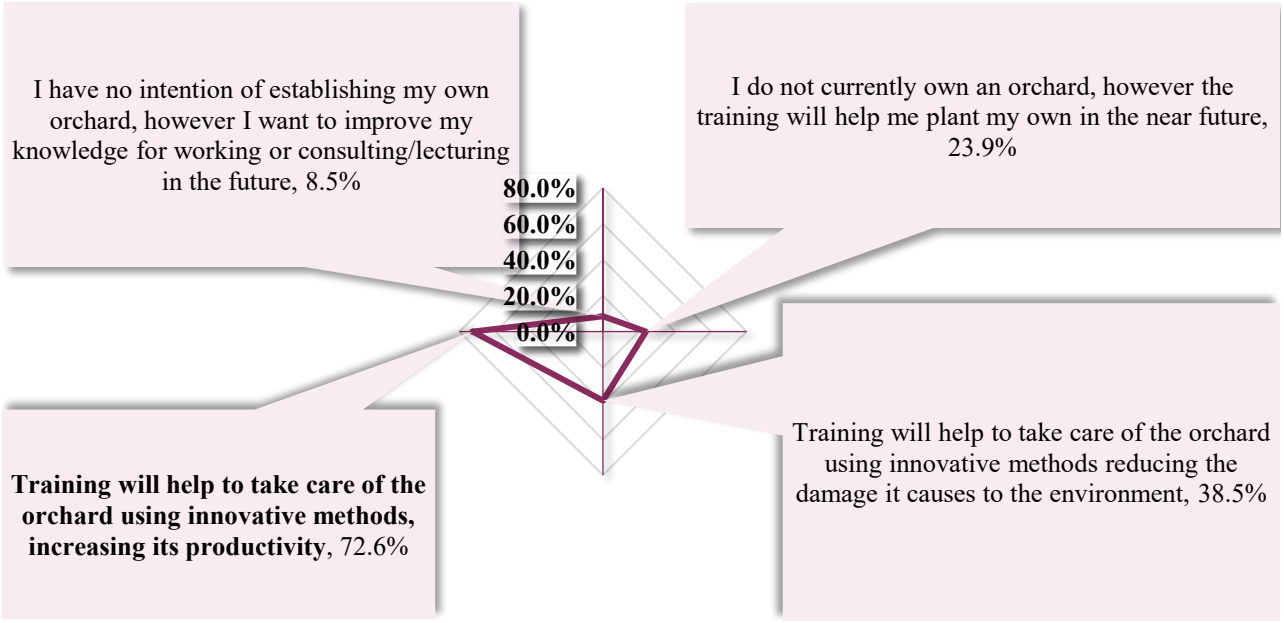


Figure 6. Expectations of respondents from the short course

Capacity and professional needs of agricultural colleges providing horticultural education

Within the scope of FRUITENIA project, it was initially planned to conduct training of trainers (ToT) for eight agricultural colleges to help them meet the narrow specialization needs with the goal of developing specialization in fruit production, as well as to transfer new knowledge in related courses to the students.

After we were rejected from one agricultural college, ten agricultural colleges were involved following the baseline assessment in order to avoid a further shortage of participants in the project.

Each of the colleges participating in the assessment has provided education in an agricultural specialty in the vocational education level of the national qualification framework, with only one college providing education also in the preliminary vocational technical level.

During the assessment, we have studied issues such as: whether the colleges provide horticultural education, what related specialties and course they offer, how they recruit students, etc. Professional needs of colleges for preparing fruit production specialists were also studied.

Availability of horticultural specialties and related courses in colleges

Overall, ten agricultural colleges have participated in the baseline assessment (the list is provided in Table 10), of which the Gavar State Agricultural College refused to use the opportunity to participate in the ToT program within the FRUITENIA project due to the lack of the fruit production specialty in their college as well as for the reason that they did not see any development perspectives. **The nine colleges offering the**

fruit production specialty or courses related to the specialty have expressed their readiness to participate in the component of the FRUITENIA project related to colleges[3].

In general, for of the colleges participating in the assessment have stated that they were planning admission in the 2020-2021 academic year in "Agricultural Economics" academic program at the vocational level (Spitak State College, Vanadzor State Agricultural College, Nor Geghi State Agricultural College, Armavir Regional State College), which prepares specialists with qualification of Agronomist. The curriculum[4] of the specialty includes such fruit-production-related courses as:

- Technologies of fruit and grape planting material;
- Technologies of growing and harvesting fruit orchards;
- Technologies of establishing perennial plantations on slopes;
- Organic Agriculture, etc.

At the moment of the survey only Nor Geghi Agricultural College mentioned that it has a preliminary vocational/technical level horticultural specialty ("Fruit Production" academic program for the 2020-2021 academic year). Although short-term, the latter includes such courses as[5]:

- Orchard Maintenance,
- Pruning and Shaping of Orchards,
- Growing Orchard Planting Material,
- Biological Basics of Fruit-Bearing Plants,
- Organic Agriculture, etc.

The remaining five colleges have had specialties with curriculums that contain fruit-production-related courses (see Table 10). Involving instructors of the mentioned courses in the ToT program will enable to transfer up-to-date knowledge on fruit production to the future students of those colleges.

Table 10. Availability of horticultural specialty and related courses in the colleges

	Availability of specialty	**Availability of related courses**
Armavir Regional State College	✔	✔
Nor Geghi State Agricultural College	✔	✔
Vanadzor State Agricultural College	✔	✔
Spitak State College	✔	✔
Masis State Agricultural College		✔
Stepanavan State Agricultural College		✔
Kochinyan Agricultural College		✔
Academician M.G. Tumanyan State Agricultural College, Shirak		✔
Goris State Agricultural College		✔
Gavar Agricultural College *		

[3] A ToT program in the field of fruit production is planned within the scope of FRUITENIA for teachers of the agricultural colleges involved in the project.

[4] For details of the curriculum of the Agricultural Economics academic program see the curriculum of the "Agronomist" qualification of "Agriculture" specialty and module programs, 2017

[5] To learn about the entire list of courses under "Horticulture" academic program, please see the Master Plan and module programs of the "Horticulture" specialty, 2017

**This college refused to participate in the program reasoning that they don't have a related course and are not planning to develop any.*

Within other specialties in the other five colleges lacking the fruit production specialty, there are related courses that can later on serve a basis for developing a professional horticultural education program, including in the content of the courses the knowledge received from the training conducted in the framework of FRUITENIA project. The colleges have mentioned the following related courses:

- Production technology of fruits, vegetables, and mushrooms;
- Commodity profile of fruits, vegetable and mushrooms;
- The process of plant growing and development;
- Types of fertilizers and nutrients and the technology of their application;
- Soil science and basics of agronomy;
- Soil and plant pests and diseases, measures, forms and methods of their control;
- The agricultural significance, types and properties of soil;
- Organization of soil cultivation operations;
- Arable Farming,
- Landscape Science;
- Basics of Ecology.

The study indicated that the nine colleges participating in the assessment are willing and have the relevant potential and interest to participate in the training of trainers (ToT) in fruit production.

Availability of applicants and approaches of applicant involvement in colleges

Although the sector has a development trend in the country, yet the vocational horticultural or related education remains unattractive. According to the information provided by the colleges, what they mainly do is filling the unpaid places in the college by state order, since, as mentioned by the representative of the colleges, the local communities are not solvent and are seeking free education. The interest towards the specialty is explained also by the fact that fruit production is developed in the region.

Among the four colleges offering "Agricultural Economics" AP, Armavir State Regional College is an exception; the last graduates of this specialty were those of the 2018-2019 academic year. Nonetheless, the college continues to offer the specialty, as, according to them, they are located in a horticultural subregion, although they also mention that there are not many jobs of this specialty.

It should be mentioned that the study has revealed a **successful case** of cooperation with the private sector. The Nor Geghi College has acquired a license for offering an "Agricultural Economics" specialty through a recommendation from a private organization and is ready to admit its first applicants for the academic year of 2020-2021. As a result of this cooperation, in addition to the 10 unpaid places covered by the state order, the college has now 6 additional unpaid places funded by the private organization.

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Among the most used methods of involvement of applicants, the colleges mention the following:

- Visits to schools, including rural schools;
- Announcements on the Facebook pages of colleges;
- Announcements on local TV channels;
- Announcements posted in the vicinity of educational and cultural centers;
- Open door day / professional orientation day for senior high school students.

In some cases, it has been mentioned that advice provided from their graduates to their friends also plays a certain role in recruitment of applicants.

Professional needs

The study has focused also on the professional needs of colleges for offering horticultural education. These needs have mainly been mentioned by the coordinators of professional curriculum and the instructors of fruit production-related courses. The mentioned needs have been grouped by their topics:

- Nursery business and methods of propagation of fruits and berries (taking seeds, receiving planting material from seeds, rootstocks of fruit-bearing plants, forms of grafting, etc.);
- Establishing fruit orchards, management and nutrition of young orchards;
- The main types of fruits and berries grown in Armenia and their varieties;
- Botanical structure of fruit and berry plants;
- Pruning of fruit trees and trimming of foliage;
- Growing of dwarf fruit trees, biological phases, harvesting and storage;
- Control of pests and diseases (cases of organic and conventional orchards),
- Control of winter and spring frost damage;
- Modern teaching methods.

The representatives of the colleges have also mentioned that, for offering horticultural education, in addition to the content enhancement, they would need also to participate in field trips to demo orchards.

During the interviews, the representatives of the colleges have expressed willingness to transfer the knowledge acquired during the training to their colleagues, students, and the population of the region involved in fruit production who often apply to them for professional advice.

Opinions of the sector representatives on the format and topics of the content presented in the fruit production website

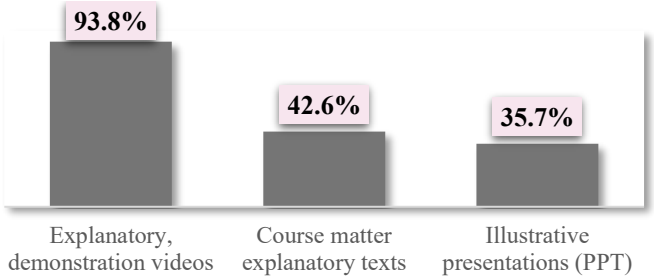


Figure 7. Preferable format of materials posted on the website

About **94%** of respondents wish to find explanatory and demonstrative videos in an Armenian-language website. There were also unique answers such as "books, guidelines", "training video clips related to particular region", "text – videoclips – practical consultancy".

The fact that the orchard owners tend to simultaneously grow different types of fruit trees is reflected also in selection of topics to be presented on the online platform. Around **78%** of respondents would like to see information in **growing different types of orchards**. The considerable majority of the respondents are interested also in topics of "Pruning", "Integrated pest and weed management", "Establishing and management of intensive orchards"

and “Establishing and management of organic orchards”. Only 46% of respondent are interested in observing the safety rules during their work in the orchard, and 60% are interested in green agriculture topics (Table 11).

Table 11. Topics of online fruit production platform

	Number	%
Cultivation of different types of orchards (stone fruits, pome fruits, nuts, subtropical fruits)	100	77.5%
Pruning	99	76.7%
Integrated pest and weed management	99	76.7%
Fertilization	96	74.4%
Establishing and management of intensive orchards (for different types of fruits)	94	72.9%
Establishing and management of organic orchards (for different types of fruits)	89	69.0%
Reasonable/smart agricultural actions aimed at the environment and climate (AP level)	77	59.7%
Observation of safety rules (related to personal health and environment) during work in orchards	59	45.7%

The above topics are closely linked with the gaps existing in the sector. During the conversations with the sector representatives, the problem related to pruning has been mentioned many times: pruning is often done by non-specialists, using no special tools, which can result in diseases of trees or decrease in yields. Orchard owners are interested in healthy trees and they say that it is not always and not with all varieties that they are able to get relevant advice and/or service. In this regard, the orchard owners, like employers, value the scientific and evidence-based approaches.

Orchard owners consider that **nutrition** of trees and the proper **fertilization** of soil require a gentle approach and are associated with the idea of organic orchard and doing no harm to the nature. Although the soil health and harmless operation of the environment is considered important by orchard owners, they state that they are concerned about the market appearance of their products.

At the same time, the growers state that if they had guaranteed knowledge on what products they could have in case of organic orchard management and how they can market them, they would not mind applying organic orchard management practices.

Social inclusion in the fruit production sector

The study has shown that there is no discrimination in hiring a person to work in the fruit production sector. While hiring, the employers considers the employee’s ability to be part of the operations in the orchard.

Gender aspect. *The study indicated that the employers tend to hire exclusively men when it comes to the orchard operations that require physical load.* The ANAU Center for Career Development and Lifelong Learning has come to the same conclusion. According to the Center’s observations, during the last year employers have suggested ANAU about 15 vacancies in agronomy, of which in 10 cases preference was given to male specialists. The employers have explained their preference by the physical load required by the particular jobs as well as the need to work in night time. In the employer’s opinion, female specialists can encounter limitations from their families in terms of working at night. The Center states that while offering jobs to female students and graduates, they often hear the answer “let me discuss with my parents first before coming”, and often they never call back again.

Employers equally consider involvement of women and men in jobs not requiring physical load. There was a case during the study when a young female agronomist was consulting in operations in an orchard who was involved in plant health and was spraying the trees. Women mainly participate in harvesting, sorting and arrangement of the harvest. On the other hand, employers mention that women themselves do not apply for heavy work. It should be mentioned that employers also are open to involve female specialists in horticultural operations; however, according to them, there is a lack of female specialists in the sector.

Involvement of disabled persons. The issue of disabled people is not so clear, as disability, having various manifestations, is diversely perceived by employers. However, the employers have mentioned many times that they are ready to hire any person who meets their requirements. There was a case during the study when an employee with the Down syndrome was noted in the group of laborers, and in another case the accountant of the company had musculoskeletal disorder.

Cooperation of ANAU with the House of Soldier Rehabilitation Center should be noted as a positive experience; within this cooperation a training of the soldiers having injuries during the 4-day April war (2016) was conducted aimed at creation and development of business ideas. Establishing a rabbit farm and a cheese plant are mentioned as results of the training program.

Following the program, two of the participants were admitted to ANAU on the general terms. To ensure their full learning process at ANAU, the University organized all their courses in the 2nd building, which is adapted for the movement of people with musculoskeletal problems.

Participants from the university have also mentioned that even prior to the outburst of COVID-19 pandemic the distance learning was initiated to enhance the accessibility of education.

Age aspect. The study has shown that employers have a positive opinion about young specialists since the latter stand out with their openness to new knowledges, while the senior generation specialists are characterized as being limited with the knowledge they have and mistrust towards new knowledge. The employers express willingness to hire young horticulturists and "teach them". There was even a case when an employer expressed willingness to fund one student to study abroad with the purpose of hiring him/her for a long-term employment.

Ethnicity. Employers do not discriminate also in terms of ethnicity; however, there are cases when the employer tends to hire people from the villages located near his/her orchard. Overall, the employers are open to work with any employee who will meet their requirements.

The opinions of the representatives of the sector on establishing a demo intensive orchard

The baseline assessment showed that the majority of the representatives of the sector (69% of the participants of the online survey, as well as considerable majority of the key informants) value the existence of the intensive orchard in the country. Among the respondents, a successful demo intensive orchard is observed as an opportunity of "transition from the theory to practice", and "experience exchange".

Existence of a demo intensive orchard was evaluated as of average importance ("3" from maximum of "5") by 19% of respondents, while for about 12% existence of demo intensive orchard is not important. 87% of those who think that demo intensive orchard is not important have their own orchards, 60% wish to be trained in the "Establishing and management of intensive orchards".

This fact suggests that some of the sector representatives, even though being interested in intensive fruit production, yet do not see the link between their learning and the existence of a demonstration intensive orchard.

04. Recommendations based on the results of the baseline study

> "The demo orchard will allow a beginner to understand what intensive is, what the difference from the traditional is, how to properly keep the sequence of works in establishing the orchard, and, most importantly, to understand the difference from the traditional pruning."- a statement by a respondent.

Box 3. Expectation of a respondent from establishing an intensive orchard

The baseline study showed that there is a common positive outlook of development among growers and specialists. The importance of the industrial development of the sector is perceived by all parties, and they are open for cooperation. At the same time, the assessment has revealed a number of problems in the sector, the solution of which can have a strategic significance for the development of fruit production in the country.

Below are packages of recommendations based on the research results that are to assure the successful implementation of the FRUITENIA project.

Package 1. Recommendations on improvement of the curriculum of the "Agronomy, Selection and Genetics" academic program

Validation of the requirements for horticulturist developed jointly with lecturers of the ANAU Department of Agronomy allows drawing several general conclusions:

- There is a conceptual and terminological irrelevance between the academia and other representatives of the sector, which can result in misunderstanding when providing professional advice.
- The requirements of the job market for horticulturist are often linked with a cluster of a number of courses or even with academic program learning outcomes, which means that a considerable part of requirements for a horticulturist is beyond the framework of one course and requires comprehensive teaching.
- Although the framework of requirements of the job market is rather wide, ranging from nursery business to marketing of the harvest in crisis situations, yet some of the courses, due to their diversity, cover the considerable majority of the requirements.

Taking into account the above statements, we recommend to:

- Do an in-depth revision of the "Horticulture" and "Variety Studies of Fruit and Berry Plants and Grapes" courses to make sure that the class hours assigned to the course are relevant in terms of

learning the topics they contain. In particular we suggest to pay a special attention to teaching the topics that the instructors have assessed as of high importance (Table 8, Annex 3, Table 24).

- ♣ During the content review of the curriculum, work not only on review of particular courses, but also be guided by the principle of the comprehensive observation and solution of the issue, thus assuring the interrelation of related topics of particular courses.
- ♣ Since the study has revealed that the employers of the sector are willing to involve and train young specialists, we recommend to involve also employers in the content review of the courses, thus increasing the university's further opportunities of linkage with the job market.

It should be mentioned that in the phase of developing the FRUITENIA project, it was planned to modernize 1 course within the curriculum of "Agronomy, Selection and Genetics" AP ("Horticulture") and develop content for 6 new courses. Taking into consideration the survey results, we suggest the project team to pay a special attention to topics related to pruning when modernizing the "Horticulture" course.

As to the six courses to be separately developed during the further phases of the project, we recommend the following courses:

- ❖ Establishing and Management of Intensive Orchards;
- ❖ Establishing and Management of Modern Nurseries;
- ❖ Establishing and Management of Nut Orchards;
- ❖ Basics of Organic Agriculture;
- ❖ Protection of Plants from Diseases ("Phytopathology")
- ❖ Protection of Plants from Pests ("Entomology").

Package 2. Recommendations aimed at development of a short fruit production course

Given the wide range of professional gaps and the needs of the sector representatives, as well as their requirement for intensive trainings on the one hand, and ICARE's experience in developing and implementation of short-term programs on the other hand, it is recommended to take into consideration 2 formats of trainings when developing the content of the short program:

- Conduct four-month full courses including a wide and comprehensive framework of topics;
- Conduct intensive thematic trainings.

Based on the results of the study, here is the prioritization of the training topics:

1. Establishing and management of intensive orchards;
2. Control of pests, weeds and rodents;
3. Up-to-date methods of pruning of orchards;
4. Basics of operation of reasonable agriculture adapted to climate/environment;
5. Establishing and management of organic orchards;
6. Proper storage and transportability of harvest.

Package 3. Recommendations aimed at development of training of trainers (ToT) program

Within the scope of FRUITENIA project it is planned to carry out a 5-day ToT program in fruit production for the faculty of ANAU and a 3-day similar program for the teachers of agricultural colleges. It is recommended to develop the content of these trainings taking into consideration the development and modernization of the courses envisaged by the FRUITENIA project for the curriculum of ANAU "Agronomy, Selection and Genetics" AP to expose the faculty to the content of the modernized courses and to strengthen their professional capacities. We also recommend to plan practicums during the training.

During the baseline assessment of the project, based on the study of requirements for horticulturists set by the job market, the professional needs of teachers of ANAU and the colleges having participated in the survey were revealed. We recommend to take these needs into consideration while selecting the topics and developing the content of the ToT program.

Training of trainers (ToT) program planned for ANAU representatives

During the validation of the requirements for horticulturists the faculty members representing ANAU have mentioned also those requirements that they would like to be trained in (Table 9). The following are the generalized topics specified by the faculty:

- Establishing and management of orchards, including intensive, organic and greenhouse orchards;
- Determining the right variety of the right fruit tree depending on the location and climatic conditions;
- Nurseries: modern and organic;
- Plant protection: diseases, pests, weeds, rodents;
- Plant nutrition and soil fertilization;
- Pruning depending on the variety, modern pruning methods;
- Smart technologies, mechanization of orchard;
- Smart agricultural practices focusing climate and environment.

In the phase of designing the training, it is recommended to demonstrate a comprehensive approach in the study of the problem, showing the interconnection of different courses in problem solving.

Training of trainers (ToT) program planned for agricultural colleges

While developing a ToT program for the teaching staff of agricultural colleges we suggest to take into consideration the professional needs specified by them, in particular:

- Nursery business and methods of propagation of fruit and berry plants (taking seeds, obtaining planting material from seeds, rootstocks of fruit-bearing plants, forms of grafting, etc.);
- Establishing, management and nutrition of fruit orchards (particularly young ones);
- The main fruit and berry types grown in Armenia and their varieties;
- Botanical structure of fruit and berry plants;
- Pruning of fruit trees and formation of foliage;
- Growing, biological phases, harvesting of dwarf fruit trees and storage of harvest;
- Control of pests and diseases (in case of organic and inorganic orchards);
- Control of winter and spring frost damage;
- Modern teaching methods.

It is also important to strengthen the acquired knowledge with the help of field trips to intensive demo orchards.

Package 4. Recommendations aimed at creation of a horticultural informational website

For the informational website to be created we recommend to post the presented materials in the **format of explanatory and demonstrative videos**. Below are the topics arranged in accordance with the number of preferences (all the mentioned topics were selected by 60 or more percent of the respondents):

1. Cultivation of different types of orchards (stone fruits, pome fruits, nuts, subtropical fruits);
2. Pruning;
3. Integrated pest and weed management;
4. Fertilization;
5. Establishing and management of intensive orchards (for different types of fruits);
6. Establishing and management of organic orchards (for different types of fruits);
7. Reasonable/smart agricultural actions focusing the environment and the climate;
8. Observation of safety rules (referring to personal health and environment) during the work in orchards.

Based on the assessment of the needs of the sector representatives, we recommend to include the following information when developing the content of the website:

- Classification, significance as well as status (occupied/free) of soils;
- Weather forecast for each region (accessible time series);
- Relevant varieties by soil and climate characteristics of the particular terrain in each region.

To enhance the level of professional consultancy and the visibility of services offered, **it is recommended also to have a platform for self-representation of specialists, especially to make visible the need for professional advice among female horticulturists.**

05. Annexes

Annex 1. Results of online survey

Annex 1.1. Characteristic data of the representatives of fruit production sector having participated in the online survey

The study conducted for the fruit production sector representatives was conducted on an online platform (the questionnaire is provided in Annex 4). The survey was participated by 129 respondents somehow associated with the fruit production sector, the distribution of whom is provided in the figure below (Figure 8).

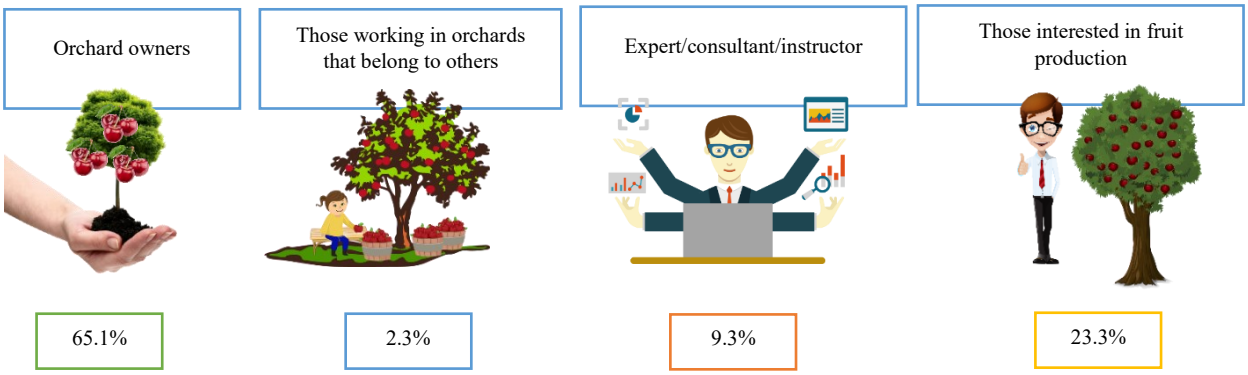


Figure 8. Distribution of online survey participants by their roles in the sector

The above figure shows the **main role** of the respondents in the fruit production sector. Thus, the majority of the respondents **(65%)** have mentioned that they had their own orchards with fruit trees. 9.3% has mentioned that they are experts, consultants or instructors in fruit production. It is noteworthy that more than 23% have stated that they are interested in being involved in further activities in the sector.

The characteristics of the respondents are provided in Figure 9 in the form of infographic. Around **50%** of the respondents are in the 36-50 age group, and around **71%** are male.

Within each age group, the majority of the participants are male. The existence of this phenomenon in comparatively younger groups indicates that such a gender distribution is not due to the ability of using internet. ***This fact can indicate that men have larger participation in the sector than women.***

This situation was demonstrated also during the interviews with the employers active in the sector who tend to consider mainly men to work in the key orchard operations due to the physical load of the work in orchards. As the employers state, another reasons for this situation is that **women rarely apply to get involved in orchard operations.** However, nearly all employers participating in the survey tend to involve women during the harvest period since "this work requires delicacy".

In general, the sector representatives value the professional education. Moreover, **73%** of respondents **believe that periodical trainings are very important for fruit production specialists**.

It is noteworthy that more than one third of the respondents have 10 or more years of experience in the fruit production sector. On the other hand, 7% of the participants are not involved in the sector yet; however, the majority have stated that they have the wish to be involved in the sector (See Annex 1.1, Table 12 - Table 19 for the supplementary tables of the online survey conducted among the fruit production sector representatives).

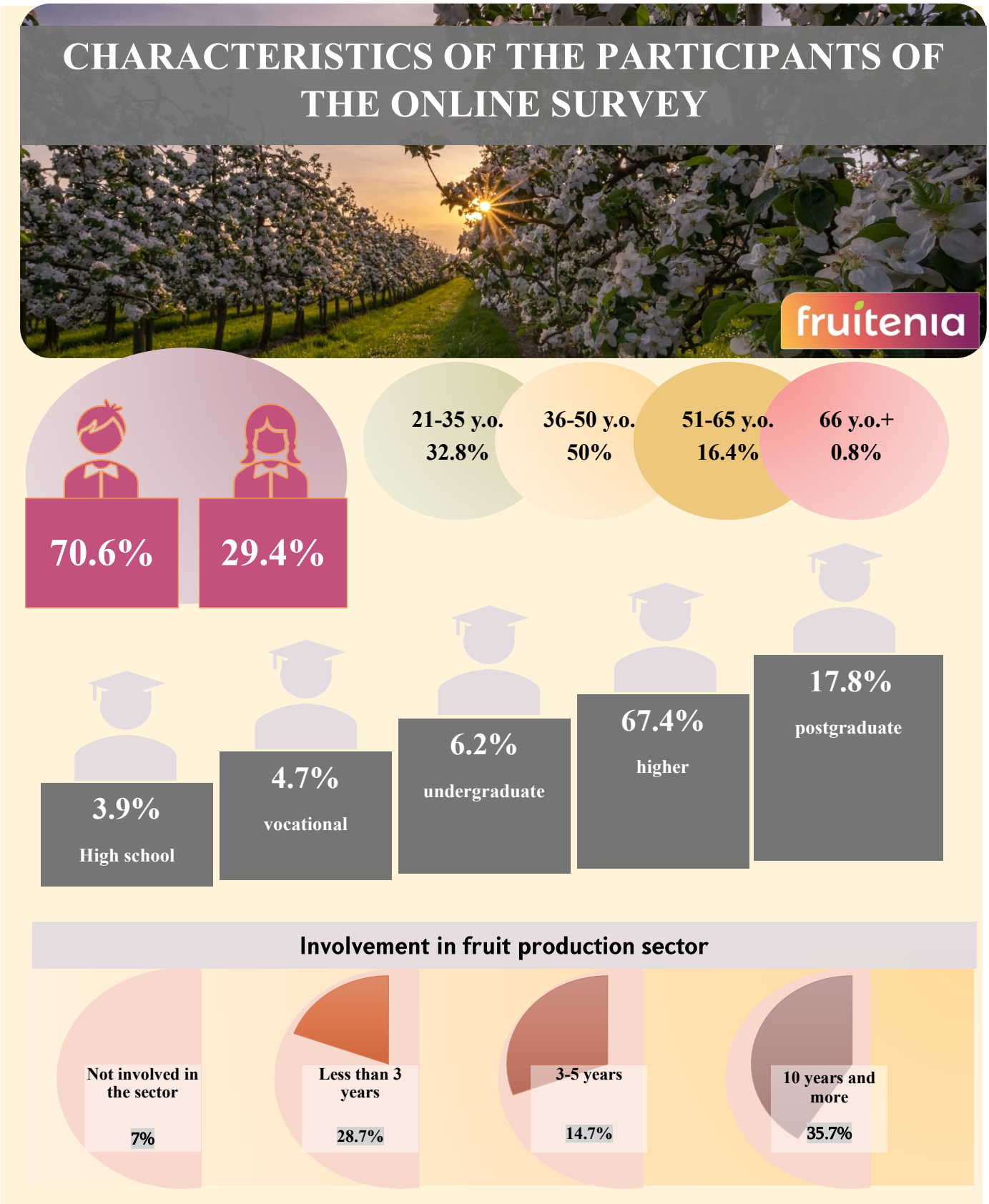


Figure 9. Characteristics of the survey participants in the form of infographic

Annex 1.2. Characteristics of the orchards of the fruit production sector representatives having participated in the survey

As mentioned earlier, more than the half of the respondents have their own orchards, the marz distribution of which is provided below. Overall, about 28% of the respondents have orchards in Kotayk marz, about 20% in Ararat marz, and about 15% in Aragatsotn marz (Table 19). It is noteworthy that the participants have stated about having different types of trees in the same orchard; moreover, growing 2 and more types of fruit trees in the same orchard makes a large share. During the interviews with orchard owners, they have often voiced about the idea that establishing a new orchard is hindered by the lack of systemized knowledge in the sector and what varieties can be grown in which marzes based on the climatic conditions.

Overall, the area occupied under fruit trees belonging to 83% of the respondents does not exceed 3 hectares (

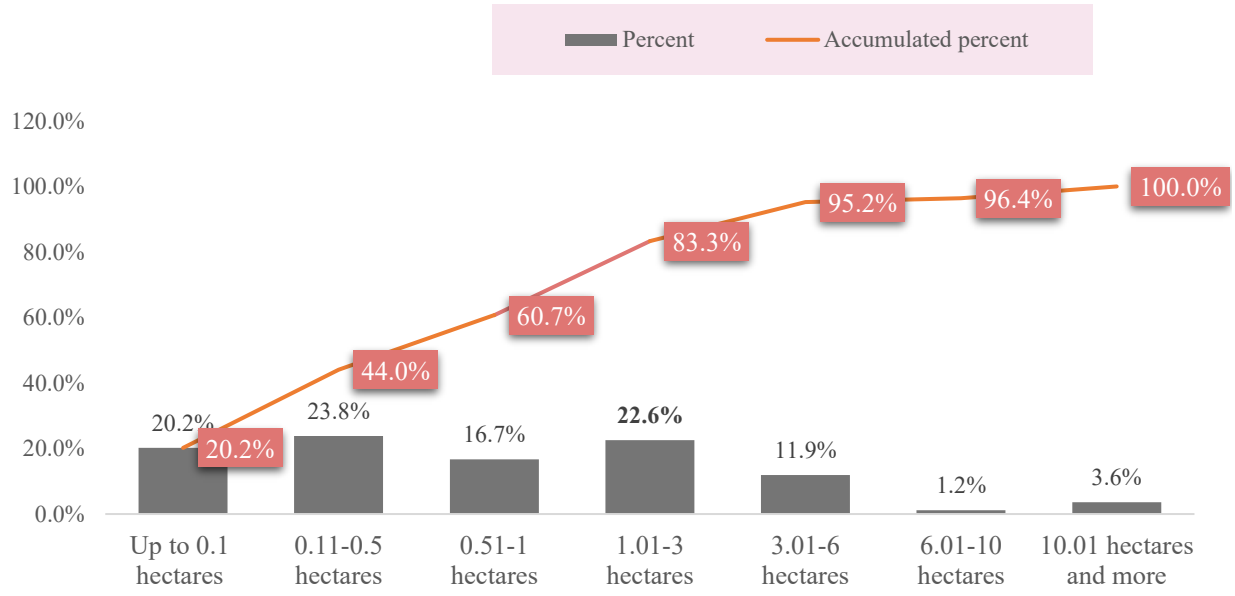


Figure 10).

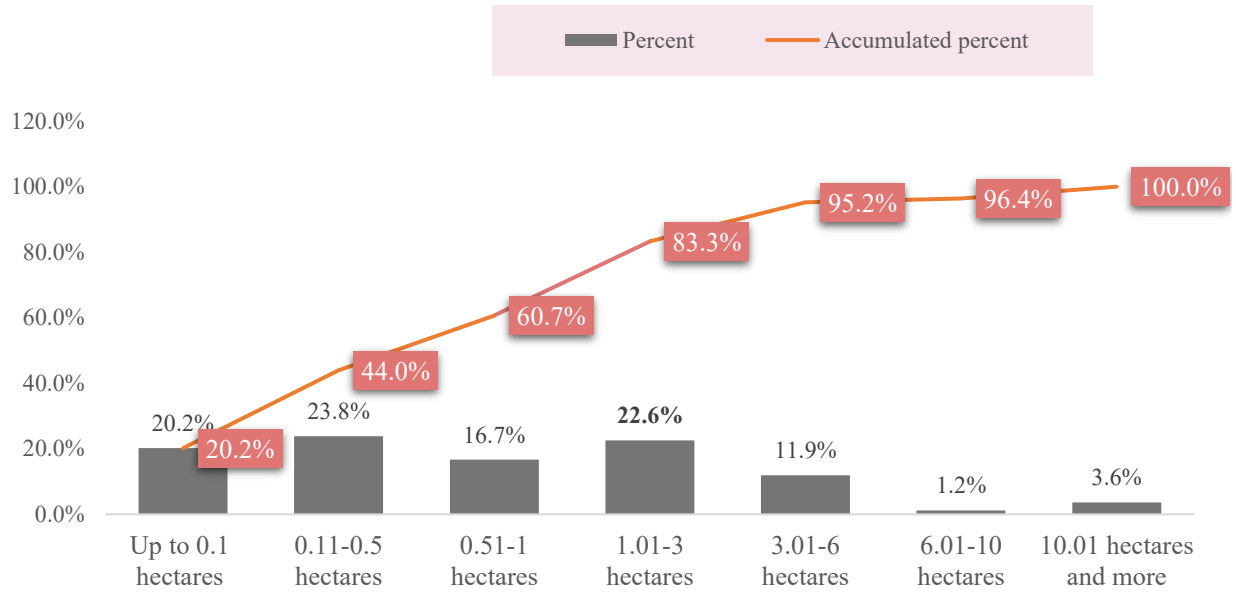


Figure 10. Distribution of survey participants by area occupied under orchards (by group and cumulative)

57% of the respondents sell the collected harvest in the local market, about 43% use it for own consumption in their households, and 17% export (Figure 11).

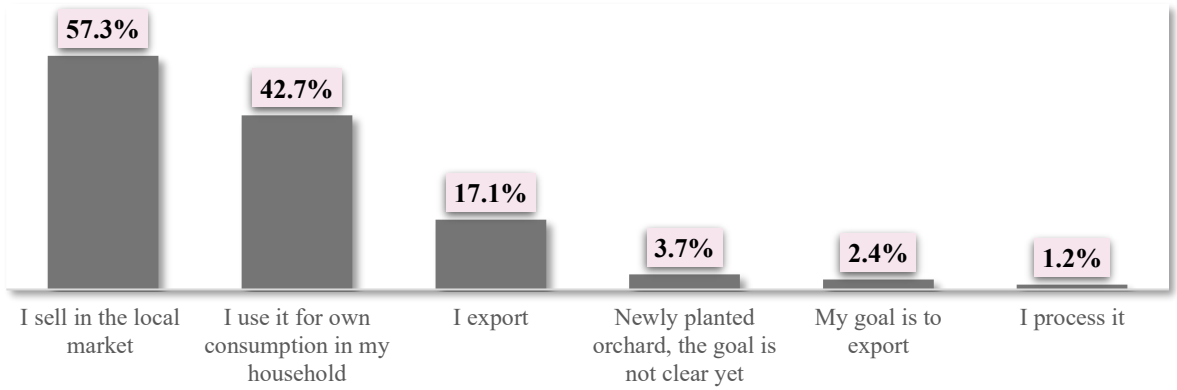


Figure 11. The use of the harvest received from fruit orchards

Annex 1.3. Supplementary tables of online survey carried out among representatives of the fruit production sector

Table 12. Distribution of total area of orchards in Armenia and the orchards of respondents by marzes and in Yerevan

Total plantations	**Hectares**	**Percent**	**Location of the orchards of the respondents**	**Number**	**Percent**
Aragatsotn	6,574	15.1%	Aragatsotn	13	14.9%
Ararat	8,630	19.9%	Ararat	17	19.5%
Armavir	9,928	22.9%	Armavir	11	12.6%
Gegharkunik	1,519	3.5%	Gegharkunik	4	4.6%
Lori	2,315	5.3%	Lori	2	2.3%
Kotayk	4,651	10.7%	Kotayk	24	27.6%
Shirak	561	1.3%	Shirak	1	1.1%
Syunik	2,621	6.0%	Syunik	6	6.9%
Vayots Dzor	2,510	5.8%	Vayots Dzor	3	3.4%
Tavush	2,774	6.4%	Tavush	2	2.3%
City of Yerevan	1,328	3.1%	City of Yerevan	4	4.6%
Total	***43,411***	***100%***	***Total***	***87***	***100%***

Table 13. Respondents' place of residence

	Number	**Percent**
Yerevan	58	44.4%
Kotayk	20	15.1%
Ararat	14	11.1%
Armavir	10	7.9%
Syunik	8	6.3%
Aragatsotn	6	4.8%
Gegharkunik	3	2.4%
Shirak	3	2.4%
Vayots Dzor	3	2.4%
Lori	2	1.6%
Tavush	2	1.6%
Total	***129***	***100%***

Table 14. Distribution of respondents by the type of the place of residence

	Number	**Percent**
Urban	79	61.1%
Rural	50	38.9%
Total	***129***	***100%***

Table 15. Distribution of the total number of respondents by age groups and experience

	10 years and more	**3 to 5 years**	**5 to 10 years**	**Less than 3 years**	**Those not yet involved**	***Total***
21-35	8.5%	4.7%	7.8%	8.5%	3.1%	***32.6%***
36-50	15.5%	8.0%	5.4%	17.8%	3.1%	***49.6%***
51-65	10.9%	3.1%	0.8%	1.6%		***16.3%***
66 and above	0.8%					***0.8%***

Total	***35.7%***	***16.0%***	***14.0%***	***28.7%***	***6.2%***	***100%***

Table 16. Distribution of each age group by experience

	21-35	**36-50**	**51-65**	**66 and more**	**Total**
N/A		1.6%			0.8%
10 years and more	26.2%	31.3%	66.7%	100%	35.7%
3 to 5 years	14.3%	14.1%	19.0%		14.7%
5 to 10 years	23.8%	10.9%	4.8%		14.0%
Less than 3 years	26.2%	35.9%	9.5%		28.7%
Those not yet involved	9.5%	6.3%			6.2%
Total	***100%***	***100%***	***100%***	***100%***	***100%***

Table 17. Distribution of each group of experience by age groups

	Unknown	**21-35**	**36-50.**	**51-65.**	**66 and more**	**Total**
10 years and more		23.9%	43.5%	30.4%	2.2%	100%
3 to 5 years		31.6%	47.4%	21.1%		100%
5 to 10 years		55.6%	38.9%	5.6%		100%
Less than 3 years	2.7%	29.7%	62.2%	5.4%		100%
Those not yet involved		50.0%	50.0%			100%
Total	**0.8%**	**32.6%**	**49.6%**	**16.3%**	**0.8%**	**100%**

Table 18. The purpose of the use of harvest received from the fruit orchard

	Number	**Percent**
Selling it in the local market	47	**57.3%**
Using for own consumption in my household	35	**42.7%**
Exporting	14	17.1%
A newly planted orchard, the purpose is not yet clear	3	3.7%
Have a goal to export	2	2.4%
Processing	1	1.2%
Total answers	***102***	***124%***
Total number of respondents	***82***	***100%***

Table 19. Location of the orchards of respondents

	Number	**Percent**
Kotayk marz	24	27.6%
Ararat marz	17	19.5%
Aragatsotn marz	13	14.9%
Armavir marz	11	12.6%
Syunik marz	6	6.9%
Gegharkunik marz	4	4.6%
Vayots Dzor marz	3	3.4%
Lori marz	2	2.3%
Tavush marz	2	2.3%
Shirak marz	1	1.1%
City of Yerevan	4	4.6%
Total orchards	***87***	***100%***

Table 20. Preferableness of short-term training topics

	Number	**Percent**
Establishing and management of intensive orchards	91	79.1%
Control of pests, weeds and rodents	86	74.8%
Modern methods of pruning in orchards	86	74.8%
Basics of reasonable/smart agriculture adapted to the climate/environment	80	69.6%
Establishing and management of organic orchards	78	67.8%
Proper storage and transportability of harvest	72	62.6%
Establishing and management of traditional orchards	41	35.7%
Other (marketing, branding, management of a complete value chain/supply chain, fertilization and nutrition)	4	3.6%
Total number of respondents	***115***	***100%***
Total answers	***537***	***467.0%***

Annex 2. Information on the agricultural colleges having participated in the assessment

Agricultural colleges that have participated in the assessment; the agricultural or related academic programs offered by them, for which admission has been announced for the academic year of 2020-2021.

Table 21. Professional education offered by agricultural colleges

	a) In vocational technical education degree	b) In vocational education degree
Vanadzor State Agricultural college	Technical support of agricultural operations	**Agricultural Economics** Veterinary medicine Accounting Artistic computer design Organization and management of transportation in road transport
Spitak State College	-	**Agricultural Economics** Veterinary medicine
Nor Geghi State Agricultural College	**Horticulture**	**Agricultural Economics** Storage and processing of crop products Beekeeping Greenhouse facility Sheltered ground (frame area) Agricultural engineering Organization and management of transportation in road transport Management
Armavir Regional State College	-	**Agricultural Economics** Commodity science Quality expert analysis of consumer goods Canning and technology of production of food concentrates Fermentation production technology and winemaking
Masis State Agricultural College	Operation and involvement of vehicles Computer operation	Greenhouse facility Management Commodity science Fish science and fish farming Tobacco growing and processing technology Technology of canned food and food concentrates Organization and management of transportation
Stepanavan State Agricultural College	-	Veterinary medicine Milk and dairy product technology Operation and repair of agricultural machinery and equipment
Shirak Academician M.G. Tumanyan State Agricultural College	-	Management Commodity science Quality expert examination of consumer goods Meat and meat product technology Organization and management of transportation in road transport Accounting
Kochinyan Agricultural College	-	Management of soil resources

		Commodity science Agroecology Fermentation production technology and winemaking Quality expert examination of consumer goods Land improvement, usage and protection of land and water resources Soil science Biotechnology of sheltered ground Veterinary sanitary expert examination Organization and management of transportation in transport
Goris State Agricultural College	Technical support of agricultural operations	Technical support of agricultural operations Veterinary medicine Mechanization of agriculture Milk and dairy product technology Management Accounting

Table 22. Fruit production -related courses in colleges planned to be taught to those admitted in 2020-2021

Educational institution	**Course**
Vanadzor State Agricultural College	Technology of fruit orchard cultivation and harvesting Technology of production of fruit and grape planting material Factors of growth and development of plants Fertilizers, their types and application Weeds, their control Soil cultivation systems Arable farming Soil science Sheltered ground Vegetable growing
Spitak State College	Production of fruits and planning materials Technologies of establishing perennial plantations on slopes Factors necessary for growth and development of plants Weeds Technology of cultivation and harvesting in fruit orchards Technology of grape growing and yielding Plant protection Basics of soil science Land cultivation systems Types of fertilizers Transportation of agricultural cargos and products Operation of agricultural machinery Forage crops Crop production technologies
Nor Geghi State Agricultural College	Fruit orchard management Pruning and formation of fruit orchards Growing planting material in fruit orchards Biological basics of fruit-bearing plants Basics of viticulture Organic agriculture Horticultural tools
Armavir Regional State College	Organic Agriculture

	Basics of soil science Land cultivation systems and agrotechnics Types of fertilizers and their use Production of fruit and grape planting material Fruit orchard cultivation growing and harvesting technology Technology of establishing perennial plantations on slopes
Masis State Agricultural College	Basics of landscape science and ecology Agricultural significance, types and properties of soil General agriculture Organization of land cultivation operations Pests and diseases of soil and crops. Measures, forms and methods of control thereof. Process of plant growth and development Types and technology of application of fertilizers and nutrition materials
Stepanavan State Agricultural College	Basics of soil science and agronomy Arable farming Landscape science Basics of ecology
Shirak Academician M.G. Tumanyan State Agricultural College	Fruit, vegetable and mushroom production technologies Merchandising characteristics of fruits, vegetables and mushrooms
Kochinyan Agricultural College	Courses within the curriculum of agroecology
Goris State Agricultural College	Landscape science and ecology

Annex 3. Results of validation of requirements for fruit production specialists with ANAU faculty

Table 23. Requirements for horticulturist (learning outcomes, academic program level)

Requirements	Weighted average
Determining the right variety of fruit tree based on terrain and climatic conditions	3.8
Establishing and management of intensive orchards	3.8
Producing product with proper appearance	3.7
Enhancing the yielding capacity of orchards	3.7
Basics of smart agricultural activity adapted to the climate/environment	3.5
Transformation of traditional orchard into intensive one	3.0

Table 24. Requirements for horticulturist (general, arranged in descending order of the weighted average grade)

Requirements	Weighted average
Proper pruning for each variety (taking into account the characteristics of the particular variety)	4.0
Diagnostics of plant diseases, providing the necessary treatment, proper application of chemicals	4.0
Modern nurseries	3.9
Management of dwarf and semidwarf fruit trees, disease diagnosis, treatment and nutrition	3.9
Determining the right variety of the right fruit trees based on the terrain and climatic conditions (academic program level)	3.8
Modern pruning methods	3.8
Management of intensive orchards	3.8
Assessment of climatic impacts on orchards	3.8
Production of plantlets of new varieties in nurseries	3.8
Soil fertilization	3.8
Design of intensive orchard	3.8
Calculation of inter-tree spacing during establishing an orchard depending on the variety	3.8
Establishing and management of intensive orchards (academic program level)	3.8
Plant nutrition	3.7
Receiving product with proper appearance (academic program level)	3.7
Full knowledge of the biological phases of the growth of dwarf and semidwarf varieties of new fruit types	3.7
Nuts (biological phases of plant, pruning, management, etc.)	3.7
Control of pests, weeds and rodents	3.7
Enhancing the yielding capacity of orchard (academic program level)	3.7
Improvement of soil quality/health	3.6
Proper storage and transportability of harvest	3.6
Processing of plantlets prior to planting: pruning, root trimming, treatment, etc.	3.6
Information on fruit types and their varieties complying with each region in terms of soil properties and climatic characteristics of terrain in a particular region	3.6
Planning and organization of marketing of products in crisis situations	3.6

Getting time series on weather forecast in each region/settlement	3.5
Basics of smart agricultural activity adapted to climate/environment (academic program level)	3.5
Intensive greenhouse orchard	3.5
Establishing and management of organic orchards	3.5
Orientation by design and coordinates when establishing an orchard	3.5
Organic nurseries, grafting, organic nursery	3.5
Selection of anti-hail nets, their peculiarities and installation (height of poles, type of net)	3.4
Mechanization and management of smart/reasonable orchards	3.4
Getting information on soil classification, significance, as well as status (occupied/free)	3.3
Means of renewable energy used in orchards	3.1
Transformation of a traditional orchard into an intensive one (academic program level)	3.0

Annex 4. Toolset for baseline assessment of FRUITENIA project

Below is the list of tools used within the scope of FRUITENIA project combined with the relevant links.

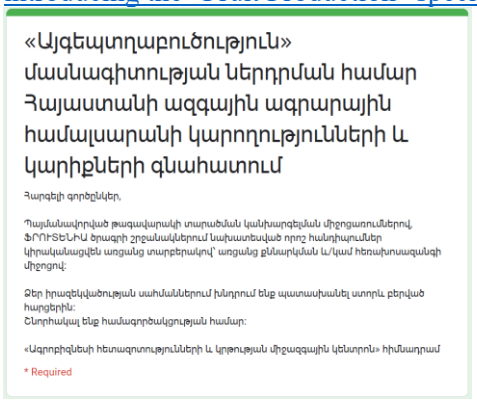
0.1. Study of the prerequisites of enhancing the competitiveness in the fruit production sector

Այգեպտղաբուծության ոլորտի մրցունակության բարձրացման նախադրյալների ուսումնասիրություն

ICARE հիմնադրամը իրականացնում է այգեպտղաբուծության ոլորտում կարճաժամկետ դասընթացի պահանջարկի, ինչպես նաև ոլորտին անհրաժեշտ գիտելիքների և կարողությունների կարիքի գնահատում: Ձեր մասնակցությունը հարցմանը կօգնի հասկանալ ոլորտի բացերը, բարելավել մասնագիտական հմտությունները և բարձրացնել ոլորտի մրցակցությունը:
Հարցումը անանուն է, պատասխանելու միջին տևողությունը՝ 3-5 րոպե:

* Այլ կարծիք ունենալու դեպքում խնդրում ենք լրացնել «այլ» / «other» տողում:

0.2. Assessment of the capacity and needs of the Armenian National Agrarian University for introducing the “Fruit Production” specialty



«Այգեպտղաբուծություն» մասնագիտության ներդրման համար Հայաստանի ազգային ագրարային համալսարանի կարողությունների և կարիքների գնահատում

Հարգելի գործընկեր,

Պայմանավորված թագավարակի տարածման կանխարգելման միջոցառումներով, ՖՐՈՒՏԵՆԻԱ ծրագրի շրջանակներում նախատեսված որոշ հանդիպումներ կիրականացվեն առցանց տարբերակով՝ առցանց քննարկման և/կամ հեռախոսազանգի միջոցով:

Ձեր իրազեկվածության սահմաններում խնդրում ենք պատասխանել ստորև բերված հարցերին:
Շնորհակալ ենք համագործակցության համար:

«Ագրոքիզնեսի հետազոտությունների և կրթության միջազգային կենտրոն» հիմնադրամ

* Required

0.3. Validation of the professional needs of the job market of “Fruit Production” with representatives of the Department of Agronomy: comparison of the curriculum of the “Agronomy, Selection and Genetics” AP and the requirements of the job market

Ուսումնական պլանի և աշխատաշուկայի պահանջների համեմատություն

Հարգելի գործընկեր,

Պայմանավորված COVID-19 համաճարակի տարածման կանխարգելման միջոցառումներով, ՖՐՈՒՏԵՆԻԱ ծրագրի շրջանակներում նախատեսված որոշ հանդիպումներ իրականացվում են առցանց տարբերակով՝ առցանց հարցաշարի լրացման, առցանց քննարկման և/կամ հեռախոսազանգի միջոցով:

Սույն հարցման նպատակն է իրականացնել «Ագրոնոմիա, սելեկցիա, գենետիկա» մասնագիտական ծրագրի շրջանակներում դասավանդվող առարկայական ծրագրերի թեմաների և աշխատաշուկայի մասնագիտական կարիքների համեմատություն:

0.4. Guidelines for studying the advisory needs of the employers operating in the fruit production sector

Այգի ունեցող գործատուի հետ հարցազրույց

ՀՀ-ում COVID-19 հավակարակի կանխարգելման միջոցառումներից ելնելով "ՖՐՈՒՏԵՆԻԱ" ծրագրի շրջանակներում նախատեսված դաշտային աշխատանքները իրականացվում են հեռավար միջոցներով:
Տվյալ առցանց ուղեցույցը հանդիսանում է այգի ունեցող գործատուների հետ հարցազրույցների օժանդակ գործիք:

0.5. Guidelines for studying the prerequisites of development of the fruit production specialty in agricultural colleges and the narrow professional needs of the colleges

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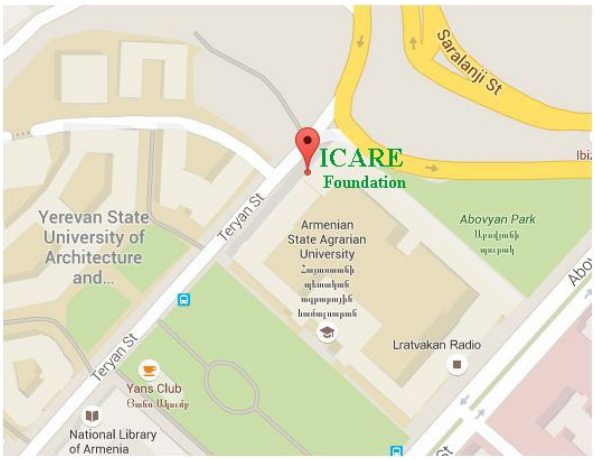

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