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Ministry of Agriculture of Republic of Tajikistan
Korea Rural Economic Institute
Ministry of Agriculture, Food, and Rural Affairs of Korea

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제 출 문

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이 보고서를 「2023 국제농업협력(ODA) 정책컨설팅(KAPEX)」 과제의 최종 보고서로 제출합니다.

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Abbreviation

APC	Agricultural Products Processing Center
FAO	Food and Agriculture Organisation
GAP	Good Agricultural Practice
HACCP	Hazard Analysis and Critical Control Point
ISO	International Organization for Standardization
IWRM	Integrated Water Resource Management
KAPEX	Korean Agricultural Policy Experiences for Food Security
KREI	Korea Rural Economic Institute
M&E	Monitoring and Evaluation
MoA	Ministry of Agriculture of the Republic of Tajikistan
MTP	Medium-Term Development Program
NCCAS	National Climate Change Adaptation Strategy
NDS	National Development Strategy
ODA	Official Development Assistance
PDM	Project Design Matrix
R&D	Research and Development
SDGs	Sustainable Development Goals
TAJSTAT	Agency of Statistic of Tajikistan
USSR	Union of Soviet Socialist Republics
WB	World Bank

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1 Joint Research Outline

1. Overview of Tajikistan

The Republic of Tajikistan has achieved significant successes in the reform of the agro-industrial complex and the development of the agro-industrial system. Structural changes in the agricultural system of Tajikistan within the framework of the adopted programs have produced effective results. Positive dynamics are observed in the production and export of agricultural products, as well as in the promotion of certain innovations in technological production and primary processing. Agricultural progress is still insufficient to respond to the growing challenges facing the country.

The impact of the country's rapid population growth and emerging trends in food markets around the world is visible. In such circumstances, it is necessary to strengthen institutional and structural reforms. At the same time, there is a need to help farmers adapt to climate change, reduced access to water and increased frequency of extreme weather events. Over the past two decades, the agricultural sector has become one of the main drivers of Tajikistan's economy. Despite limited

natural resources and high exposure to climatic hazards, the agricultural sector recorded an average growth of 6.4% in 2010-2019 and 8.8 and 6.6% in 2020 and 2021, respectively. The growth of the agricultural sector is mainly due to the promotion of agrarian reforms, accelerated diversification of production and, to some extent, increased productivity of crop and livestock production.[1)]

The processing of agricultural products, in example of the Republic of Tajikistan, is essential for the development of the agriculture sector. The issue currently appears over here and needs action to solve. The current social and economic status of agriculture in rural area is poor, because the quality of social life in these region is closely tied to their economy, which largely depends on the agricultural sector. Agriculture has been one of the main drivers of Tajikistan's economic growth over the past 20 years. Approximately 80 percent of Tajikistan's poor population resided in rural areas in 2019 where agriculture accounted for 21 percent of GDP and during the same year, employed 61 percent of the labor force.[2)] Despite the significant importance of the agricultural sector, food security at the national level in Tajikistan remains heavily reliant on imports to cover the country's food needs and provide agriculture inputs.

2. Research Background

Developing the agriculture sector is one of the objectives of the National Strategy for 2030 in the Republic of Tajikistan. Processing agricultural products is a crucial component of this strategy. The government is paying special attention to developing the agriculture sector and increasing the export of agricultural products.

1) The Development Program of the Agri-Food System and Sustainable Agriculture for the Period up to 2030

2) NAREE. 2023. Tajikistan CSA Analysis. China

The processing of agricultural products in Tajikistan is an important sector of the economy, which plays a key role in ensuring the food security of the country, creating jobs, and increasing the incomes of the population. Tajikistan's processing sector has significant potential for further development. According to experts' estimates, only about 30% of agricultural production is processed in the country.

The Program for the Development of Agro-food System and Sustainable Agriculture for the period up to 2030 (hereinafter referred to as the Program), which along with measures to increase the productivity of agricultural products provides for measures to create a modern infrastructure for storage and processing of agricultural products,[3] the development of small and medium-sized businesses in the processing sector, the introduction of innovative technologies. Agriculture in rural area in the Republic of Tajikistan needs support with new technology and machinery, developing planting method to make life of farmers easier. New approach of technology and machinery will help farmers save time, produce more product, save more, reduce expenses and make their work and life easier.

Current status of processing agriculture products in Tajikistan is not developed well. Farmers produce the products, and either middlemen or the farmers themselves bring it to market to sell. Most of farmers sell their product without any packaging and branding, leading to a decline in product quality and reduced profits for them. As a result, during trading, transportation, and delivery, many products get spoiled. Due to the lack of packaging, inadequate storage, and a lack of awareness regarding proper post-harvest management and processing processes for agricultural products, the majority of farmers end up wasting their produce and missing out on opportunities to increase their income. This issue faced 95% of agriculture sector in Republic of Tajikistan in rural area and it must solve as soon as possible. Some companies, especially within the plant-food sector, are trying to

3) World Bank. 2021. Tajikistan Agrifood and Public Expenditure Review

reduce food waste by 'up-cycling' which involves using low-valued foods or food-processing byproducts, that would otherwise not be consumed by humans, to create food products.[4)]

Currently the way of farmers packaging the product is unsafe, because using plastic bags for storing, transporting and packaging is not healthy way of product. Using plastic bag is also the sensitive topic nowadays because it not only spoils the the product but also harms the entire environment. It is estimated that as of 2015 only 9 percent of the approximately 6,300 metric tons of plastic waste generated globally has been recycled.[5)] On the other hand, recycling of plastic packaging remains a challenge as plastics tend to be made of different types of polymers, mixed with various processing additives (flame-retardants, colorants, plasticizers, UV-stabilizers and so on).[6)]

To solve these problems mentioned above, the motivation of farmers is crucial, and resolving this issue will introduce new avenues of motivation for them, opening up opportunities to produce agricultural products more efficiently. Additionally, proper processing of agricultural products will help Tajikistan ensure food safety. The food safety implications for plant-derived food depend on various factors, including the quality of the soil, the agricultural inputs used in the cultivation of the source plants, and the methods of harvesting, storage, transportation, as well as the handling of products post-processing and at the retail level, along with the implementation of appropriate food safety management practices.[7)]

Strengthening the processing capabilities of agricultural products should start with the farmers. If farmers have the abilities to produce and store high-quality products, they will not need to sell their products to middlemen. Instead, they can

4) FAO. 2022. Thinking about the future of food safety – A foresight report

5) Geyer, Jambeck and Law, 2017

6) FAO. 2022. Thinking about the future of food safety – A foresight report

7) FAO. 2022. Thinking about the future of food safety – A foresight report

sell directly to processing companies, which will be possible to reduce the cost of processed products. This, in turn, will benefit both farmers and buyers, who will not have to pay the fees of middlemen.

In this context, it is necessary to analyze the current status of processing agricultural products in Tajikistan and suggest the best way to improve it, aiming to increase the quality of agricultural products while also improving farmers' income.

3. Introduction of Joint Research Team

The Joint Research Team consists of experts from both Korea and Tajikistan.

Korean experts:

〈Table 1-1〉 Research Team (Korea)

No	Full name	Position	Joint Research Task
1	Dr. Jongsun Kim	Director, Center for International Agricultural Partnership (CIAP), Korea Rural Economic Institute (KREI)	Team Leader
2	Dr. Kyung-Phil Kim	Research Director, Department of Agroindustry Innovation Research, KREI	Agricultural product trade and distribution expert
3	Minkyung JEON	Research Assistant, CIAP, KREI	Research assistant, coordinator

Tajikistan experts:

〈Table 1-2〉 Research Team (Tajikistan)

No	Full name	Position	Joint Research Task
1	Dr. Firdavsi Kholiqzoda	Senior Level Project staff, Tajik-SHEP	Head of the Research Team, Coordinate the work and summarize the report
2	Abdullozoda Ahmadjon	Head of Agrarian Policy and Monitoring of Food Security Department, MoA	Expert in the agricultural sector
3	Nigina Rajabova	Consultant in Agriculture Sector, MoA	Data entry, analysis and processing

2 Research Methodology

1. Research Question

The overall purpose of this research is to understand the current status of processing agricultural products in Tajikistan focusing on two specific regions, and to propose an Official Development Assistance(ODA) project aimed at strengthening processing agricultural capabilities based on the research results.

To achieve this, the research endeavors to answer the following two core questions;

1. What is the situation of agricultural product base on processing and storing?
2. How necessary is the development of processing agricultural product in Tajikistan?

First, the research team aims to understand the current status of agricultural product production and processing, the utilization of technology in processing,

packaging practices in the agricultural sector, and the willingness of farmers in the marketplace to sell their products as either fresh or processed agricultural products.

After identifying the aforementioned points, the research team aims to formulate policy recommendations for farmers, agribusiness, marketing, trade, export, and cooperation strategies between Korea and Tajikistan. Finally, the Official Development Assistance(ODA) project proposal will be developed based on the research results and in line with the policy recommendation.

2. Research Methodology

2.1. Literature Review

A literature review was conducted to gather primary data for analyzing the current agricultural products processing industry and its value chain in Tajikistan. National and regional agricultural development policies and strategies, past agriculture development project reports, agricultural situation analysis reports, national statistics on agriculture, and other research reports are reviewed.

2.2. Field Research

The research team conducted a field research to assess the actual situation and interview stakeholders. Following the consultation with the Ministry of Agriculture of Republic of Tajikistan, the joint research areas(Sughd, Khatlon) and items(onion, carrot, apple, grape, and rice) are confirmed.

During the field research, the team was able to understand the current status and

issues of agricultural product processing in Tajikistan by interviewing the Ministry of Agriculture, local government agricultural departments, agriculture research and education institutions, farmers, and agricultural processing companies. Additionally, key survey questions were identified through field research.

〈Table 2-1〉 Summary of field research

Category	Name of institute	Date
Government, public agencies, academia, etc.	Ministry of Agriculture of Republic of Tajikistan	20 September, 2023
	ACADEMY OF AGRICULTURAL SCIENCES OF TAJIKISTAN	20 September, 2023
	AGRARIAN UNIVERSITY OF TAJIKISTAN	21 September, 2023
	Department of Agriculture of Sughd region	22 September, 2023
	Vahdat National Garden	22 September, 2023
	Department of Agriculture of Khatlon region	25 September, 2023
Farm	Grape farm (Sughd)	22 September, 2023
	Onion farm (Khatlon)	23 September, 2023
Processing company	Barakat Isfara	22 September, 2023
	Obi Zulol Production Factory	23 September, 2023
	Behbbudi CC	25 September, 2023
	Boktar Food Factory	25 September, 2023

2.3. Survey

This research is designed to address quantitative questions posed to farmers and processors of agricultural products in Tajikistan, with a focus on factors that facilitate processing agricultural products. Conducting a questionnaire survey is deemed the most effective means of gathering extensive data. The selection of a quantitative method aims to comprehensively understand all facets of the subject by reaching a larger pool of respondents and gathering substantial data. Through this approach, the research team anticipates being able to analyze a majority of the data, thus providing insights closer to the reality of investigating the topic.

In this survey, standardized questionnaire items were used among farmers and

processors in the target areas. A total sample of 100 respondents were contacted to participate and respond to the questionnaire. For data analysis, the research team utilized Excel sheets and Kobo Toolbox to obtain results. Respondents were mainly asked about their agricultural production, processing, and storage practices, with a focus on five strategic crops identified in the research.

Afterward, an organization was arranged involving key stakeholders, including key informants, to validate the preliminary findings, provide feedback, and offer further input for writing and finalizing the reports.

3. Research Area

Of the five distinct regions in Tajikistan, Sughd and Khatlon regions were selected due to their predominant presence of agricultural producers, which cater to Tajikistan's markets and serve as exporters.

〈Table 2-2〉 Regions of The Republic of Tajikistan

N	Name	ISO	Capital
1	Sughd Region	TJ-SU	Khujand
2	Districts under Republic Subordination	TJ-RA	Dushanbe
3	Khatlon Region	TJ-KT	Bokhtar
4	Gorno-Badakhshan Autonomous Region1	TJ-GB	Khorugh
–	Dushanbe	TJ-DU	Dushanbe

3.1. Sughd Region

Sughd region (formerly Leninabad province) is located in the north of Tajikistan. Its capital city is Khujand, and the population of the Sughd region was 2,823,900 in

2022. The territory of the region is mainly formed by mountains. In the north are Kurama (3,769 m high) and Mughal (1,624 m) mountain ranges, which are part of the Tien-shan Mountain range. The southern direction is occupied by the mountains of Turkistan (5,509 m), Zarafshan (5,489 m) and Hisor, which belongs to the Hisor and Oloy mountain range. It is located between Kurama Mountain range and Turkestan, in the western part of Fergana valley, through which the Syr river flows. The Ferghana Valley separates the Turkestan and Zarafshan mountain ranges.

Rivers - Syr Darya with the flow of Isfara, Khojabokirgan, Aqsu, etc. Also, Zarafshan with its tributaries Fondaryo, Kishtut, Maghiyan, which has snow glaciers, has a large hydropower reserve and is used for land irrigation.

There are two big lakes in sughd region: Iskandarkul and Aksukan. The soils of the plains are open gray, dark gray in the mountains, which are gradually replaced by loamy soils, mountain-barren soils, and mountain meadow soils. The vegetation of the region consists of desert and semi-desert vegetation; yavshan (shibag), camel's foot thorn, in the valleys of the rivers there are a small number of groves left.

The climate is dry. Winter is not so cold (average temperature in January -1.1), summer is hot (average temperature in July is +28); annual precipitation -150 mm, in places 300 mm per year. Sometimes a hot and dry wind blows. In the mountains, the altitude is about 1000 m colder (average temperature in January -4 and July +26), rainfall more than 400 mm per year; at an altitude of 2,500 m, the average temperature in January is -9, July is +15, annual rainfall is up to 800 mm.

In the field of agriculture, more than 268.4 thousand ha of land are cultivated every year, with cotton, grain products, vegetables, fruits, etc. they produce In the region (since 2015), there are 604.3 thousand head of cattle, more than 1.4 million. head of sheep and goats are 1.7 million. Poultry heads are grown. In 2020, the number of cattle in the sughd region increased to 669 thousand 710 heads, and the number of small cattle equaled 1 million 574 thousand 769 heads.

In the Sughd region, within the framework of the 'Program for the development of

horticulture and viticulture in the Republic of Tajikistan for 2016-2020', gardeners and viticulturists have achieved significant achievements. During this period, almost 4,360 ha of new gardens were built in the cities and districts of Sughd region. During the last 5 years, instead of 2,076 ha, more than 5 thousand ha of old orchards were restored in the cities and districts of Sughd region. In addition, over the past five years, 207 ha of intensive orchards, comprising apples, plums, apricots, peaches, black plums, and cherries, have been planted. Additionally, pears, almonds, walnuts, and quinces have been cultivated. Furthermore, approximately 373 ha of old vineyards have been restored, and 351 ha of new vineyards have been established.

3.2. Khatlon Region

Khatlon region is a province in the south of the Republic of Tajikistan. Its center is city of Bokhtar, which is located 100 km south of Dushanbe, the capital of Tajikistan, on the bank of the Vakhsh River.

Khatlon region was officially established on 2 December, 1992 based on the Decision of the Supreme Council of the Republic of Tajikistan.

Khatlon region is located in the Vakhsh Valley with a land area of 24,600 km² and includes 17.2 percent of the territory of Tajikistan. This region is bordered in the north by the subordinate districts of the republic, in the east by the Badakhshan Mountain Autonomous Region, in the south by Afghanistan, and in the west by Uzbekistan.

The population of Khatlon region is 3,047,800 people, which is 35.6 percent of the population of Tajikistan. Of these, 547.5 thousand people, approximately 18 percent of the total population of the region, were urban and 2,500.3 thousand people (82.0 percent) were rural. The average population density in the region is 123.9 people per km². Khatlon people speak Tajik and Uzbek languages.

Khatlon region has 334 art enterprises, which produce 29.8 percent of the total volume of production in Tajikistan. There are 15,196 mln. kw/h of electric power, 27.9 thousand power transformers, 59.2 thousand tons of cotton fiber, 774.0 thousand tons of grain, 197.9 thousand tons of cotton, 461.9 thousand tons of vegetables, 3,605,000 tons of raw materials were produced.

The number of cattle breeders in the region was 756.4 thousand, including 394.7 thousand cows, 1,720.6 thousand sheep and goats, and 54.7 thousand horses.

Mainly Sughd and Khatlon region are located for agriculture sector. In this reasons the Joint Research Team focused to this two region of the Republic of Tajikistan.

4. Research Scope and Limitations

This research holds importance as the first agricultural research cooperation between Korea and Tajikistan, but it has several limitations.

4.1. Region

As mentioned earlier, this research focuses on the five strategic crops across two regions including Sughd and Khatlon. During field research, the team observed that collecting data solely from these two regions may not suffice, as the targeted crops in Tajikistan are also extensively produced in the Republican Subordination Districts. Due to time constraints, the joint research team was unable to include these territories. It is recommended that future surveys incorporate the Republican Subordination Districts for comprehensive analysis.

4.2. Target

The present study has its limitations. Several general implications of this survey can be drawn from investors, security analysts and policy makers. Based on the results, farmers can do better in market analysis and selection of post-harvest and post-processing agricultural products for their business as well as daily use. In addition, it is expected that the results of this survey will help farmers to identify which markets are associated with different types of agricultural products, its needs, quality, size and packaging of agriculture products.

The result can be summarized not only by the number of farmers, the average rate of agricultural products processing enterprises in the processing of agricultural products after harvesting, but also by the use of the current state of the market and the seller and buyer of agricultural products. Thus, future research is recommended to include both consumers and traders of agricultural products as well, so that the data collected through the questionnaire can be widely compared.

4.3. Time

The time limitation during the current survey was also a significant issue. The survey and analysis were completed within 3 months, which was insufficient. It is recommended for future joint research endeavors that the duration of the collaboration be scheduled for at least one year. This extended time frame would allow the research team to thoroughly collect, analyze, and evaluate the situation in the targeted market.

3 Analysis of Agriculture Development Policies and Strategies of Tajikistan Methodology

1. National Development Policies and Strategies

Tajikistan has key policy and strategic documents that provide a common vision for the short- and long-term development of the country. In 2016, the National Development Strategy of the Republic of Tajikistan for the period until 2030 (NDS - 2030) and the Medium-Term Development Program for 2016-2020 (MTP 2016-2020) were adopted, and in 2021, the Medium-Term Development Program of the Republic of Tajikistan for 2021-2025 (MTP 2021-2025) was adopted. Furthermore, in 2020, the Program of Food Security for the Republic of Tajikistan for 2020-2024 was adopted, holding particular significance in ensuring the country's food security.

Legislation and planning for the agricultural sector and environmental protection of the Republic of Tajikistan are consistent with the objectives of the country's broader policy partnership.

1.1. National Development Strategy of the Republic of Tajikistan for the period until 2030 (NDS – 2030)

The NDS - 2030 was adopted taking into account the priority areas for the Republic of Tajikistan. Ensuring food security and the population's access to quality nutrition is one of the four strategic development goals of the Republic of Tajikistan, along with the following (i) ensuring energy security and efficient use of electricity, (ii) to overcome the communication deadlock and turn the country into a transit country (iii) accelerated industrialization and the expansion of productive employment.[8)]

1.2. Medium-Term Development Program for 2016-2020 (MTP 2016-2020)

The MDP for 2016-2020 defined the goals, priorities, tasks and activities necessary for the transition to a new-quality economic growth model. These objectives are as follows: (a) Ensuring stable access to energy resources; (b) Overcoming insufficient food self-sufficiency; (c) Integrating cross-border and national transport corridors and developing telecommunication networks; and (d) Ensuring equal access to social services.[9)]

8) Government of the Republic of Tajikistan, 2016. National Development Strategy of the Republic of Tajikistan for the period until 2030.

9) Government of the Republic of Tajikistan. Medium-term Development Program of the Republic of Tajikistan for 2016-2020.

1.3. Medium-Term Development Program of the Republic of Tajikistan for 2021-2025 (MTP 2021-2025)

The MDP 2021-2025 concretizes the second phase of the implementation of the NDS -2030, which should ensure continuity of development and strengthen elements of the new growth model. The MDP 2021-2025 identifies priorities, goals, objectives and activities aimed at (a) increased efficiency in the utilization of national resources; (b) strengthening of the institutional framework; (c) development of human capital and substantial improvement in the quality of social services; and (d) further development of the country's regions.

An important feature of this strategic document that distinguishes it from the previous MDP 2016-2020 is that the implementation of its priorities, goals and objectives is based on: (a) strengthening of preventive measures under the negative impact of the crisis in the world economy provoked by the spread of COVID-19; (b) concretization of the principle of industrialism within the framework of the new strategic goal announced by the President of the country - accelerated industrialization; (c) formation of the foundations of digital transformation in the country. These features make it necessary to revise and clarify the target parameters of the NDS-2030 and their monitoring indicators, taking into account the current conditions in the world.[10)]

1.4. Other relevant policies and strategies

Water Sector Reform Program of the Republic of Tajikistan for 2016-2025

The Water Sector Reform Program of the Republic of Tajikistan for 2016-2025 details the proposed water sector reforms in all sub-sectors related to water use.

10) Government of the Republic of Tajikistan. Medium-term Development Program of the Republic of Tajikistan for 2021-2025.

They are based on the principles of integrated water resources management (IWRM) and are aimed at taking into account social, economic and environmental interests through sustainable and balanced management and development of water resources.[11)]

National Climate Change Adaptation Strategy of the Republic of Tajikistan for the period up to 2030 (NCCAS RT 2030)

National Climate Change Adaptation Strategy of the Republic of Tajikistan for the period up to 2030 (NCCAS RT 2030). This strategy contributes to the formulation and implementation of Tajikistan's climate change and adaptation policy and is aimed at supporting economic growth and accelerating the modernization of all sectors of the economy, diversifying and strengthening the global market, as well as improving the competitiveness of Tajikistan's economy by increasing the country's adaptability and energy efficiency.

The Strategy will enable the country to adopt a more integrated and dynamic approach to planning for the sustainable development of the country as a whole, and in particular its economy, and to take into account medium- and long-term projections of climate change and variability. The main aspects of this strategy are the risks associated with climate change and adaptation measures, as well as reducing the impacts of these risks on the population and key sectors of the economy. Consequently, the Strategy identifies adaptation needs and options by sector, prioritizing cross-sectoral adaptation options such as IWRM and ecosystem-based adaptation.

11) Government of the Republic of Tajikistan. 2015 г. Water Sector Reform Program of the Republic of Tajikistan for 2016–2025.

2. Tajikistan's Agriculture Development Policies and Strategies

2.1. Program for the Development of Agro-industrial Systems and Sustainable Agriculture for the period until 2030

In 2023, the Government of the Republic of Tajikistan adopted the Program for the Development of Agro-industrial Systems and Sustainable Agriculture for the period until 2030, which aims to continue agrarian reforms, create a climate change resilient system, provide favorable conditions for the promotion of agriculture, increase productivity, job creation, efficient use of water and energy for production, sustainable development, improving the welfare of the population and food security.

In recent years, due to improvement of meliorative condition and introduction of new lands into agricultural turnover, the share of sown areas allocated for potatoes has increased - 37.1%, vegetables - 45.4% and melons - 23%, orchards and vineyards - 26.4%. As a result, grain production increased by 28.7%, potatoes by 5.1%, vegetables by 93.5%, melons by 76.1% and fruits by 42%.

Despite the progress made in the development of the agricultural sector and the establishment of agri-food systems, the country still faces a number of challenges. In 2025, the share of the agricultural sector in GDP is 25%, which indicates a rapid growth of production, but the growth of production is very slow. The reason lies in underdeveloped infrastructure and its inefficient use, insufficiently developed technological base, potential losses of land and water resources.

A number of institutional, structural and scientific-technical issues remain unresolved, including the insufficient level of development of agro-logistic services. Despite the steps taken to develop agro-logistic services, the infrastructure for grading, calibration, processing of produce as well as cold storage is at a rather low

level and does not meet the needs of storage and post-harvest processing, especially of perishable early maturing produce.

Despite the positive growth dynamics of fruit and vegetable exports, their diversification is insufficient and accounts for only 3% of the total value of the country's exports. The problem of insufficient diversification is insufficient investment in agro-logistics services, water-saving technologies and other trade support measures.

The program highlights the following key approaches: (a) improvement of the management and control system, with an emphasis on the introduction of new methods of forecasting and planning, interdepartmental coordination and diversification of public spending allocated to the development of the sector; (b) increasing the investment attractiveness of agriculture using organizational and economic mechanisms that provide for the use of specialized private or mixed investment funds, as well as risk reduction instruments for financing agriculture; (c) improving inter-sectoral interaction both at the level of sectoral programs and the functional responsibilities of the involved authorized bodies and organizations in the interests of increasing agricultural productivity; (d) restructuring of the scientific, technical and educational base in agriculture; (e) building up the agrological infrastructure necessary for agricultural production; (f) creating conditions for the development of the institute of agricultural extension services, including promoting the development of a culture of using agronomic technologies; introduction of climate-smart agriculture methods to ensure rational use of natural resources (soil and water) and environmental protection; (g) adaptation and formation of an agricultural system resistant to climate change; (h) expanding understanding of the principles of integrated water resources management in the agricultural sector; (i) promoting the efficient use of water, water-saving practices and technologies in the production of agricultural products and reducing energy costs and water pollution; (j) rational use of soils to optimize production and ensure

profitability of crops; expanding the opportunities of small dehkan farms to receive high incomes from production, broad involvement of rural youth and women in this work; and (k) encouraging the unification of agricultural producers into production groups, agro-industrial clusters and other forms of cooperation.

The program plans to promote investments in agro-logistics centers to improve the horticulture value chain and increase their competitiveness and access to markets.

2.2. Concept of Creation and Development of Agro-Industrial Clusters in the Republic of Tajikistan for the period up to 2040

The Concept of Creating and Developing Agro-Industrial Clusters in the Republic of Tajikistan for the period up to 2040 serves as the foundation for designing and implementing projects aimed at establishing and nurturing the agro-industrial clusters, which are considered as measures to diversify production and promote competitive agro-industrial products. The concept aims to foster a common understanding of the methodology of creating and developing such clusters while also creating favorable conditions for their establishment and ongoing growth.

The concept provides for the solution of the following tasks: (a) formation of methodological and legislative grounds for the creation and development of agro-industrial clusters; (b) definition of the priority directions of agro-industrial clusters; (c) creation of conditions for the development and implementation of cluster projects, organizational and methodological assistance in their development and implementation; (d) assistance to organizational and practical work on the creation and development of agro-industrial clusters; (e) promotion of cooperative ties between farms, processing enterprises, research institutions and other organizations in various fields within the unified production programs,

characterized by a complete form of the production of agricultural commodities (production of raw materials, processing and production of finished products, storage and trade), innovation processes, quality control programs and other; (f) increasing the innovation activity of entrepreneurs to update production and processing of agrarian products; (g) promoting better interaction between science, education and production, the formation of a system of vocational training, meeting the requirements of agricultural producers; (h) organization and maintenance of the state support system for creation and development of agro-industrial organization and functioning of the state support system for the creation and development of agro-industrial clusters; (i) establishment of coordination between the central bodies and city and district executive bodies and city and local governments; and (j) establishment of coordination between central bodies and executive bodies of the state power of cities and districts and the private sector (producers and suppliers of agricultural commodities and processed goods).

2.3. Food Security Program of the Republic of Tajikistan for 2020–2024

The Food Security Program of the Republic of Tajikistan for 2020-2024 is aimed at sufficient provision of the population and processing enterprises with safe and nutritious agricultural products at the expense of own production. Ensuring physical and economic accessibility of food will be realized on the basis of diversification and innovation of the agricultural sector of the country, in order to achieve its sustainable growth and competitiveness, development of agricultural production clusters, increase profitability and export potential and access of the population to high quality food.

The following priorities have been identified by the program: (a) ensuring physical and economic accessibility by increasing domestic agricultural production in all

categories of households and reducing dependence on imports; (b) developing an effective system of agricultural resource management and a culture of utilization; (c) Diversification of agricultural production based on innovative technologies and strengthening the sustainability of the product value chain; and (d) joining the group of states with a sustainable level of food security (at least 70 percent).

In order to realize the tasks, it is supposed to show the competitiveness of own products in relation to imported products and to provide their storage. Products preserved with the new technology will be more affordable as shelf life will increase mass consumption and generate more profit for the producers in the market.

2.4. Program to Create Favorable Conditions for the Introduction of Good Agricultural Practices in Agricultural Production of the (International Standard Global G.A.P.)

The program of creating favorable conditions for the introduction of good agricultural practices in agricultural production (international standard Global G.A.P.) is aimed at ensuring the development of the agricultural sector, introducing new methods of innovation and technological management in the agricultural sector, and increasing the volume of agricultural exports.

The program includes the following goals and objectives: (a) create favorable legislative, procedural, technical and financial conditions in the agricultural sector and related industries for the implementation of the Global G.A.P. standard; (b) increased knowledge of producers and involved government agencies on the requirements of the Global G.A.P. standard; (c) assessment and analysis of legislation for compliance with the Global G.A.P. requirements, taking into account the analysis of the existing practice of implementation of conditions and requirements stipulated by the provisions of the Global G.A.P. standard for each key element of the standard

(sanitary and hygienic procedures, occupational health and safety, environmental protection, water and soil quality, production waste management, etc.) and development of proposals for amendments and additions to the existing normative and technical acts for compliance with the requirements of the Global G.A.P. standard; (d) preparation of a national interpretation guide for the requirements of the GLOBAL G.A.P. standard, which is based on national regulatory requirements. According to GLOBAL G.A.P. procedures; (e) development of incentives for producers intending to implement the GLOBAL G.A.P. Standard and producers who hold GLOBAL G.A.P. certificates (as well as HACCP[12] and ISO[13]) or have contracted for certification work; and (f) assessment and development of capacity building measures for the national quality infrastructure (development of procedures for GLOBAL G.A.P. Standard certification, local body accreditation and/or accreditation of local laboratories, training of consultants and auditors).

As a result of the program implementation, the following positive effects will be achieved:

- Harmonization of food safety management systems and capacity building of national quality infrastructure;
- Creating new conditions for production and improving existing production and business relationships that completely eliminate or prevent physical and biological contamination of products;
- and Increasing the confidence of consumers, trade and purchase and retail networks in Tajik products, as well as on the investment climate in agriculture.

12) HACCP: Hazard Analysis and Critical Control Point

13) ISO: International Organization for Standardization

2.5. Program for the Development of Horticulture and Viticulture 2016–2020

Horticulture and viticulture are key branches of agriculture in the Republic of Tajikistan, capable of supplying the domestic market with food, enhancing the republic's export potential, and providing permanent employment for the population. The favorable weather conditions in the country enable the expansion of orchards and vineyards by utilizing high-yielding variety seedlings and adopting new innovative technologies. This ensures a consistent supply of fruits and grapes to meet the population's demand year after year, with surplus available for export.

Tajik fruits are considered the most delicious in the world thanks to abundant sunny days, clean mountain waters, fresh air, as well as favorable soil which is located at an altitude of more than 1-2 km above sea level. Tajikistan grows such fruits as: cherries (April 15-June 20), grapes (May-November), apricots (May-July), pears (June-November), apples (June-November), figs (August-October), persimmons (October-December), watermelons and melons (May-November), Greek nuts (September-October) and many others.

The program aimed to construct new orchards and vineyards, reconstruct old ones, and replace low-yielding varieties with high-yielding ones to boost export volumes. Through the establishment of intensive and super-intensive orchards, along with the implementation of advanced seeds and technologies in fruit nurseries, it aimed to increase overall fruit and grape production volumes.

In order to implement this Program and achieve its goals, the subordinate enterprises and institutions of the Ministry of Agriculture of the Republic of Tajikistan, in particular the Republican Unitary Enterprise of Fruit and Vegetable Nursery Farms "Tochikniholparvar", farms subordinate to the Institute of Horticulture and Vegetable Growing of the Tajik Academy of Agricultural Sciences and the Forestry Agency under the Government of the Republic of Tajikistan had to

prepare seedlings, taking into account climatic conditions and soil of the regions, using new and innovative methods of planting, as well as the use of new planting materials.

The Program notes that in order to adequately supply the country's population with fresh fruits and grapes throughout the year, various measures need to be implemented. These include exporting products, construction of warehouses for storage of fruits with special refrigeration units, enterprise for production of glass containers, packaging materials, small and medium workshops and enterprises for processing of products depending on the availability of raw materials and market needs, all measures should be taken.

As a result of this program, as of 2022, 496 fruit storage facilities have been constructed, with a capacity of about 187,000 tons.

2.6. Concept of Seed Sector Development of the Republic of Tajikistan for the period til 2030

The favorable climate and environment in Tajikistan enable the production of high-quality seed varieties and hybrids to meet local demands and facilitate seed exports. Therefore, the focus of seed sector development should not only be on meeting local needs but also on expanding seed exports, thereby enhancing the productivity of the sector. Historically, plant breeding and seed production were fully funded by the government budget.

However, economic reforms and the transition to a market-based economy have led to reduced funding for the sector. Consequently, alongside government-dominated seed production, private seed production has emerged and is in its initial stages of development. While some private seed farms have shown promising results in introducing new varieties, particularly in cereals and vegetables, challenges

remain in variety testing, seed multiplication, and release. As a result, the current status of the seed sector in the country is not satisfactory. Therefore, the formulation and adoption of a Seed Sector Development Concept as a strategic document to outline state policies for sector development are crucial.

The Seed Industry Development Program in the Republic of Tajikistan for 2021-2025 is a medium-term action program based on the priorities of the National Development Strategy of the Republic of Tajikistan until 2030, aiming to increase crop yields and production by growing new varieties, as well as seeds and planting materials. The program aims to implement the Government of the Republic of Tajikistan's policy on plant breeding and seed production in alignment with international standards. Its objectives include enhancing the operations of governmental bodies in seed production, plant breeding, quality control, registration, and protection of plant varieties. Additionally, it seeks to improve quality control and certification of seeds, phytosanitary and quarantine plant control, seed production, processing, and marketing. Furthermore, the program focuses on training and retraining industry specialists to ensure the quality of seed production and marketing.

The purpose of breeding new plant varieties is to provide farmers with high-yielding varieties with good consumer qualities, adapted to local conditions. In implementing the program, two main processes are priorities for the development of the industry: (a) creation of a legal basis for the formation of new breeding and seed centers and support of functioning farms; and (b) improvement and targeting of processes and level of state financial support in the field of breeding and seed production.

3. Regional Agriculture Development Strategy

3.1. Program of Socio-Economic Development of Sughd region for 2021-2025

The primary objective of the program is to ensure the realization of the Sustainable Development Goals. The ultimate aim of Tajikistan's long-term development is to elevate the well-being of its population through sustainable economic growth. The development program for the Sughd region is aligned with national-level strategies and programs while also accounting for the region's unique development characteristics. It encompasses all activities undertaken in the region, including those funded by state and local budgets, development partner contributions, public organizations, and investors.

The program presents the following objectives by 2025: (a) increasing the efficiency, diversity and competitiveness of the real sector of the economy, including fixed assets of enterprises and institutions, natural resources such as water, land and underground minerals, energy, transport, information and communication infrastructure and others; (b) human resource development; (c) institutional strengthening of the country; and (d) ensuring macroeconomic stability based on the balanced development of the regions of the region.

The agricultural sector is considered one of the main drivers of economic development of the region and plays an important role in the socio-economic life and food supply of the population of the region and the republic, since 75 percent of the region's population live in rural areas and are mainly engaged in agriculture.

In the medium term, as in the previous program, the main focus will be on ensuring sustainable development of the agricultural sector and ensuring food security.

To achieve the set goals for agricultural development, the program considers the

following tasks: (a) continuation of the process of sectoral reforms; (b) restoration and improvement of the water supply system; (c) development of new lands; (d) development of partnership between the state and the private sector; (e) improving the innovation base for the development of the agro-industrial complex; (f) increasing the capacity of agricultural farms; (g) increasing mechanization and automation of industry; and (h) ensuring environmental safety in the process of agricultural production.

To solve the set tasks and achieve the main goals of the industry, it is necessary to implement the following measures:

1. Strengthening the food base;
2. Introduction of modern equipment and technologies;
3. Improving the condition of pastures in neighboring areas of the region;
4. Protection of orchards and vineyards; and
5. Creating conditions for strengthening the value chain towards the production of export-oriented products and other tasks.

The result of the implementation of these measures will be strengthening ties between production and science, increasing the level of state regulation and development of selection and breeding activities, strengthening ties between different levels of management of the agricultural sector.

One of the important features of the implementation of these measures is their synergistic effect, that is, they reinforce each other. The implementation of these measures will help increase the volume of environmentally friendly products in the consumer market and increase demand in the world market.

3.2. Program of Socio-Economic Development of Khatlon region for 2021-2025

The main goal of the program is to improve the living standards of residents of the region by ensuring rapid economic development. To achieve the highest goal for the period until 2025, the following sub-goals have been identified: (a) creation of favorable living conditions for the population of the region; and (b) transformation of the region into an industrial, agricultural, cultural and tourist center.

The Program defines the following benefits: (a) ensuring sustainable economic development by activating existing potential; (b) development of industrial entrepreneurship; (c) ensuring access of urban and rural populations to clean drinking water; (d) development of existing infrastructure (utilities, transport, energy) and basic social infrastructure; (e) protection of the environment and ecology; and (f) disaster risk prevention and a number of other benefits.

Within the framework of the program it is planned: (a) transforming the region into an industrial, agricultural, cultural and tourist center; (b) revitalization of existing enterprises and construction of new enterprises equipped with modern equipment and technologies; (c) ensuring the development of free economic zones in cities and districts of the region; (d) formation and development of light industry, food industry, processing of agricultural products (meat, dairy products, fruits and vegetables) and building materials; (e) construction of greenhouses and cold rooms for growing and storing agricultural products; (f) bringing lands out of agricultural use into agricultural use, providing them with clean water and installing drainage systems in most areas of the region; and (g) creation of poultry enterprises, fish farms and special reservoirs for their storage and other tasks.

In order to overcome existing problems and, in this regard, promote further development of the industry, it is necessary to implement the main goals of the industry:

1. Increasing production volumes of horticultural products;
2. Ensuring stable growth in livestock production; and
3. Improving the innovative basis for agricultural development.

The program also reflects gender issues. Carrying out measures to improve reclamation conditions will provide favorable conditions for increasing the area of agricultural land, increasing the volume of agricultural production and its profitability.

4 Current Situation on Post-Harvest Stages of Agricultural Products in Tajikistan

1. General situation on post-harvest stages of agricultural products in Tajikistan

In recent years, the economy of the Republic of Tajikistan has undergone significant socio-economic transformations associated with the transformation of property relations through the processes of denationalization and privatization of agricultural, processing, service enterprises and their various associations. These processes have been pivotal in shaping a diverse agrarian economy, characterized by the emergence of various organizational and legal ownership forms including joint, private, unitary, state, different types of joint-stock companies, cooperatives, farms. The country's agro-industrial complex has started operating with relative independence and tough competition, giving a strong impetus to the development of its industries. However, despite these positive changes, domestic production still struggles to match the competitiveness of foreign counterparts.

The development of agricultural enterprises in the Republic of Tajikistan is taking place in difficult conditions caused by systemic crises and painful problems of

reforming the country's economy. In addition, there are obstacles in the relationship between industries and structure-forming industries and toughening competition in the external markets of agricultural products. Regional agricultural enterprises in their production and marketing activities have faced the difficulties associated with changes in the economic space of the country and the world. The country's economy moves towards innovative development and the establishment of a single economic space.

In 2022, the total volume of agricultural production across all categories of farms in the country reached 49.3 billion somoni,[14] marking an 8% increase compared to 2021. The largest shares in crop production are occupied by vegetables and cereals. Additionally, the country actively cultivates cotton and fruits, which are exported.

〈Table 4-1〉 Total volume of agricultural production of the Republic of Tajikistan 2016-2022

Unit: million ton

	2016	2017	2018	2019	2020	2021	2022
Vegetables	1,748,0	1,859,0	2,119,4	2,182,6	2,479,4	2,597,6	2,714,8
Grains	1,436,0	1,448,0	1,296,2	1,414,6	1,561,4	1,586,3	1,756,3
Cereal (including rice)	96,0	98,0	90,5	106,4	133,4	140,4	146,9
Fruits	341,0	405,0	447,9	473,8	467,8	444,4	512,0
Gripes	214,7	228,3	241,9	247,2	239,1	267,5	301,1

Source: Agency on statistics under the President of the Republic of Tajikistan. Statistical publication "Agriculture of the Republic of Tajikistan", 2023

Statistics indicates that over the last 10 years, the area for the horticultural crops production in Tajikistan has increased by an average of 71,000 ha or 3.2% per year. In contrast, during the same period, acreage under cereal crops has decreased by 1.7% per year, and acreage under fiber spinning crops declined by an average of 24.3% per year. This trend suggests that fruit crops provided a higher return on investment compared to other crops.

14) The somoni is the currency of Tajikistan. (1 somoni = 0.091 USD, date: 13 May, 2024)

According to Agency of Statistic of Tajikistan , by 2022, a total of 311.3 thousand ha have been allocated for horticultural production, most of which is used for fruit cultivation (52.8%). Most of the land was devoted to fruit.

The share of land areas allocated to all categories of agricultural crops increased, except for nuts, which remained stable over the analyzed period of time. The fastest relative growth was observed for vegetables, potatoes, melons and melon crops, which was almost identical at 5.6-5.7% per year. The area under fruit increased by an average of 1.5% per year and under grapes by 0.4%. In absolute terms, the largest increase over the ten years was observed in vegetables 28.7 thousand ha and potatoes 21.0 thousand ha. Fruit area also increased by an impressive 11.7 thousand ha, or about 1.2 thousand ha per year.

Over the past 10 years, Tajikistan has been steadily increasing its production of fresh produce. The average annual increase reached 6.5%, which was the result of an equal increase in both the sown area and yield per ha.

〈Table 4-2〉 Gross harvest of selected agricultural products by regions of the Republic of Tajikistan 1991-2020

Unit: ton

Regions	Years					
	1991	2010	2017	2018	2019	2020
Grains						
Khatlon region	131,044	380,094	903,125	822,560	870,256	985,322
Sogd region	105454	360,562	309,997	272,394	331,689	351,374
GBAO	4,276	16,263	14,176	9,574	6,351	7,103
DRS	50,917	198,120	220,381	191,638	206,335	217,555
Dushanbe	264	20	10	3	7	2
Republic of Tajikistan	291,955	1,261,059	1,447,689	1,296,169	1,414,638	1,561,356
Vegetables						
Khatlon region	66,145	533,887	1,021,221	1,198,327	1,258,992	1,469,760
Sogd region	132,615	329,538	480,551	517,859	494,914	560,393
GBAO	2,775	18,346	16,838	11,383	10,666	10,656
DRS	120,592	260,853	340,463	391,811	417,978	438,549

Regions	Years					
	1991	2010	2017	2018	2019	2020
Dushanbe	372	–	12	12	6	2
Republic of Tajikistan	322,449	1,142,624	1,859,085	2,119,392	2,182,556	2,479,360
Fruits						
Khatlon region	8,463	95,437	173,877	188,468	201,535	209,094
Sogd region	45,875	69,741	123,744	139,350	150,985	139,395
GBAO	1,214	15,304	19,749	20,179	20,084	20,736
DRS	14,144	44,901	87,648	99,982	101,136	98,577
Dushanbe	68	–	16	16	17	–
Republic of Tajikistan	69,764	225,383	405,034	447,935	473,757	467,802
Grape						
Khatlon region	39,474	61,236	101,419	104,536	106,025	107,453
Sogd region	38,989	37,022	57,123	61,362	61,746	50,572
GBAO	2	–	–	–	–	–
DRS	14,079	26,041	69,761	76,003	79,394	81,071
Dushanbe	63	–	–	–	–	–
Republic of Tajikistan	92,607	124,299	228,303	241,902	247,167	239,096

Source: Agency on statistics under the President of the Republic of Tajikistan. Statistical publication "Agriculture of the Republic of Tajikistan", 2021

The table data indicates that the production of fruits and vegetables is increasing from year to year. The fastest relative increase in production was observed for melons, grapes and fruits 9.4%, 8.4% and 8.4%, respectively. In terms of absolute value, the greatest growth occurred in the fruit category, which over the past 10 years on average added about 78.3 thousand tons of production per year.

Average yields increased the most for table grapes 8% and for fruits 6.9%, while average potato yields decreased by 2% per year, and vegetable yields showed a very slight downward trend, which could be due to more wide range of grown products.

As part of this study, the Ministry of Agriculture of the Republic of Tajikistan proposed to study the current potential and processes of post-harvest processing of the following types of crops: onions, carrots, apples, grapes and rice.

CROP 1: Onion

After the collapse of the Union of Soviet Socialist Republics (USSR), Tajikistan, along with multiple problems of state building, faced the task of ensuring economic security, especially in the field of the maximum possible domestic food production, obtaining high yields of the most valuable vegetable crops in the human diet, including onions.

Therefore, scientists of the republic and research institutions conducted certain studies devoted to the problems of improving selection and technology in vegetable growing. However, for a number of reasons, the problem of the development of onion seed production and its reasonable placement for the agro-economic science of Tajikistan remains open.

The agro-climatic conditions of Tajikistan are very suitable for growing onions. At the same time, the most attractive, from the point of view of the efficiency of placement of this crop, is the Sughd region. The presence of a fairly high thermal regime in this zone is favorable for the cultivation of many agricultural crops and in particular onions. The warm period in this zone is relatively long. In the lowest areas of the Sughd region, the duration of the warm period reaches 270 days, and it depends on the altitude of the territory.

Active vegetation of plants is possible for 200-230 days in areas located below 1,000 m above sea level. Effective cultivation of onions for food and seed purposes largely depends on the duration of the frost-free period on the soil surface. The longest frost-free period (208 days) on the surface of the earth at an altitude of 300 m above sea level. Annual precipitation averages 100-200 mm, so onions are cultivated in the irrigated zone. Thanks to the presence of irrigated lands in this zone, favorable conditions are created for organizing intensive vegetable growing and seed production of vegetable crops, producing high yields of onions, tomatoes, carrots, cucumbers and melons.

A special place is occupied by the southern regions of the Khatlon region, where

the earliest vegetable products are obtained. In some years, the projection of early onion variety Peshpazak arrives at the markets of Dushanbe by the end of April.

In general, the climatic resources of all valley regions of the republic make it possible to cultivate onions not only for food purposes, but also for seeds, both in autumn and spring when sowing seeds or planting uterine bulbs.

At the first stage of economic reforms in Tajikistan, special priority was given to agricultural reform. This was based on the role played by agriculture and industries related to the processing of agricultural raw materials in the modern economy of the republic. It is the agricultural sector that can be a powerful factor in the economic stability of the republic; agricultural products, especially cotton and onions, currently serve as the main foreign exchange resource, a source through which the purchase of imports of food products, petroleum products, equipment and technological materials vital for the republic is ensured. equipment.

The natural and economic conditions of Tajikistan are very favorable for the cultivation of all heat-loving crops, especially cotton and vegetables, in particular onions. Thoughtful use of these conditions will significantly increase the income of farmers.

The problems of meeting the population's needs for onions and other food products have always been in the foreground. Numerous experiments have proven that with the rational organization of labor, the use of the latest technology, specialization and concentration of production, it is possible to speed up the process of fully meeting the needs of the population of the republic in the near future.

According to Agency on Statistics of the President of the Republic of Tajikistan (TAJSTAT), in 2022, 525.8 thousand tons of onion were produced, of which Khatlon region accounted for 63.6% (334.2 thousand tons), Sughd region 27.2% (143.0 thousand tons), DRS 9% (47.2 thousand tons) and GBAO 0.2% (1.4 thousand tons). In 2023, onions were sown on an area of more than 17 thousand ha, while most of the sown area - about 11.3 thousand ha - will be early onions.

CROP 2: CARROT

Carrots are one of the main vegetable crops in Tajikistan. Table carrots play an important role in human nutrition. It is a rich source of essential carbohydrates, mineral salts, vitamins and micro elements. Carrot roots are widely used in the preparation of national dishes, in cooking, as independent dishes and as a seasoning. Carrot juice is highly recommended for baby food. Carrots are very valuable as food for farm animals, especially in the diet of young animals and breeding herds. 100 kg of root vegetables contain 14 feed units, 0.8 kg of digestible protein, 80 g of calcium, 50 g of phosphorus. Carrot tops are fed to animals fresh and ensiled.

According to the Ministry of Agriculture of the Republic of Tajikistan, in 2023, carrots were planted on an area of 4,938 ha, 1,770 ha of which were early sowing.

In 2022, carrot production amounted to 499,170 tons. Carrots are considered one of the main consumer goods. It is also considered the most economically important vegetable in the world. Carrots are the main agricultural export product for many countries around the world. According to TAJSTAT, 5,600 tons of carrots were exported abroad in 2022.

CROP 3: APPLE

In Tajikistan, favorable natural conditions, including an abundance of sunny days, mountain water and fresh air, give local fruit products juiciness and sweetness.

Tajikistan is the birthplace of apples and all modern, tasty and healthy varieties of this fruit. In the past, when growing apples, folk breeders created many varieties depending on natural conditions and turned the country into practically an apple paradise. Today, apples of local varieties are grown throughout the republic and in each region they have their own characteristics.

According to the Institute of Horticulture of the Academy of Agricultural Sciences

of Tajikistan, a total of 220 variety-exemplary local apple trees of the national selection of the republic have been identified. Of these, about 30 varieties are grown in the republic. According to the ripening period, apples grown in Tajikistan can be divided into four categories.

- Early varieties ripening in May-June. Usually their fruits are small and the yield is low. They also do not last long - from 10 to 30 days. Early apples in Tajikistan are grown in the lowland regions of Khatlon and Sughd regions, as well as in the Gissar Valley. People call them "peshpazak" (quick-ripening), there are hundreds of varieties and dozens of species - Javpazak, Sabzakseb, Shakarseb, etc. Note that many of these varieties have summer and autumn varieties.
- Summer apple varieties ripen in July-August. They last a little longer, but transportability is significantly lower than in autumn and winter. The most common varieties are Zago-raseb, Gulseb, Kandak, Zardseb, Pongozi, Ashtarkhoni, Shokhiseb, White filling, White anise, etc.
- Autumn varieties of apples occupy an intermediate position between summer and winter ones. They reach harvest maturity at the end of August, and consumer maturity 10-20 days after harvest. These varieties can be stored for up to three months. Autumn varieties include Garma, Kandak, Zardseb, Tiramohi surkh, Sharaf, Pongozi, Sangseb, Gulobiseb, Maliki Shafei, Abdullogi, Maliki, Kandak, Mirsangini, Sharaf, Anis, Aport, Antonovka, etc.
- Winter apple tree varieties reach full maturity in September-October. They usually reach consumer maturity during storage, after several months of storage.

Scientists of Tajikistan identify 9 populations of the Sievers apple tree in the republic, which have their own biological characteristics in each region: (1) Ramit, (2) Fayzabad, (3) Karategin, (4) Karatag, (5) Varzob, (6) Zeravshan, (7) Muminabad, (8) Dashtidzhumskaya, and (9) Darvazskaya. Based on them, hundreds of local varieties have been bred, which differ not only in species, but also in yield. These include

low-yielding ones - producing less than 30 kg of fruit per year, moderately productive ones - from 30 to 60 kg, high-yielding ones - from 60 to 130 kg, and high-yielding ones - over 130 kg per year.

In various regions of Tajikistan, dozens of local varieties of early apples are grown and there are their own famous varieties. For example, in Kabodiyon and Shakhritus, such varieties as Surkhak, Peshpazak, Javpazak, Sumanakseb, Mokhtobi, Sayatseb, Shakshakaseb, Guldonaseb, Shakarseb have tasty fruits. They differ from each other in color and taste: some are sour, others are sweet and sour, and such, for example, as "Husni Yusuf", "Shakar seb", "Pongozi" and others are very sweet and aromatic. However, all early-ripening varieties of Tajik apples share the characteristic of not being suitable for long-term storage and transportation over long distances. As a result, these varieties are sold only within the domestic market.

CROP 4: GRAPE

The agro-climatic conditions of Tajikistan allow the cultivation of grape varieties with a wide variety of taste, properties, purpose and ripening time.

More than two thousand varieties grow in the country. Among them are Tagobi, Sokhibi, Chilyaki black, Khujandi - in Khujand; Chilyaki white and Angur kalon (Nimrang) - in Ista-Ravshan; Rasmi and Hamirak - in Rasht; Lal, Mukhchaloni, Jaus white (Sultani) - in Gissar; Angur safedi, Lyali khusha daroz, Angur chochi shtur - in the Kulyab zone; and Angur siyo shaartuz - in the Lower Kofarnikhon valley and many others.

The collection of the Institute of Horticulture and Vegetable Growing preserves more than 100 varieties, and the branch of the Sughd region contains more than 300 varieties and forms of grapes. Among them, there are varieties obtained by Tajik breeders, such as Gissarsky early, Zarif, Miyona, Babatag, Zebo, Anzob, Vahdat, Sarvar. At the same time, the share of all these varieties in the plantings of the

republic is insignificant. These and many other valuable local grape varieties are represented by several bushes in collection vineyards or private plots, some of them are on the verge of extinction.

The widespread introduction of the best local varieties into production will improve the assortment of grape plantings in the republic and will make it possible to provide the country's population with a valuable food product.

Central Asian grape varieties are distinguished by strong shoot growth, powerful bush development and require large formations. Therefore, when cultivating them, it is necessary to take into account local soil and climatic conditions, the characteristics of growth and development of bushes, and use varietal agricultural technology. A number of regions of the Republic of Tajikistan are characterized by exceptionally favorable soil and climatic potential and rich traditions of grape culture.

A promising direction for the development of viticulture in the republic is the production of table grapes for domestic consumption and export. Improvement of the existing grape assortment in the regions is carried out through the use of indigenous varieties, introduction, and also through selection. Grape varieties approved for use on the territory of the Republic of Tajikistan in 2021 have reached 25 names.

In recent years, the planting of vineyards with seedlings of grafted plants has been expanding. As a rootstock, varieties with fast growth are used, and as a scion, a variety intended for cultivation is used. This approach is practiced in particular in the Gafurovsky district of the Sughd region. This approach makes it possible to obtain higher yields and higher durability of the vine.

The Republic of Tajikistan has sufficiently large reserves of land resources for the development of horticulture, especially viticulture. Large-fruited, high-sugar, table-raisin and seedless grape varieties have been cultivated for many centuries.

TAJSTAT data indicate that in Tajikistan there is an increase in grape production due to both an increase in the area under vineyards and an increase in their yield.

From 2011 to 2022, the area of vineyards expanded from 36,508 to 39,721 ha, marking an increase of 3,213 ha, or 8.8%. Concurrently, the total grape harvest during the same period rose from 154,726 to 301,112 tons, representing an increase of 146,386 tons, or 94.6%. Productivity over this period surged from 49.6 to 84.7 c/ha, reflecting a gain of 23.6 c/ha, or 32.2%.

The reason for the decline in gross harvest is unfavorable weather conditions (spring frosts, hail). Losses are associated with fungal, bacterial and viral diseases, as well as the activity of harmful insects. There is poor organization of work to carry out protective measures against pests and diseases on site.

〈Table 4-3〉 Cultivated area and grape production in the Republic of Tajikistan 2011-2022

Year	Area harvested (ha)	Production quantity (ton)	Productivity (c/ha)
2011	36,508	154,726	49.6
2012	36,511	167,101	52.9
2013	37,812	175,335	54.9
2014	36,125	188,836	61.1
2015	38,707	203,806	64.2
2016	37,061	214,775	67.4
2017	37,775	228,303	69.0
2018	38,106	241,901	72.7
2019	38,570	247,167	73.2
2020	39,815	239,096	69.0
2021	39,449	267,475	77.6
2022	39,721	301,112	84.7

Source: Agency on statistics under the President of the Republic of Tajikistan. Statistical publication "Agriculture of the Republic of Tajikistan", 2023

〈Table 4-4〉 Area of vineyards by regions of the Republic of Tajikistan 1991-2022

Unit: ha

	1991	2017	2018	2019	2020	2021	2022
The Republic of Tajikistan	36,870	37,776	38,106	38,570	39,815	39,449	39,721
Dushanbe	199	–	3	–	3	12	11
GBAO	1	–	–	–	–	–	–
Sughd region	14,487	11,735	11,892	12,272	13,339	13,466	13,470
Khatlon region	13,110	13,459	12,936	12,726	12,904	12,322	12,618

	1991	2017	2018	2019	2020	2021	2022
RRP	9,073	12,582	13,275	13,572	13,569	13,649	13,622
Tursunzoda	1,240	3,438	3,658	3,658	3,658	3,658	3,658
Misor	3,242	4,435	4,435	4,582	4,552	4,596	4,681
Shairinav	–	858	871	995	1,013	1,095	1,156
Rudaki	1,402	793	763	782	786	733	562
Varzob	402	512	416	416	416	416	416
Vaidat	2,336	2,096	2,697	2,683	2,686	2,687	2,686
Faizobod	442	445	435	456	456	463	463
Nurobod	–	2	–	1	2	1	–
Sangvor	–	–	–	–	–	–	–
Rasht	6	3	–	–	–	–	–
Tojikobod	–	–	–	–	–	–	–
Lyakhsh	–	–	–	–	–	–	–
Rogun	3	–	–	–	–	–	–

Source: Agency on statistics under the President of the Republic of Tajikistan. Statistical publication "Agriculture of the Republic of Tajikistan", 2023

Of the 39,721 ha allocated for vineyards in 2022, 13,470 ha are in the Sughd region, 12,618 ha in the Khatlon region, and 13,622 ha in the regions of republican subordination (RRS). Among the RRP, grapes are grown in Gissar (4,681 ha), Tursunzade (3,658 ha), Vakhdat (2,686 ha), Shakhrinavsky (1,156 ha), Rudaki district (562 ha), Fayzabad (463 ha) and Varzob (416 ha) areas.

〈Table 4-5〉 Gross Grapes yield by regions of the Republic of Tajikistan 1991-2022

Unit: ton

	1991	2017	2018	2019	2020	2021	2022
The Republic of Tajikistan	92,607	228,303	241,902	247,167	239,096	267,475	301,112
Dushanbe	63	–	–	–	–	47	77
GBAO	2	–	–	–	–	–	–
Sughd region	38,989	57,123	61,362	61,748	50,572	54,735	59,537
Khatlon region	39,474	101,419	104,536	106,025	107,453	108,451	125,529
RRP	14,079	69,761	76,003	79,394	81,071	104,242	115,969
Tursunzoda	488	22,380	25,749	27,753	32,144	46,127	52,511
Gissar	7,791	28,168	30,251	30,340	27,861	33,635	35,135
Shakhrinav	–	5,524	6,022	7,260	7,109	9,623	11,876
Rudaki	1,889	2,349	2,392	2,417	2,056	1,738	1,760

	1991	2017	2018	2019	2020	2021	2022
Varzob	571	1,680	1,623	1,599	860	1,692	2,514
Vahdat	3,136	9,057	9,161	9,209	10,224	10,567	11,431
Faizobod	204	603	805	816	817	860	742

Source: Agency on statistics under the President of the Republic of Tajikistan. Statistical publication "Regions of the Republic of Tajikistan", 2023

The gross grape harvest in the republic for all categories of farms in 2022 amounted to 301,112 tons. Of the three grape growing zones (Sughd, Khatlon regions, and RRP), despite minor differences in the area of vineyards, a significant share of the gross harvest falls on the Khatlon region, which amounted to 125,529 tons.

CROP 5: RICE

Rice is considered one of the most consumed cereal crops as it ranks second in the world in terms of cultivated area and yield. There are 13 varieties of rice grown in Tajikistan and its annual consumption ranges from 12 to 15 kg per person.

In order to ensure the population's access to quality food and implement one of the strategic goals of the country's government - ensuring food security, it is recommended to reserve more products. The rice harvest can be stored without processing for several years. In this regard, agricultural producers must reserve rice as much as possible and thus ensure an abundance of rice on the consumer market.

The leader of the nation, the respected Emomali Rahmon, even amid the 2020 COVID-19 pandemic, called on residents to stock up on essential commodities for two years. The head of state then stressed: Tajikistan must supply the domestic market with products, increase plantings of potatoes, cereals and corn, and increase production of essential products, including flour, vegetable oil and rice.

Rice is a tropical crop that requires a lot of humidity and heat. Experts recommend plowing rice fields in the fall. This is because the soil in rice fields is constantly underwater and does not receive enough oxygen to be inhaled. In addition, before

autumn plowing, it is considered necessary to spray 200 to 400 kg of superphosphate per hae. Because rice absorbs water up to 25-30 percent of its weight and begins to germinate at a temperature of +15-16 degrees. The higher the water temperature, the faster the rice grows.

In 2022, 1,756.3 thousand tons of grains and legumes were produced, including 146.9 thousand tons of rice, which is 8.3% of the total volume of grains and legumes. The main factors for increasing rice production are increasing the volume of planted areas and increasing yields. In 2022, compared to 2017, the area sown with rice increased by 364 ha, or 2.9%.

〈Table 4-6〉 Cultivated area and rice production in the Republic of Tajikistan 2011-2022

Year	Area harvested (ha)	Production quantity (ton)	Productivity (c/ha)
1991	9389	23306	27,4
2017	12527	97763	46,7
2018	11825	90446	50,7
2019	12394	106442	50,5
2020	12975	133439	54,0
2021	12733	141727	54,7
2022	12891	146868	55,0

Source: Agency on statistics under the President of the Republic of Tajikistan. Statistical publication "Agriculture of the Republic of Tajikistan", 2023

〈Table 4-7〉 Rice harvest area of the Republic of Tajikistan 1991-2022

Unit: ton

	1991	2017	2018	2019	2020	2021	2022
The Republic of Tajikistan	9,389	12,527	11,825	12,394	12,975	12,733	12,891
Dushanbe	–	–	–	–	–	10	7
GBAO	–	–	–	–	–	–	–
Sughd region	3,957	9,080	8,500	8,920	9,231	9,237	9,280
Khatlon region	4,733	2,174	2,227	2,264	2,365	1,930	1,933
RRP	699	1,273	1,098	1,210	1,379	1,556	1,671

Source: Agency on statistics under the President of the Republic of Tajikistan. Statistical publication "Agriculture of the Republic of Tajikistan", 2023

Of the 12,891 ha allocated for rice in 2022, 9,280 ha account for the Sughd region, 1,933 ha for the Khatlon region, and 1,671 ha for the districts of republican subordination (RRS). Among the RRS, grapes are grown in Gissar (198 ha), Tursunzade (1056 ha), Vakhdat (120 ha), Shakhrinav (278 ha) districts, and Rudaki district (19 ha).

2. Main issues on post-harvest stages of 5 strategic items

The fruit and vegetable market is subject to seasonal fluctuations. Its stability is related to the volume of reserves and storage conditions. In inventory management, a distinction should be made between inventories owned by rural producers and consumers in trading organizations. Storing fruit will be profitable provided that the future delivery price exceeds the current price, taking into account the cost of storage. Analyzing the volume of stocks by their owners, storage costs, payment terms for storage over time, inflation, changes in interest rates on loans, as well as the possibility of making a profit from the sales of fruit in the future will allow us to develop measures to regulate its sales and address changes in market seasonality.

The food market infrastructure is a key factor influencing food production, distribution, and consumption in Tajikistan. Although the Tajikistan government is taking steps to develop agriculture and improve infrastructure, the food market still faces several challenges. Despite the increasing per capita production of crops and livestock, the issue of storage, distribution, and timely delivery of the harvest remains acute, alongside insufficient supply of agricultural products to the population.

It is difficult to imagine the development of agriculture and agribusiness without proper post-harvest handling and distribution, which includes weed clearance, collection, grading, packaging, cold storage, labeling, etc. Currently, in Tajikistan,

opportunities for individual producers and farmers are limited, and access to modern markets requires the presence of well-established logistics and product sales networks.

The KAPEX research project will conduct research into national and regional demand for post-harvest handling, distribution, and processing equipment. A special role in this direction is given to agro-logistics centers, which consist of physical infrastructure for the consolidation, storage, and marketing of products, as well as the creation of jobs and added value.

Recommendations will be provided on the organization and operation of warehouse and refrigeration infrastructure for both raw materials and processed products, as well as logistics (wholesale consolidation). These measures aim to increase shelf life, maintain quality and marketability, and expand sales channels. The research will place particular emphasis on the development of post-harvest storage systems as a tool to enable farmers to receive a larger share of the selling price for their produce. Storage is also critical to minimizing post-harvest losses. Activities will be developed to attract advanced technologies, improve storage facilities and logistics, and mobilize financial resources and expertise from both domestic and foreign sources. Efforts in this direction will reduce the loss of agricultural production for five selected crops and meet the population's needs for food products.

5 Survey Results

1. Overview of the survey

To assess the potential for the processing of agricultural products in Tajikistan, a survey was conducted among the participants in the supply chain for the production and processing of agricultural products. Farmers and entrepreneurs from the Khatlon and Sughd regions who have experience in producing and processing selected five strategic products (onions, carrot, apples, grapes, and rice) participated in the survey.

The study focused on investigating the following issues.

- General information: age, business area, main products, etc.
- Agricultural product processing: level of losses of agricultural products, reason for the damaged or losses, method of processing, etc.
- Agricultural product storing: average and potential period of agricultural products, motivation for storing, average price increase by storing period, etc.
- Necessity and importance of improvement of agricultural product processing in Tajikistan: regional importance, importance by item, export potential, etc.

The survey also explored the availability of opportunities and resources for farmers and entrepreneurs in the processing and storage of agricultural products. The needs of farmers and entrepreneurs in the development and improvement of the sector of processing agricultural products in Tajikistan were identified. Based on the study, recommendations were proposed to improve the efficiency of agricultural product processing and to increase the overall income of farmers and entrepreneurs in Tajikistan.

2. Survey Data Analysis

2.1. Characterization of respondents

❍ Total number of respondents

More than 100 respondents participated in the survey, of which 60 questionnaires were selected for analysis based on the completeness of responses.

The analysis of the questionnaires revealed that many respondents encountered difficulties providing information, particularly concerning economic calculations. This indicates a lack of skills among respondents in making such calculations.

As observed, many farmers and entrepreneurs lack specialized economic education, leading to a deficit in the necessary knowledge and skills for accurate calculations.

❍ Age characteristics of respondents

Potential and existing farmers and entrepreneurs from Khatlon region (28 people) and Sughd region (32 people), whose activities are related to the production and processing of agricultural products, participated in the survey.

The sample of districts for the survey included districts with potential production of selected agricultural products (onions, carrots, apples, grapes, and rice). The distribution of respondents by district is presented in 〈Table 5-1〉.

〈Table 5-1〉 Distribution of respondents by districts (Sughd and Khatlon regions)

Region	Number of respondents
Khatlon region.	**28**
Farkhor	9
Dusti	9
Khovaling	5
Muminobod	5
Sughd region.	**32**
B. Gafurov	7
J. Rasulov	12
Penjikent	10
Asht	3
Total	**30**

A total of 58 men and 2 women, aged 30 to 60, participated in the survey. Analysis of the age data of the participants shows that the greatest economic activity in agriculture falls on people in the age group of 45 to 60 years old, which accounts for 53% of all respondents.

However, the activity in agricultural production of older people (more than 60 years old), who account for 28% of respondents, is not excluded. The age characteristics of respondents are presented in 〈Table 5-2〉. According to the age structure of the survey, agricultural production is not popular among young people aged between 30 and 44.

〈Table 5-2〉 Age characteristics of respondents

Age	30-44	45-59	Over 60
Number of respondents	11	32	17

❍ Professional characteristic of respondents

Among the participants, over 80% were heads of farms, while just over 13% were entrepreneurs who own warehouses for the storage of agricultural products. Representatives of local administrative authorities and researchers constituted the remaining portion (7%). The business structure of the survey is presented in 〈Table 5-3〉.

〈Table 5-3〉 Professional characteristics of respondents

Category	Farms	Processor/ entrepreneur	Researcher/ professor	Government official
Number of respondents	47	8	1	4

2.2. Processing of agricultural products

❍ Production

The survey indicates that onions, apples, and carrots are the top-priority products in the chosen districts. The majority of surveyed farms are primarily engaged in the production of onions and apples. The survey data are presented in 〈Table 5-4〉.

〈Table 5-4〉 Priority products of respondents

Main crops	Onion	Apple	Carrot	Grape	Rice
Number of respondents	25	19	16	7	8

Based on statistical information regarding the production of five strategic crops for the current research, categorized by location, the data is presented in the following 〈Table 5-5〉.

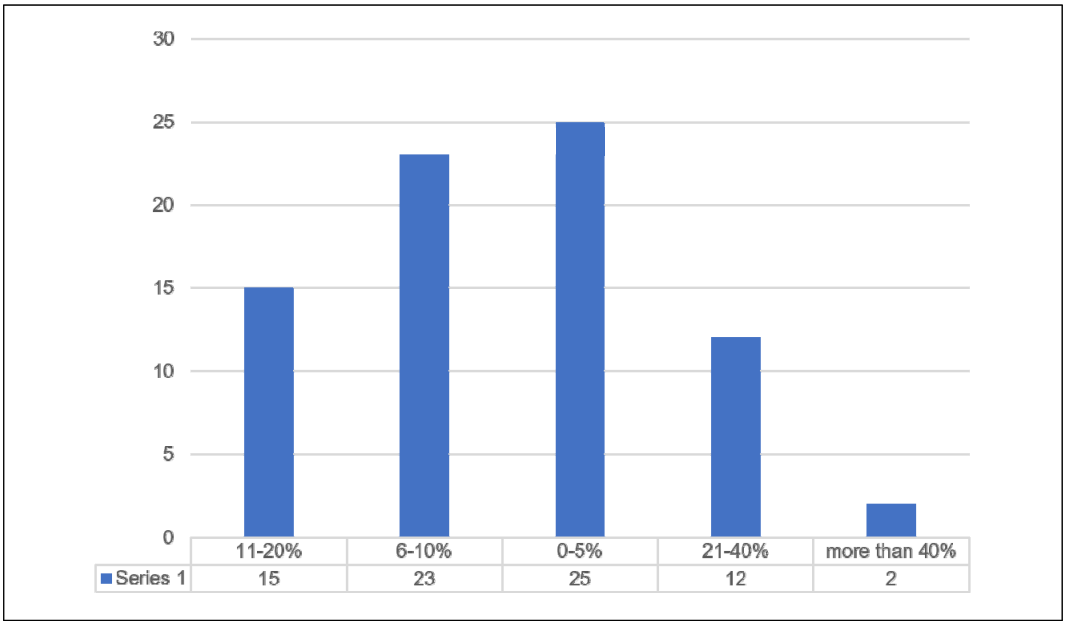
〈Table 5-5〉 Production of 5 strategic crops in targeted districts in Khatlon and Sughd regions

Khatlon Region (Year – 2022, per tan)					
Crops	Onion	Apple	Carrot	Grape	Rice
Farkhor	92,380	1,938	31,650	2,846	8,892
Khovaling	15,678	8,088	7,680	240	0
Muminobod	40,120	15,600	4,484	5,877	0
Dusti	145,654	0	72,850	200	6,238
Sughd Region (Year – 2022, per tan)					
Crops	Onion	Apple	Carrot	Grape	Rice
Asht	1,092	1,003	441	2,000	381
B. Gafurov	34,653	519	6,822	15,487	11,657
Panjakent	22,157	5,146	9,732	4,936	11,241
J. Rasulov	17,759	319	34	851	4,139

❍ Product losses

Respondents were asked to estimate how much of their produce was lost on average during the harvesting and storage periods. Approximately 50% of the responses (about 50%) indicate a loss of up to 10%.

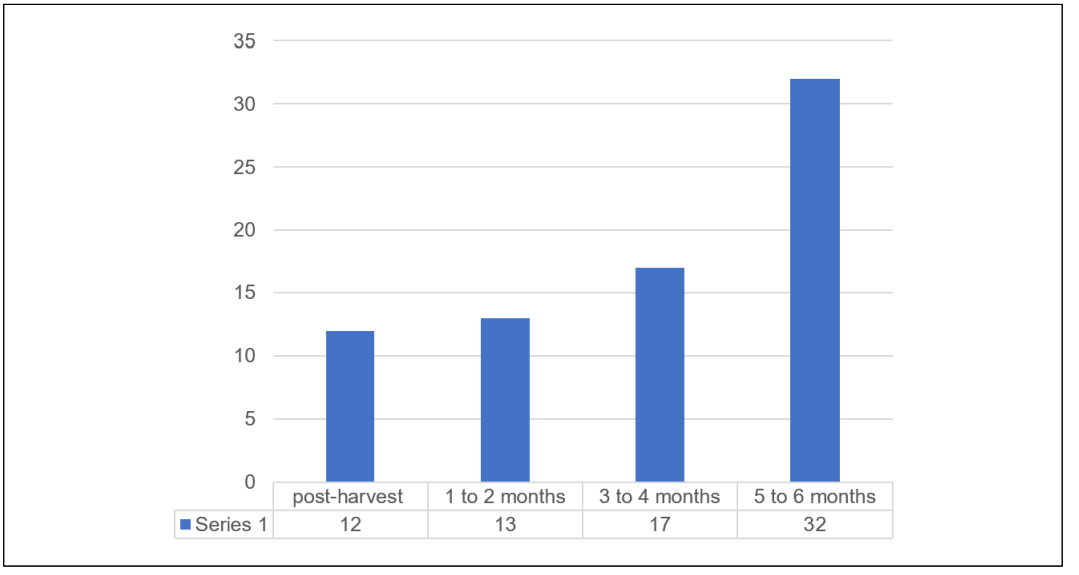
〈Figure 5-1〉 Overall product losses during the harvesting and storage period



The survey findings reveal that product losses occur at every stage of the supply chain. The most significant losses of agricultural products occur within 5–6 months after harvest, likely due to inadequate storage infrastructure that does not support long-term preservation. Respondents also highlighted that agricultural product losses can occur not only during storage but also immediately after harvesting, often linked to poor product quality.

These challenges may also be related to breaches of food quality and safety requirements during the harvesting and transportation of products, such as damage to products during harvesting, failure to maintain proper temperatures, and improper use of equipment (e.g., containers). These concerns are consistent with data from other surveys.

〈Figure 5-2〉 Average product losses by period



According to The State of Food and Agriculture (2019) report, approximately 14% of food is lost globally after harvest and before reaching retail. The survey results indicate that this percentage is higher in this country, signifying a pressing issue that demands significant attention and intervention.

More than half of the respondents, constituting over 50% of the total, identified challenges in selling products in the markets due to poor product quality as the main reasons for product damage or loss.

Product losses due to poor quality can be attributed to various factors, such as unfavorable weather conditions, diseases and pests, and non-compliance with product quality and safety requirements during production and harvesting.

〈Figure 5-6〉 Main reason for products damaged or lost

Main cause of damage or loss	Number of respondents
Impossible to eat or sell because they become spoiled immediately after harvest	5
Difficult to sell in the market due to low marketability (quality)	29
Difficult to recover the processing cost (selection, packaging, etc.)	7
Other causes	14

Among other reasons that lead to product loss, 25% of respondents cited the lack of storage facilities and refrigerators, packaging materials, and modern harvesting equipment, in particular, combine harvesters for rice harvesting. The problem of power outages was noted, which leads to spoilage of products during storage.

Among the evaluated products, according to the respondents, carrots have the highest risk of spoilage of all the evaluated products.

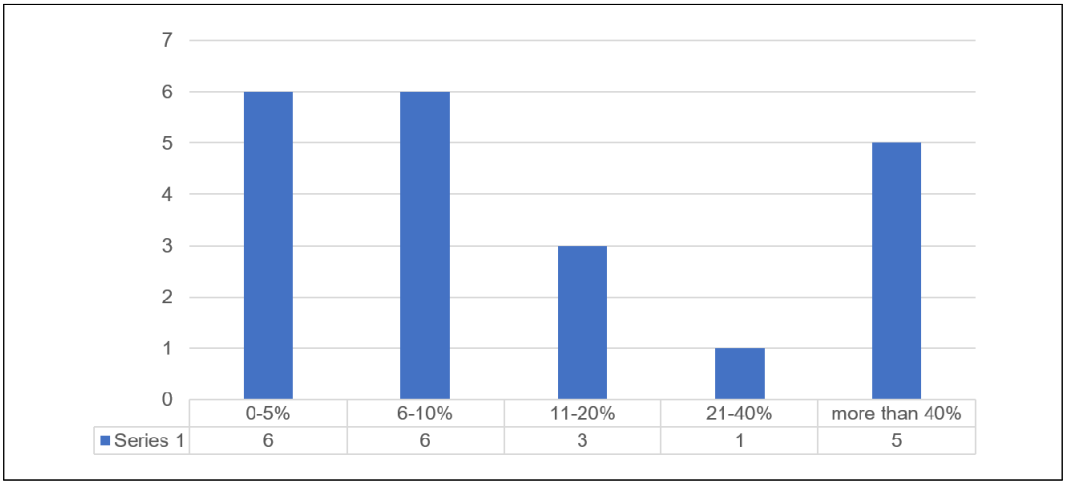
❍ Level of processing of agricultural products

The results of the survey showed that the level of processing of agricultural products remains low despite the development of the sector. For 36% of respondents, the processing of their products is 40%. According to respondents' estimates, the main products of processing are apples (juices), rice (cleaning), and grapes (drying).

21% of respondents noted the level of processing in the range of 0-5%, specifying that they do not process their products but sell them fresh immediately after harvesting. This mainly concerns onion and carrot producers.

Onion processing problems are one of the most acute issues for businesses in the Khatlon region. Business has repeatedly raised this issue on various platforms of public-private dialogue, but no solution has been found. The details of the respondents' answers are presented in the chart below.

〈Figure 5-3〉 Overall processing level of respondents



❍ Drying methods

During the survey, special attention was paid to the methods of drying agricultural products. Respondents were asked to select and describe the most common drying methods they use. The results of the survey showed that the most common method of drying agricultural products is natural drying in the open air or under a shed. This method is the simplest and most accessible for agricultural producers.

〈Figure 5-7〉 Drying methods of agricultural products

Drying methods	Number of respondents
Dry outdoors on the road or on the floor, using sunlight	16
Dry in the sun using equipment such as a net	3
Drying indoors	2
Using the drying machine	3
Other	0

Although artificial drying in drying chambers offers benefits such as uniform and accelerated drying of produce, it has not been widely embraced by farm households. The primary barrier to agricultural product processing is the limited access to drying equipment, a sentiment echoed by 50% of the respondents.

❍ Major obstacle for processing agricultural products

The high cost and energy intensity of drying or other equipment for processing agricultural products is the main obstacle to access to equipment and machinery for the majority of farmers, which requires additional costs. It is important to note that about 8% of respondents believe that the low level of processing of agricultural products is related to a lack of skilled labor. These conclusions are supported by findings from other studies.

The pressing issue of limited access to infrastructure for sorting, calibration, and processing of products, as well as cold storage, is underscored in the Program for the Development of the Agro-food System and Sustainable Agriculture until 2030, sanctioned by the Government of Tajikistan on March 1, 2023. The program not only focuses on industrial processing but also incorporates initiatives to encourage small-scale, on-farm processing. Furthermore, it addresses technical issues and aims to improve farmers' understanding of sorting, calibration, storage, and transportation methods for agricultural products, considering their suitability during storage.

〈Table 5-8〉 Main reason for not processing the products

Reasons for not processing the products	Number of respondents
Need the sales money	21
Absent or insufficient processing facility	32
Lack of labor to process the product	5
Difficult to guarantee that the processed product will be sold at a higher price	3
Others	1

❍ Motivation for processing agricultural products

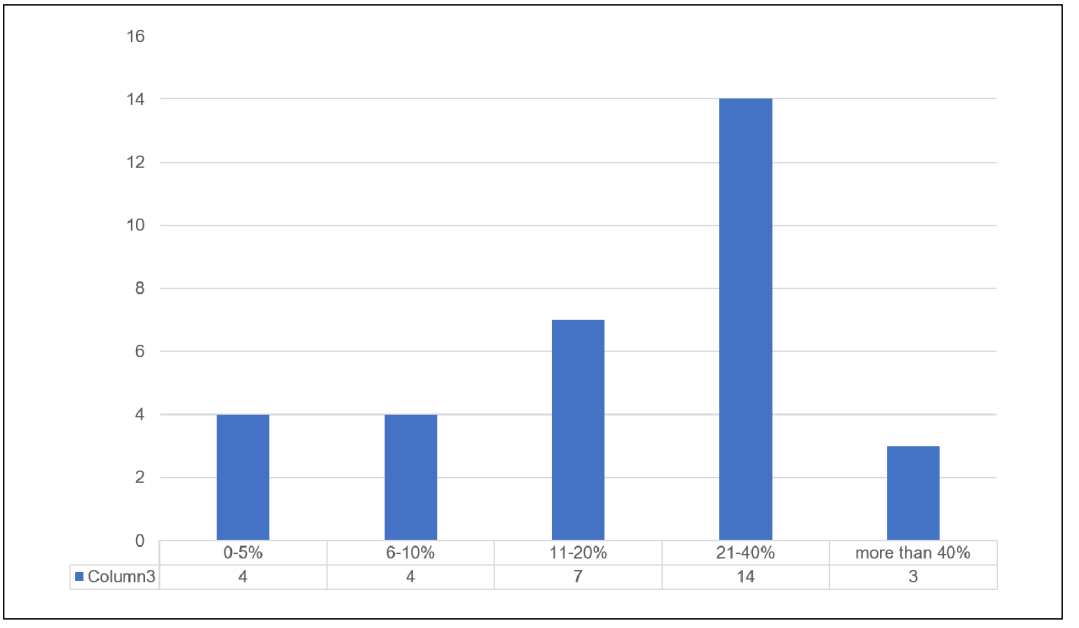
Respondents showed a high interest in the processing of agricultural products grown by them. Over 80% are convinced that the processing of agricultural products provides an opportunity to get higher profits from the sale of processed products.

〈Table 5-9〉 Main motivation for processing the products

Motivations for processing the products	Number of respondents
Possibility of selling processed products as more expensive than fresh product	34
Ability to avoid product concentration in the market during the harvest season and control supply and demand	2
Utilizing a storage facility that guarantees the product's long-term preservation	2
Demand from the enterprise or company for processed products	1
Other	1

During the survey, respondents were also asked to compare the prices of processed and freshly harvested produce. Most respondents who process agricultural products realize that income from processed products is higher.

〈Figure 5-4〉 Expected income growth rate after processing



According to the results of the survey, apples are the most demanded product for processing for 57% of respondents. This is due to the fact that apples have universal properties that allow them to be used both for drying and for juice production.

2.3. Storage of agricultural products

❍ Storage method

Infrastructure for storing agricultural products allows farmers to minimize product losses and earn higher profits.

To clarify the existing capacity in the selected districts, respondents were asked to describe the storage methods they use on their farms. The majority of respondents (about 70%) use traditional storage methods (their homes or on-farm storage facilities). Only 22% of respondents have specialized storage facilities and cold rooms, of which only half use cold rooms. These data indicate that farmers in these areas have limited access to modern methods of storing agricultural products.

〈Table 5-10〉 Storage methods of agricultural products

Storage methods	Number of respondents
Digging up the soil and storing products underground	3
Outdoors: using a roof, shade netting, etc.	3
On the floor of a house or warehouse at room temperature	36
Other	12

❍ Major obstacle for storing agricultural products

Refrigerator accessibility issues are also reflected in the adopted Program for the Development of Agrifood Systems and Sustainable Agriculture for the period up to 2030. In Tajikistan, as of 2022, there are about 496 fruit storage facilities with a potential capacity of about 187 thousand tons, which do not meet the storage needs of all cultivated products.

Among the obstacles to the storage of products, respondents put the availability of storage infrastructure in the first place (53% of answers). Products are sold immediately after harvesting due to financial problems (32% of answers). For a certain group of respondents, the cost of storage facilities is too high. That is why residential premises are used.

〈Table 5-11〉 Main reason for not storing the products

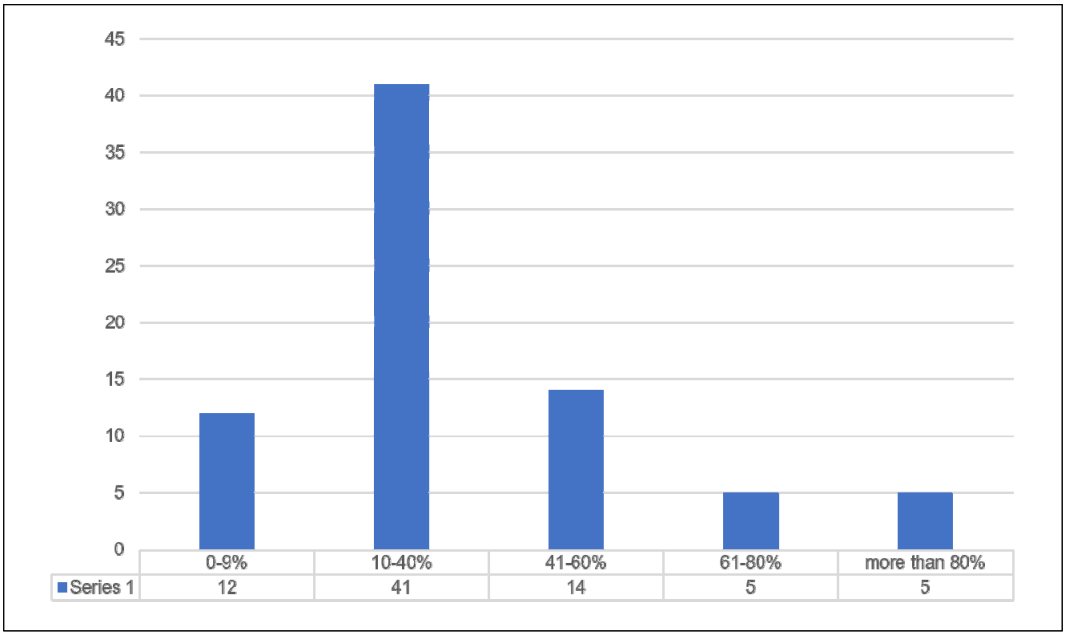
Reasons for not storing the products	Number of respondents
Need the sales money	20
Absent or insufficient storing facility	33
No guarantee that the stored goods will be sold at a higher price	1
The quality is not very good, so there is no need to save them	2
The cost of storage (using a storage, etc.) is too high, so it is difficult to make a profit	5
Others	1

The state of agricultural storage infrastructure in the country differs by region. In the Sughd region, it is more developed than in the Khatlon region. This is due to the fact that in the Sughd region, there are more cold rooms with automatic temperature and humidity control modes. The respondents' answers also support these conclusions.

❍ Motivation for storing agricultural products

For 80% of respondents, the development of agricultural storage infrastructure provides an opportunity to sell products at a higher price. Another significant aspect of assessing the storage potential is the problem of the product storage period. From the answers of respondents who were asked to calculate the volume of products coming to the market during the storage period, it can be concluded that agricultural products, in most cases (more than 70% of answers), are sold immediately after harvesting. The most perishable products, such as onions, grapes, and apples, take the leading positions in this aspect.

〈Figure 5-5〉 Expected income growth rate after storing



Income received from the sale of agricultural products that are stored in specialized storage facilities increased from 10% to 40% for the majority of respondents. At the same time, some respondents noted that incomes depend on the situation in the market.

2.4. Necessity of improvement of processing agricultural products in Tajikistan

The development of the agricultural processing sector in Tajikistan is one of the main strategies implemented by the government. In the framework of this study, respondents were asked to express their vision of possible measures to improve the processing sector. It is intended to align their development vision with the implementation plans of the adopted programs. The completeness and content of

the respondents' answers to the questions in the third part of the questionnaire indicate their interest in improving the agro-processing sector.

❍ Importance of hardware facility sector

Many of the statements put forward in the adopted policies were confirmed in the respondents' answers, with a special emphasis on the technological modernization of the sector. Respondents emphasized the significance of modern storage facilities in minimizing product losses as the primary factor. Processing equipment (including drying, canning, and other processes) and packaging issues ranked second in importance.

❍ Importance of software sector

Regarding the intangible aspects of the production process and processing, respondents emphasized the importance of technical knowledge. The need for knowledge on growing and processing, including how to store it and how to combine it with other products to reduce losses, was emphasized.

It is important to emphasize that in the strategic programs, in particular the Program for the Development of Agrifood Systems and Sustainable Agriculture for the period until 2030, a special place is given to the issues of investing in the training of producers in supply chain management skills. These issues include various areas, including training in cold storage and storage organization (including knowledge of product co-production and separate storage), and the use of quality and safety standards along the supply chain.

The importance of the need to develop tools for product and market research and human resource management expressed in the respondents' answers is noted. A certain portion of respondents realize the critical importance of these tools for improving the quality, efficiency, and export readiness of products.

Particular attention should be paid in this report to aspects of human resource

development. Several of the respondents indicated that they face problems with the availability of skilled workers with modern agro-technical skills and skills for proper harvesting and post-harvest processing of produce that meet international quality and safety standards. This notion is reinforced by additional research, underscoring the significance of these challenges for exports, especially in the case of Khatlon. As practice shows, many exporters invite such specialists from other countries, which increases the cost of production.

❍ Priority products for processing

More than half of the respondents attach importance to exporting and see its potential. It is important to emphasize that discussions held in the country within the framework of various export promotion programs show that producers are not fully aware of the requirements for preparing products for export. Practically, this results in wasted time and a deterioration in product quality.

The most export-competitive item among the five strategic crops is onion, which has huge potential for production in the selected regions as well as for export. About 45% of respondents see prospects for increasing exports of this product, both fresh and dried.

❍ Digitalization

According to forecasts, the demand for horticultural products is expected to grow in the domestic market to meet the needs of the population for basic foodstuffs amid the increasing population in the country.

Equipping agricultural producers with modern machinery and equipment is critical for the development of agribusiness. This is confirmed by the results of the survey. As indicated above, respondents note the importance of this aspect, and their responses correlate with the adopted policies. However, in modern conditions, agribusiness is impossible without the introduction of innovative digital

technologies. Respondents were asked to compare the importance of hardware and software for their businesses. Despite a strong interest in hardware, several respondents saw the need to develop software products to help them grow their businesses.

The Program for the Development of Agrifood Systems and Sustainable Agriculture until 2030 defines e-commerce as a mechanism for promoting export-oriented agricultural products. E-commerce is necessary to adjust market information mechanisms to improve production planning and trade efficiency in domestic markets, as well as to create a market for agricultural services. The program envisages promoting measures to invest in infrastructure for digital and logistical linkages so that, over time, all agricultural producers can benefit from agricultural e-commerce.

6 Korea's Experience on Processing Agricultural Products

1. Current Agricultural Product Distribution Policy

1.1. Plan to advance agricultural product distribution structure

❍ Vision: Innovation in distribution and logistics through creation of a mass distribution ecosystem for agricultural products

- establishment of a year-round bulk transaction system in production areas, digital transformation through online transaction

❍ Goal

1) Expanding the amount handled by integrated production organizations
2) Establishment of online wholesale market
3) Expansion of online-centered direct transactions

❍ Implementing strategy

1) Strategic distribution in producing area

2) Digital transformation of agricultural product trading

3) Creating a distribution ecosystem of creativity and competition

1.2. Three Strategies to improve distribution of agricultural products

❍ Strategy 1: Improving the agricultural product supply system in response to changes in the consumer environment

→ Strategic distribution in producing area (scale improvement, centralization)

① Introduction of smart production and distribution facilities (APC) to enable product development tailored to consumer demand and supply to mass buyers

② Nurturing an organization of local producers with product expertise

③ Creation of a large-scale logistics base that will become the core of integrated logistics in each region

❍ Strategy 2: Digital transformation of agricultural products trading (online wholesale market for agricultural products)

① Introduction of a nationwide online wholesale transaction system that separates commerce and logistics

② Enhancing wholesale market transaction and logistics efficiency through digitization of transaction information

③ Present mid- to long-term development direction by diagnosing the role of local wholesale markets

❍ Strategy 3: Promote infrastructure and system improvement to promote private distribution innovation

→ Creating a distribution ecosystem of creativity and competition

① Cultivating professional human resource and supporting innovative startups optimized for online and digital environments

② Establishment of a foundation for private use of production and distribution data

③ Strengthening the consumer protection system related to online and direct transactions of agricultural products

④ Expansion of direct producer-consumer transaction channels as alternative distribution channels of the wholesale market

2. Fruit tree and vegetable industry policy trends

2.1. Current status of orchard industry policy

❍ Summary of fruit industry development measures

- Korea's fruit industry development measures were established and implemented three times from 2004 to 2022. The first fruit tree industry development plan was implemented from 2004 to 2010, the second fruit tree industry development plan was implemented from 2011 to 2017, and the third plan was implemented from 2018 to 2022.

2.1.1. The 1st fruit industry development plan (2004-2010)

❍ The goal of the fruit industry development plan was set to improve the competitiveness of orchard farms, and to achieve this, it proposed organization centered on large-scale farms, establishment of a high-quality fruit production and distribution structure, and management stability and restructuring of orchard farms.

- Production sector: rain cover area for high-quality production, creation of low-growing apple orchards, expansion of irrigation facilities, etc.

- Distribution sector: arrangement and establishment of base distribution facilities in each region across the country so that scaled, specialized, and well-equipped production distribution organizations can conduct marketing on an equal footing with consumer distribution organizations.
- Export sector: reorganizing the production base of specialized production export complexes and strengthening overseas promotion
- Stabilization of supply and demand: fostering a nationwide regional product organization to establish a producer-centered autonomous supply and demand control system, and supporting a distribution agreement order system for autonomous producer organizations
- Stable management of orchard farms: introduction of direct payment system for income preservation adapted to openness, implementation of structural reform of the orchard industry

2.1.2. The 2nd fruit industry development plan (2011-2017)

❍ Inadequate advancements were made in establishing an affordable, yet high-quality production system, thus prompting the need to devise appropriate measures for improvement.

- Promote cost reduction and quality improvement: expansion of production facility modernization area (support for conversion to rain covers, irrigation facilities, windbreaks and flood control facilities, energy-saving facilities, etc.), increase are for GAP and eco-friendly cultivation, and scale improvement project for orchard farming
- Improvement of distribution structure: establishment of APC specializing in fruits, development of joint brands, establishment of nationwide wholesale logistics centers in consumer locations
- Promotion of consumption and expansion of exports: improvement of fruit sweetness labeling system and standard specifications, promotion of activa-

tion of fruit traceability system, joint marketing centered on fruit export council, development of integrated export organization, etc.

- Self-regulation of supply and demand and stabilization of farm management: strengthening the autonomous supply and demand control function of producers centered on representative organizations for each item, promoting autonomous supply and demand control using distribution agreements and distribution control orders, expanding disaster insurance to stabilize farm management, operating the FTA income preservation direct payment system, and system reform for supporting business closures
- Expansion of research and development (R&D) support: fostering new superior varieties and consumer-preferred varieties, extending shelf life and developing post-harvest management technology, establishing storage environment model, and supporting development of new materials

2.1.3. The 3rd fruit industry development plan (2018-2022)

❍ Focus on fostering a fruit industry selected by consumers in response to rapid changes in the domestic market environment

- Expansion of consumption-oriented production base: expansion of fruit cultivation area other than the six major fruit species, development and distribution of consumer-preferred varieties, supply of superior disease-free seedlings, expansion of automated production system, development and distribution of minimum production cost model management indicators, etc.
- Enhancing the market response of the production organization: strengthening the expertise of the personnel in charge of operating the production center distribution organization, providing customized consulting support for the alliance, expanding the APC handling rate at fruit tree bases, expanding the APC business area, increasing the handling volume of co-brands, etc.

- Establishment of a system to create sustainable consumption: establishment of a supply system for small and medium-sized crops, small packages, and convenience products tailored to changes in consumption conditions, etc.
- Cultivating specialized organizations by product and expanding exports: cultivating representative organizations by export product, analyzing market demand by export country and product, creating a pilot export specialized production complex that can perform production linkage, safety and quality control in one stop, and strengthening strategic export marketing functions. global distribution platform, collaboration model with overseas companies, pioneering new markets and diversifying marketing channels, etc.
- Establishment of an information and governance system in preparation for the 4th industrialization: establishment of an accurate statistical base on production and consumption conditions, formation of a public-private cooperation organization in the fruit industry, etc.

2.2. Key policies for vegetable supply and demand management

❍ The Korean government is improving the self-subsidy system as a major policy tool for stabilizing the supply and demand of agricultural products, and is promoting a pilot project to strengthen the producer-centered autonomous supply and demand management promotion system, such as cultivation area management, by activating cultivation reporting by mandatory self-subsidy groups.

- In Tajikistan, there are significant differences in the supply and demand of major vegetables such as onions and price fluctuations depending on the period.
- It will be useful to study and draw insights from Korea's policy initiatives concerning supply-demand stability and align them with Tajikistan's policy framework.

- The primary focus of these initiatives involves piloting projects to manage cultivation areas in conjunction with the self-subsidy system and cultivation reporting.

2.2.1. Improvement and operation of self-support system

❍ Self-support organization status: perform activities for the common benefit of members by utilizing mandatory membership fees collected from members with representativeness and responsibility for the relevant items.

❍ Scope of membership: divided into farmers (including producer groups) who automatically join and distributors who can join voluntarily to ensure producer-centered operation.
- Official members: all farmers, agricultural management organizations, and producer organizations of the relevant product pay mandatory levies and implement self-support group decisions (cultivation reports, etc.)
- Voluntary member: a member of a processing, storage, distribution, or export company who voluntarily joins the organization and pays the membership fees stipulated in the self-support organization's articles of incorporation.

❍ Roles and functions: clarify the role of mandatory self-support organizations as public corporations, strengthen the function of the self-help management committee and ensure independence.
- The role (scope of business) of self-support organizations is defined by law, and the matters that can be carried out with self-help funds (purpose of self-help funds) within the relevant scope are set.
- In accordance with the self-support law, 'projects for the development of product industry and common interests of members' are carried out, and

self-support funds are used for projects to stabilize supply and demand and improve product competitiveness.

* Common benefit projects: autonomous supply and demand stability, consumption promotion promotion, education and information provision, distribution structure improvement, export activation, research and development (R&D), government consignment business, etc.

- The self-support fund management committee is independent of the board of directors and is responsible for matters related to controlling supply and demand and improving product competitiveness using self-support funds.

2.2.2. Garlic and onion public-private cooperation supply and demand governance operation

❍ Project name: Garlic and onion cultivation report linked cultivation area management pilot project

❍ Business purpose

- Strengthening the producer-centered autonomous supply and demand management promotion system, such as management of cultivation area through activation of cultivation reports by mandatory self-subsidy organizations.
- Establish specific action plans for management of cultivation area by sharing roles in regional supply and demand management through the governance of self-support groups and local governments (main production area council)

❍ Detailed business details

- Establishment of a local implementation body by forming a local branch of a self-support organization
- Improving self-support awareness and promoting cultivation reporting education

- Establishment of governance of self-support groups and main production area consultative bodies, etc.

3. Agricultural product distribution channels and standardizing system

3.1. Distribution Channel

By presenting the distribution status of Tajikistan's main products, such as grapes and onions, in Korea, including storage and processing, this provides a benchmark for establishing the Tajikistan government's distribution policy.

3.1.1. Grapes

❍ In Korea, most of the grape distribution path usually goes through the following route: producer → distributors in producing area, producer group → wholesaler, retailer → large distributor, retailer → consumer.
- Some quantities are sold directly to consumers through direct transactions.
- Produced quantities are also sold to overseas markets through export companies.

❍ The shipping destinations of fruit farmers are diverse, ranging from producer organizations such as cooperative corporations made up of agricultural cooperatives specializing in fruit handling, to distributors at the production site who buy and sell in the field, commercial markets at the production site, and direct sales to consumers. At the wholesale and retail stage, in addition to the wholesale market, there are various types of companies such as large distributors and bulk demand sources.

- The main buyers from producer groups are wholesalers and large distributors, and those in producing area are wholesalers.

3.1.2. Onion

❍ In Korea, the distribution channel for onions usually goes through the following route: producer → storage company, distributors in producing area, producer group → wholesaler → retailer, large distributor → consumer.

- Producers have the highest proportion of sales to producers and distributors (50%), followed by sales to storage companies (26%) and shipments to producer groups (25%).
- Sales channels are diverse, including producer groups, storage companies, wholesalers, large distributors, and bulk consumers.

3.2. Agricultural Products Standardizing System

❍ Concept

- Agricultural products are selected and packaged to meet unified standards, classified into grades, and shipped using standard packaging materials.

❍ Purpose

- Promoting fair trade and increasing farm income by improving the credit rating and marketability of agricultural products
- Improving distribution efficiency by reducing distribution costs such as transportation and loading
- Create an eco-friendly environment by suppressing waste generation at consumption points through sorting and packaging shipments.

❍ Process for standard enactment and amendment

- Research on production and distribution
- Drafting of proposal : Reflection of research results
- Consultation : Producer/Consumer group, Distributors, Related institutions, etc
- Drafting of standard : Refection of consultation comments
- Deliberation by agricultural and fishery product quality control council : Resolution of deliberation
- Standard establishment and announcement

❍ Agricultural product standards

- Grading : classified into super, good, and normal based on quality
- Packaging : stipulates trading unit, package size, packaging material, and labeling requirements

3.3. Agricultural product processing trends

3.3.1. Grape

❍ Most fruits produced in Korea are shipped in the form of fresh fruits, so the proportion of processed volume is not high.

- In the case of grapes, the processed volume decreased from 9,500 tons in 2005 to 4,800 tons in 2020.
- The proportion of processed volume compared to total production did not change significantly from 2.5% in 2005 to 2.9% in 2020.
- In Korea, the main processed products made from fresh fruits are canned food, juice, nectar, jam, alcohol, vinegar, and beverages (others).
- In the case of grapes, juice products account for about half (46.8%) of the total processed volume, followed by beverages and other products at 33.6%, alcohol at 10.9%, and jam at 8.6%.

3.3.2. Onion

❍ Types of processed products using onions in Korea

- Used as ingredients for seasoned foods, dressings/sauce, processed fruit/vegetables, instant foods, dumplings, kimchi, etc.
- Processed products are mainly sold to manufacturers, dealers, large distributors, and restaurants/catering companies.

4. Current distribution system of grape and onion in Korea

4.1. Grape

❍ Production

- Korea's grape cultivation area is 13,183 ha as of 2020.
- The main cultivated varieties are Campbell Early, Delaware, Geobong, Shine Muscat, and green grapes.
- As of 2019, the percentage of cultivation area by variety is Campbell Early 47.7%, Geobong 24.9%, Shine Musket 14.7%, MBA 8.9%, Delaware 0.6%, and other varieties 3.3%.

〈Table 6-1〉 Characteristics of Korean major grape varieties

Category	Characteristics
Shine Muscat	Shine Muscat is known for its large, yellow-green grape bunches. The seedless grape is characterized by its fantastic crunchy texture and its sweet taste of musket. Also, as the fruit is firm, one must not need to worry about the fruit falling apart while it is being exported.

Category	Characteristics
Kyoho Grape	Kyoho Grapes are known for its beautiful purple hue and magnificent bunch. It is characterized by its sweet, soft, and juicy flesh. The grape is rich in various nutrients such as minerals, vitamins, calcium, and iron – it is a nutritious snack that everyone can enjoy.
Campbell Early	Known for its black-purple hue, the Campbell Early possesses berries that are adjacent to one another, giving a feeling of firmness. The rind of the grape is a bit thick but comes off easily when pressed gently, and the fruit's juice and flesh are easily separated. With its abundant juice, it's known as a cool, sweet fruit that could be enjoyed by everyone.

Source: Korea Grape Export Association

❍ 4.1.2. Harvest and self-selection

- Farmers mainly harvest between 6 a.m. and 12 noon and self-sort and package it or transport it to a joint sorting facility.
- Due to the nature of grape items, most grapes are self-selected and packaged and shipped to wholesale markets, and jointly selected quantities are shipped to large distribution companies.

❍ Packaging

- Packaging units are mainly Campbell 5kg, Geobong 2kg, and Shine Muscat 2kg in cardboard boxes.

〈Figure 6-1〉 Grape harvest and packaging

Harvest

Self-selection and packaging

❍ Shipping and sales

- The grape shipment window has the highest proportion of systematic shipments through producer groups (local agricultural cooperatives, etc.), and direct shipments are also made to wholesale markets and production centers through wholesale transactions.
- Looking at the ratio by grape shipping destination, in the case of the Yeongdong region, the main production area (as of 2020), 45.0% was from Gyetulha, 45.0% from production site distribution, 12.0% from internet and street sales, and 4.0% from the production center.

❍ Selection

1) Joint screening center operation

- Most joint sorting facilities are operated by local agricultural cooperatives, etc. and are equipped with a sorting facility, low-temperature warehouse, precooling facility, and collection point.
- Work process: Collection of farm harvest → Removal of disease and heat → Removal of foreign substances by air spray → Packaging by weight (tripod, non-farmland packaging) → Packaging in cardboard box → Covering with plastic wrap → Shipping or storage in low temperature warehouse (0~2℃)
- Packaging: Mainly, Campbell is sorted and packaged in 5kg cardboard boxes, and Geobong and Shine Muscat are shipped in 2kg cardboard boxes.

2) Sorting facility transportation

- When shipping systematically, the quantity that the farm self-sorts and packs is transported to a common collection site through self-transport or local agricultural cooperatives through rotating collection.

❍ Shipping and sales

- Systematic shipment to wholesale markets, large distributors, etc. through producer organizations (local agricultural cooperatives, etc.)

- Producer Distribution Center (APC): Supply to large distributors, export, shipment to some wholesale markets, etc.
- Local agricultural cooperative collection points: consumer wholesale markets, consumer traditional markets, fruit and vegetable specialty stores, etc. (customers are selected by the shipper)

〈Figure 6-2〉 Grape joint screening and shipment

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Gathering from individual farms</td><td>Selection (screening)</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Packaging (by size and grade)</td><td>Shipment (to large distributor, etc.)</td></tr>
</table>

4.2. Onion

❍ Production

- As of 2021, the nationwide cultivation area is 17,661ha, 6,770kg per 10a, and production is 1,195 tons.
- Harvest time: For early shipment, harvest when the stems are completely dead.
- The scope of harvesting work includes the order of plastic removal, plucking, drying, sorting, packaging, loading, etc.

❍ Sales

- Distributor: local agricultural cooperatives, local distributors (storage companies), direct shipment (wholesale market), farm storage

〈Figure 6-3〉 Onion distribution process

		
Waiting for shipment (producing area)	Transport loading	Waiting for auction (wholesale market)

❍ Storage

1) Simple storage

- A method of laying wood on the floor, loading onions (20kg), covering them with plastic or a sunshade, and storing them next to the road.
- To avoid sun and rain, they are stacked and stored on steel pallets on roof and side wall installations until August.

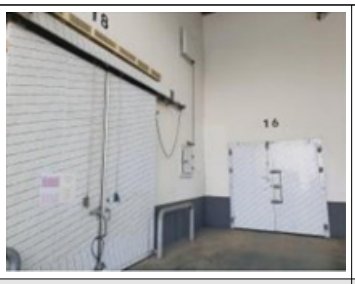
2) Cold storage

- Store in refrigeration after harvest, maintaining temperature at 0℃ and humidity at 70-80% until April-May of the following year.

3) Curing

- When onions stored in storage are forcibly dried at 33-35℃ for 3-5 days, the onion skin turns red and new epidermal tissue is formed. The importance of curing is increasing as it heals cuts and wounds during harvest and lowers the rate of decay.

〈Figure 6-4〉 Onion storage facility

		
Simple facility storage (temporary)	Cold storage facility	Cold storage facility (long-term storage)

❍ Producer organization

1) Types of producer organizations: Producer organizations such as local agricultural cooperatives and specialized agricultural cooperatives.

2) Purchase type

- Supporting the price received by producers through contract cultivation business and self-purchase business for outdoor vegetables.
- Perform tasks such as shipping guidance, providing market information, inducing system shipments, supplying farming materials, and supporting farming expenses.

❍ Purchase

- Purchase method: contract cultivation (or procurement), consignment business
- Contract cultivation: When prices rise, the performance rate of contract cultivation projects is very low.
- Acquisition business: A business that purchases and sells itself considering market conditions

❍ Sales

- The main sales outlets for purchased quantities are wholesale markets, large distributors, and bulk demand sources.

5. Implications for improving agricultural product processing in Tajikistan

5.1. Necessity of constructing production and distribution facilities (storage/processing)

5.1.1. Construction of a distribution center in the main producing area

❍ Necessity

- Expected effects of increasing economic crop area, easing fluctuations in supply and demand, and reducing waste rate
- Performance of selection and storage functions enables fresh/high-quality consumption by domestic and foreign consumers, thereby improving consumer satisfaction.

- Contribute to increasing exports by improving the safety and quality of fresh and dried fruits
- Contributes to increasing farm income by increasing the possibility of controlling supply and demand and alleviating price fluctuations

❍ Main facilities to be built: sorting and packaging center, low-temperature/freezing storage, processing facilities, etc.
- Major equipment: forklift, pallet, etc.

5.1.2. Construction of onion cold storage

❍ Necessity
- Alleviating oversupply of onion producers and large price fluctuations, improving the possibility of supply and demand control
- Contributes to increasing farm income by maintaining quality, improving marketability, and reducing loss rates

❍ Main construction facilities: cold storage, related work facilities (forklifts, pallets, etc.)

5.2. Research and development (R&D) and education/consulting

❍ Necessity
- Improving the productivity of Tajikistan's fruits and vegetables by transferring the results and experiences of Korea's fruit and vegetable research and development (R&D), contributing to high-quality production, maintaining freshness and improving quality in the distribution process, and increasing farm income.

❍ Main contents

- Cultivation technology research and development: Cultivation methods for increased productivity and high-quality production
- Development of post-harvest management technology for long-term storage and extension of distribution period and freshness.
- Low-temperature storage, selection and packaging methods for standard shipment, etc.
- Preferred varieties, small packaging, etc. that reflect consumer preferences
- Research on the effectiveness of grapes and onions

5.3. Improvement of production area and wholesale/retail distribution

❍ Necessity

- Establish support policies and improve support systems to improve the efficiency of Tajikistan's fruit and vegetable distribution in response to changes in the internal and external distribution environment.
- Improvement of production distribution, wholesale and retail distribution in response to changes in consumption conditions

❍ Main contents

- Establish a timely/appropriate quantity/genuine product supply system by nurturing producer organizations in the main producing area and using the production area distribution center centered on the producer organization.
- Operate a vegetable supply and demand management system (producing area distribution organization self-support system, etc.) to perform a supply and demand management function centered on producer groups.
- Enhancing the transparency of distributed products by operating a standard specification system for each agricultural product

5.4. Promoting online/digital transactions

❍ Necessity

- Expected to reduce distribution stages, reduce distribution costs, and improve distribution efficiency through online/digital transactions

❍ Main contents

- Operate direct transactions through cyber exchange by digitizing production and distribution transaction data
- Cultivating professional manpower optimized for online and digital environments

7 Conclusion

1. Policy Recommendations

❍ Summary of the survey

The survey results show that respondents' views align with the approved policy regarding the development of the processing sector. Specifically, the survey highlighted the following key points:

- low adoption of advanced technologies and equipment in processing, particularly in drying vegetables, such as onions;
- limited utilization of quality, safety, and product labeling standards;
- insufficient access to modern storage infrastructure in terms of both price and quality;
- under-utilization of intangible resources like market research and human resource management systems. Additionally, technical education and skill development for workers are not prioritized;
- lack of proper skills among producers to process agricultural products and minimize losses;

- inadequate coordination between actors in the agro-processing sector and the broader agro-food chain;
- limited access for producers to markets and essential information.

Empowering the enhancement of Agro-processing in the selected pilot product areas may encompass various essential elements:

- Modernizing agro-processing processes, such as grading, drying/conservation, packaging, and storage, with a focus on introducing new methods and technologies to enhance product quality.
- Developing new processed products and seeking new markets for these products (e.g., dried onions, dried carrots combined with salt, etc.)
- Training specialists and staff working in agricultural product processing plants to effectively utilize new technologies and quality management techniques.
- Evaluating and improving storage infrastructure and logistics that support agro-processing.

It is recommended to execute the planned reforms alongside the implementation of the Concept of Creation and Development of Agro-Industrial Clusters up to 2024, adopted by the Government of Tajikistan in 2020. This aims to enhance the production and processing sectors by consolidating small producers around a leading processing enterprise or storage center. Through this, equipment modernization, the provision of financial resources for modern equipment purchases, the creation of maintenance centers, the implementation of educational programs, and organization internships and exchanges of experience can be facilitated.

A crucial component involves a detailed assessment of existing processing methods for specific products to identify inefficiencies and bottlenecks, enabling the identification of opportunities for streamlining operations and increasing efficiency,

with consideration for technology, automation, and quality control to ensure high-quality agricultural products.

This assessment can pinpoint the most in-demand types of equipment and technologies. To develop a cohesive understanding of the sector's needs and its development strategy, a blueprint for future reforms must be combined with institutional measures. Despite the existing vision for the sector's development outlined in the Program for the Development of the Agrofood System and Sustainable Agriculture until 2030, further development of this sector necessitates the elaboration of a sectoral Program for the development of the agro-processing sector, defining goals, objectives, measures, and indicators for improvement and development. The Program for the development of the agricultural products processing sector should be integrated into a broader program for the development of the Agrofood system, such as the Program of Development of the Agrofood System and Sustainable Agriculture until 2030.

2. ODA Project Proposal

2.1. Goal and objective

The overarching goal of the Project is to contribute to the development of Tajikistan's agri-food systems by fostering a conducive environment for value-added agriculture production and processing. This will be achieved through special attention to the following specific objectives.

❍ Objectives

- Decrease agricultural product losses by modernizing production and processing infrastructure in targeted areas.

- Enhance entrepreneurial proficiency and implement innovative methods for harvesting, storage, and processing leading to optimizing productivity and efficiency.
- Strengthen market access for individual producers by enhancing market linkages and facilitating access to domestic and international markets.

2.2. Expected Results

Aligned with the Project objectives, the intervention is structured around 3 core directions, aiming to empower producers in target areas to enhance profitability through the utilization of modern post-harvest processing equipment and knowledge. These core directions are:

- Modernization of production and processing infrastructure (modern equipment and technologies) in targeted areas for selected products
- Introduction of innovative skills/knowledge for effective agriculture production and processing
- Market Expansion and post-harvest Sales Channel Creation in targeted areas for selected products

Outcome 1. Enhanced efficiency in post-harvest management of selected products

Achieving improved agricultural efficiency in production, storage, and processing depends heavily on modernizing the equipment used by the farmers and providing access to modern machinery for small-scale farmers heavily reliant on human labor. The upgraded equipment aims to facilitate long-term storage and maintain quality throughout the supply chain. The environmentally friendly technologies will be

integrated to reduce the environmental impact of production and processing operations. Training sessions will accompany the distribution of equipment to ensure proficiency in usage. The project activities will involve the implementation of various trainings to improve skills in using the equipment for storage, packaging, and processing of agricultural products.

❍ Indicators

- 50 producers/production groups for selected products adopting modern equipment aimed at reducing product losses and increasing productivity, categorized by gender, age group of the owner, and enterprise size
- Average income of producers/production groups implementing modern equipment and innovative technology for effective post-harvest
- Reduction in post-harvest losses as a percentage of total production.

Outcome 2. Equip farmers and processors with the necessary skills and knowledge to implement innovative practices in agriculture production and processing

The implementation of contemporary technologies and machinery for production and processing requires the adoption of innovative methods, best practices, and the enhancement of skills and knowledge to improve efficiency, quality, and sustainability in the production and processing of agricultural products.

The project activities will involve the implementation of various training programs to improve knowledge and skills in the following areas, including sustainable farming practices, crop management, post-harvest management and proper storing methods, etc.

❍ Indicators

- 100 producers /production groups trained on innovative methods/skills and knowledge to improve efficiency, quality, and sustainability in the production and processing of agricultural products.
- 50 producers/production groups using innovative methods/skills/knowledge for the production, harvesting, storage, and processing of selected agricultural products. categorized by gender, age group of the owner, and enterprise size.

Outcome 3. Increase market access for selected producers through the development of a diversified post-harvest sales channel

The strategies for market expansion aim to increase productivity and resilience to mitigate risks for producers, production groups/communities in target areas for selected products.

The project activities will include the following elements:

- Conduct comprehensive market research to identify potential postharvest sales channels suitable for selected products and develop market strategies and business plans based on the findings.
- Establish partnerships with local and international distributors, wholesalers, or retailers for selected products.
- Organizing trade shows and exhibitions for selected products

❍ Indicators:

- Number of producers accessing new markets and market share increased.

2.3. Project Activities

2.3.1. Activities (for Outcome I)

❍ Developing cross-sectoral linkages and identifying producers and production groups to access investments and financing for production and processing equipment /infrastructure.

❍ Establishing matching grants to upgrade production and processing infrastructure for selected agriculture products in target areas (boost productivity, creation of modern refrigerated chambers or modern equipment, generators, processing plants, or the acquisition of modern equipment for the processing (drying) of vegetables (onions and carrots) and fruits, and the cleaning of rice.)

❍ Conducting training on the use of modern equipment and technologies

❍ Providing technical assistance and consultations for the development of packaging for potential producers

2.3.2. Activities (for Outcome II)

❍ Mobilize high-level experts to collaborate with producers and institutions on topics including management potential, product design, process optimization, energy efficiency, waste management, and pest control.

❍ Design and conduct training programs for producers focused on innovative practices in areas like:

- Sustainable Farming Practices and crop management:
- Modern food processing technologies like freeze-drying, high-pressure processing, and vacuum packaging;
- Proper methods and technologies for organizing the storage, processing, and collection/loading of products.
- Food quality and safety standards and certification.

- Climate change impacts and implementing climate-smart agriculture practices, including innovative irrigation techniques, water and energy efficiency;
- Market access and supply chain management.

❍ Establishing partnerships with local organizations, institutions, and enterprises to collaborate on implementing innovative solutions.

2.3.3. Activities (for Outcome III)

❍ Facilitate the creation of new sales channels for target agricultural products, including exploring online marketplaces, establishing relationships with grocery chains, and expanding participation in farmers' markets.

❍ Organizing exhibitions and fairs to promote the products of pilot producers.

❍ Assisting producers in establishing delivery channels and points of sale for modern packaging materials

❍ Setting up advisory services to increase productivity and support equipment usage, including electronic advisory services, and strengthening capacity for their use, particularly for women and youth.

2.4. Project Implementation

2.4.1. Implementation structure

The project implementation group, under the coordination of the Ministry of Agriculture of the Republic of Tajikistan, will be central to executing the program. This group will oversee contracting for project activities following established procedures, engaging various organizations to ensure the achievement of the project's objectives.

2.4.2. Legal Status of Participating Organizations

The project aims to involve small and medium enterprises through legal entities and individual entities engaged in the cultivation, storage, and processing of agricultural products. The educational programs will involve the participation of government phytosanitary services, consulting companies, or individual experts in the relevant training topics.

2.4.3. Responsibilities of Cooperating Organizations

❍ Ministry of Agriculture of the Republic of Tajikistan

- Provide overall leadership and coordination for the project implementation.
- Oversee the selection of project beneficiaries (SMEs and individual producers).
- Collaborate with the project team to develop and implement relevant agricultural policies and regulations.
- Issue permits and licenses required for project activities (e.g., construction of processing facilities).
- Participate in the Steering Committee meetings and decision-making processes.

❍ Project implementation group under the MOA

- Overseeing the project execution, ensuring activities are completed according to the plan.
- Contracting and procurement
- Developing and implementing a communication strategy
- Monitoring and evaluating project progress, identifying challenges, and measuring the project's impact on achieving its objectives.
- Preparing regular progress reports for relevant stakeholders.

2.4.4. Communications Plan Among All Stakeholders

The Project's communication and visual representation plan aims to effectively inform all stakeholders about the goals, objectives, activities, and impact of the Project. This measure will contribute to increasing interest and expanding cooperation in matters related to enhancing the potential for agricultural product processing in Tajikistan and stimulating its productivity.

The target groups include the project team, the Ministry of Agriculture of the Republic of Tajikistan, other government agencies, investors, farmers, processors, distributors, consumers, the media, and other organizations.

The Project's activities will be communicated through all available communication channels. Social media platforms will be utilized to share news about projects, success stories, resources, and interaction opportunities. The Project will collaborate with the media by conducting press conferences, developing press releases, and compiling materials for the media. Furthermore, video content will be developed to disseminate information about successful projects.

Demonstrations, seminars, and knowledge exchange training will be conducted to directly engage farmers and processors. The project team will prepare regular progress reports and disseminate necessary information among relevant stakeholders. Materials and informational and educational events will be conducted in Tajik and other local languages to ensure inclusivity.

To improve communication, the project team will gather feedback through surveys. Interaction with key stakeholders will be carried out within the framework of the established steering committee, which will include the participation of the Ministry of Agriculture of the Republic of Tajikistan and other relevant agencies, including executive bodies of selected districts.

2.5. Result Management Plan

The monitoring and Evaluation (M&E) plan, tracks the project's progress toward its goals and objectives. This plan ensures accountability, transparency, and continuous learning by integrating quantitative and qualitative methodologies to provide comprehensive insights into the project's performance and impact.

The key components of the M&E plan include:

- Baseline Data: This involves collecting data on income levels, equipment utilization, and productivity of targeted producers and production groups through surveys and data gathering.
- Regular Progress Monitoring: Ongoing monitoring of project activities.
- Outcome Evaluation: Assessing the impact of the project on reducing product losses, increasing productivity, and improving income levels among targeted producers. This evaluation also considers the effectiveness of training programs, expansion of market channels, and the participation of producers in trade shows and exhibitions.

Data collection methods may vary depending on the indicators and may include surveys, in-depth interviews, analysis of project documents, reports, and other sources.

Additionally, the project will produce quarterly progress reports that outline significant achievements, challenges, and recommendations for adjustments. The project will also facilitate Steering Committee Meetings to assess project performance, address issues, and make strategic decisions.

Annex 1. Questionnaire (ENG)

Questionnaire on Agricultural Product Processing

This questionnaire is designed to study the current status of agricultural product processing in Tajikistan. Your answer will be confidential and strictly used for statistical purpose only. Please provide us your honest response on the following questions.

Thank you for your cooperation.

* Contact person: Firdavsi Kholiqzoda, Tel: (+992) 006061010, e-mail: min.agro.tj@gmail.com

☐ **General Information**

Category	① Below 18	② 18 - 29	③ 30 - 44	④ 45 - 59	⑤ Above 60
	( )	( )	( )	( )	( )
Business Area	① Large scale farm	② Middle man /dealer	③ Storing /processing company	④ Researcher /professor	⑤ Government /public sector
	( )	( )	( )	( )	( )
District	① Sugd	② Khatlon	③ Others		
	( )	( )	( )		
Main product (produce/sell)	① Onion	② Carrot	③ Grape	④ Apple	⑤ Rice
	( )	( )	( )	( )	( )
Personal Information					
Name		**Contact info**	(tel.)		
			(email)		

1. Agricultural product processing

* Response target: Large scale farm, Middle man /dealer, Storing /processing company

** Here, “processing” means the basic processing like drying or making juice

1-1 What is an average loss rate of your main product during harvesting and storing period?

– Please write down two(2) of your main product and place a check mark(√) in the box which corresponds with your answer.

Average loss rate by period		① 0~5%	② 6~10%	③ 11~20%	④ 21~40%	⑤ Above 40%
Item(1) _____	After harvest					
	1 -2 month					
	3 -4 month					
	5 -6 month					
Item(2) _____	After harvest					
	1 -2 month					
	3 -4 month					
	5 -6 month					

1-2 What is the main reason that your products get damaged or lost?

① Impossible to eat or sell because they become spoiled immediately after harvest

② Difficult to sell in the market due to low marketability (quality)

③ Difficult to recover the processing cost (selection, packaging, etc.)

④ Others (please specify _____)

1-3 What percentage of your main products goes into processing (drying, juice, etc.)?

– Please write down two(2) of your main product and place a check mark(√) in the box which corresponds with your answer.

Processing rate	① 0~5%	② 6~10%	③ 11~20%	④ 21~40%	⑤ Above 40%
Item(1) _____					
Item(2) _____					

1-4 How do you dry your main product? (for this time, only focusing on drying)

① Dry outdoors on a road or floor using sunlight

② Dry in the sun using equipment such as a net

③ Dry indoors

④ Using a drying machine

⑤ Others (please specify _____)

1-5 If you do not process your product, what is the reason?

① Need the sales money

② Absent or insufficient processing facility

③ Lack of labor to process the product

④ Difficult to guarantee that the processed product will be sold at a higher price

⑤ Others (please specify _____)

1-6 If you do process your product, what is your motivation?

① Able to sell the processed product at a higher price than fresh one

② Able to avoid concentration of product in the market during harvest season and control supply and demand

③ Possible to use a storage which keeps the product safe in the long term

④ Demand from the enterprise or company of the processed product

⑤ Others (please specify _____)

1-7 When selling your product after processing, on average what percentage do you sell at a higher price than when you sell fresh product immediately after harvest? (drying, making juice)

* based on your experience in 2022 or 2023

– Please write down two(2) of your main product and the type of processing that you do

Average price increase	**Type of processing** (drying, juice)	Compare the price between the processed one and the fresh one				
		① 0~5%	② 6~10%	③ 11~20%	④ 21~40%	⑤ Above 40%
Item(1) _____	_____					
Item(2) _____	_____					

2. Agricultural product storing

* Response target: Large scale farm, Middle man /dealer, Storing /processing company

2-1 On average, what percentage of your products goes into the market by storing period?

Shipping rate	① Right after harvest	② Within 1 month	③ Within 2-3 months	④ Within 4-5 months	⑤ After 5 months	Sum
(example) onion	*50%*	*30%*	*10%*	*7%*	*3%*	*100%*
Item(1) _____						
Item(2) _____						

2-2 How do you store your main products?

① Dig the ground and store it underground

② In the outdoor space using roof, shade net, etc.

③ On the floor of house or warehouse at room temperature

④ Others (please specify _____)

2-3 If you store your products in a cold storage which is able to control the temperature and humidity, where the storage is located?

① Sugd

② Khatlon

③ Others (please specify _____)

2-4 If you do not store your product, what is the reason?

① Need the sales money

② Absent or insufficient storing facility

③ No guarantee that the stored product will be sold at a higher price

④ Quality is not that good so no need to save them

⑤ Storing cost (using a storage, etc.) is too expensive so it is difficult to make a profit

⑥ Others (please specify _____)

2-5 If you do store your product, what is your motivation?

① After storing, possible to sell the product at a higher price

② To prevent concentration of the product in the market and the price decrease when the harvest season

③ Others (please specify _____)

2-6 When selling your product after storing, on average what percentage do you sell at a higher price than when you sell fresh product immediately after harvest? (drying, making juice)

* based on your experience in 2022 or 2023

– Please write down two(2) of your main product and the type of processing that you do

Average price increase by storing period		Compare the price between the stored one and the fresh one				
		① 0~9%	② 10~40%	③ 41~60%	④ 61~80%	⑤ Above 80%
Item(1) _____	After 1-2 months					
	After 2-4 months					
	After 5-6 months					
Item(2) _____	After 1-2 months					
	After 2-4 months					
	After 5-6 months					

3. Necessity and importance of improvement of agricultural product processing in Tajikistan

* Response target: Large scale farm, Middle man /dealer, Storing /processing company, Researcher /professor, Government /public sector

* It is found that due to lack of facilities of processing (drying, juice, etc.) and storing, price fluctuations are large and it is difficult to control supply and demand of agricultural product after harvest.

- Please place a check mark(√) in the box which corresponds with your answer.
- Think about what is necessary to improve processing and storing of agricultural product in regional and national level of Tajikistan.
- Please put ONLY ONE check mark for each category (For each category, the number of check mark should be one)
- Here, hardware includes basic infrastructure or facilities and software includes capacity building, technical assistance, etc.

Category (processing/storing)	Sub-category	National	Regional	
		Tajikistan	Khatlon	Sugd
1. Regional importance	① Khatlon			
	② Sugd			
2. Importance by item (choose only one)	① Onion			
	② Carrot			
	③ Grape			
	④ Apple			
	⑤ Apricot			
	⑥ Rice			
3. Comparative importance between hardware and software	① Hardware			
	② Software			
4. Importance of hardware facility sector	① Selection and packaging facility			
	② Processing (drying) facility			
	③ Storage			
5. Importance of software sector	① Research and development (R&D)			
	② Human resource			
	③ Technical education			
6. The item most in need regarding selection and packaging	① Onion			
	② Carrot			
	③ Grape			

	④ Apple			
	⑤ Rice			
7. The item most in need regarding processing (drying)	① Onion			
	② Carrot			
	③ Grape			
	④ Apple			
	⑤ Rice			
8. The item most in need regarding storing	① Onion			
	② Carrot			
	③ Grape			
	④ Apple			
	⑤ Rice			
9. The item most in need regarding human resource development	① Onion			
	② Carrot			
	③ Grape			
	④ Apple			
	⑤ Rice			
10. The item most in need regarding technical education	① Onion			
	② Carrot			
	③ Grape			
	④ Apple			
	⑤ Rice			
11. The most potential for export	① Onion			
	② Carrot			
	③ Grape			
	④ Apple			
	⑤ Rice			

4. Necessity(importance) by item

* Response target: Large scale farm, Middle man /dealer, Storing /processing company, Researcher /professor, Government /public sector

– Please place a check mark(√) in the box which corresponds with your answer.

<Explanation>

- Importance: ①Not important at all ②Slightly important ③Moderately important ④Important ⑤Very important
- Necessity: ①Not necessary at all ②Slightly necessary ③Moderately necessary ④Necessary ⑤ Very necessary
- Potential: ①Not potential at all ②Slightly potential ③Moderately potential ④Potential ⑤Very potential

- Here, hardware includes basic infrastructure or facilities and software includes capacity building, technical assistance, etc.

Item: Onion

Category	Details	Low	←	Importance Necessity Potential	→	High
		①	②	③	④	⑤
Supply control	Importance of supply control					
Overall improvement	① Hardware					
	② Software					
Hardware (infrastructure)	① Selection or packaging facility					
	② Processing (drying) facility					
	③ Storage					
Software	① Research and development (R&D)					
	② Human resource					
	③ Technical education					
Export	① Export necessity					
	② Export potential					

Item: Carrot

Category	Details	Low	←	Importance Necessity Potential	→	High
		①	②	③	④	⑤
Supply control	Importance of supply control					
Overall improvement	① Hardware					
	② Software					
Hardware (infrastructure)	① Selection or packaging facility					
	② Processing (drying) facility					
	③ Storage					
Software	① Research and development (R&D)					
	② Human resource					

	③ Technical education					
Export	① Export necessity					
	② Export potential					

Item: Grape						
Category	**Details**	**Low**	←	**Importance Necessity Potential**	→	**High**
		①	②	③	④	⑤
Supply control	Importance of supply control					
Overall improvement	① Hardware					
	② Software					
Hardware (infrastructure)	① Selection or packaging facility					
	② Processing (drying) facility					
	③ Storage					
Software	① Research and development (R&D)					
	② Human resource					
	③ Technical education					
Export	① Export necessity					
	② Export potential					

Item: Apple						
Category	**Details**	**Low**	←	**Importance Necessity Potential**	→	**High**
		①	②	③	④	⑤
Supply control	Importance of supply control					
Overall improvement	① Hardware					
	② Software					
Hardware (infrastructure)	① Selection or packaging facility					
	② Processing (drying) facility					
	③ Storage					

Software	① Research and development (R&D)					
	② Human resource					
	③ Technical education					
Export	① Export necessity					
	② Export potential					

Item: Rice						
Category	**Details**	**Low**	←	**Importance Necessity Potential**	→	**High**
		①	②	③	④	⑤
Supply control	Importance of supply control					
Overall improvement	① Hardware					
	② Software					
Hardware (infrastructure)	① Selection or packaging facility					
	② Processing (drying) facility					
	③ Storage					
Software	① Research and development (R&D)					
	② Human resource					
	③ Technical education					
Export	① Export necessity					
	② Export potential					

**** Thank you for your time and cooperation ****

Annex 2. Questionnaire (Tajik)

Пурсишнома оид ба коркарди махсулоти кишоварзӣ

Пурсишномаи мазкур барои омӯзиши вазъи кунунии коркарди маҳсулоти кишоварзӣ дар Тоҷикистон пешбинӣ шудааст. Ҷавоби шумо махфӣ хоҳад буд ва танҳо бо мақсади оморӣ истифода мешавад. Лутфан ба мо ба саволҳои зерин ҷавоби дуруст/самимии худро диҳед.

Ташаккур барои ҳамкориатон.

* Шахси тамос: Фирдавсӣ Холиқзода , Тел: (+992) 006061010, e-mail: min.agro.tj@gmail.com

☐ **Маълумоти умумӣ**

Синусол	① Аз 18 пасттар	② 18 - 29	③ 30 - 44	④ 45 - 59	⑤ Баланд 60
	( )	( )	( )	( )	( )
Минтақаи тиҷорат	① Хочагии колони деҳқонӣ	② Миенарав / дилер	③ Нигоҳдори / коркарди маҳсулот	④ Тадқиқотчӣ / профессор	⑤ Ҳукумат /бахши давлатӣ
	( )	( )	( )	( )	( )
Вилоят/ноҳия	① Суғд	② Хатлон	③ Дигар		
	( )	( )	( )		
Маҳсулоти асосӣ (истеҳсол/фурӯш)	① Пиез	② Сабзӣ	③ Ангур	④ Себ	⑤ Биринҷ
	( )	( )	( )	( )	( )
Маълумоти шахсӣ					
Ном		**Маълумот барои тамос**	(тел.)		
			(почтаи элек)		

1. Коркарди махсулоти кишорзӣ

Посухдиҳандаҳои зерҳадаф : Хоҷагии калони деҳқонӣ, минаравҳо / дилер, ширкатҳои нигоҳдории / коркард

* * Дар инҷо «коркард» коркарди асосӣ ба монанди хушк кардан ё тайёр кардани шарбатро ифода мекунад

1-1 Сатҳи миёнаи талафоти маҳсулоти асосии шумо дар давраи ҷамъоварӣ ва нигоҳдорӣ чӣ қадар аст?

– Ду (2) маҳсулоти асосии худро нависед ва дар катаге, ки ба ҷавоби шумо мувофиқ аст, аломати чек (√) гузоред.

Сатҳи миёнаи талафот аз рӯи давра		① 0~5%	② 6~10%	③ 11~20%	④ 21~40%	⑤ Зиёда аз 40%
Банди (1) _____	Баъди ҷамъоварӣ					
	1-2 моҳ					
	3-4 моҳ					
	5-6 моҳ					

Банди (2) _____	Баъди ҷамъов арӣ					
	1-2 моҳ					
	3-4 моҳ					
	5-6 моҳ					

1-2 Сабаби асосии вайрон ё гум шудани маҳсулоти шумо дар чист ?

① Ман метавонам бихӯрам ё фурӯшам, зеро онҳо фавран пас аз ҷамъоварии ҳосил вайрон мешаванд

② Аз сабаби паст будани бозорёбӣ (сифат) фурӯш дар бозор мушкил аст.

③ Барои барқарор кардани хароҷоти коркард (интихоб, бастабандӣ ва ғ.)

④ Дигар сабаб (лутфан нишон диҳед _____)

1-3 Чанд фоизи маҳсулоти асосии шумо ба коркард (хушккунӣ, шарбат ва ғайра) меравад?

– Ду (2) маҳсулоти асосии худро нависед ва дар қуттие, ки ба ҷавоби шумо мувофиқ аст, аломати чек (√) гузоред.

Сатҳи коркарди P	① 0~5%	② 6~10%	③ 11~20%	④ 21~40%	⑤ Зиёда аз 40%
Банди (1) _____					
Банди (2) _____					

1-4 Чӣ тавр хушк мекунед? (инҷо, танҳо ба хушккунӣ таваҷҷуҳ карда мешавад)

① Бо истифода аз нури офтоб дар беруни роҳ ё фарш хушк намудан

② Бо истифода аз таҷҳизот ба монанди тӯр дар офтоб хушк намудан

③ Дар дохили хона хушк намудан

④ Истифодаи мошини хушккунӣ

⑤ Дигар намуд (лутфан нишон диҳед _____)

1-5 Агар шумо маҳсулотатонро коркард накунед, сабаб чист?

① Мефурӯшед барои он ки пул лозим аст

② Набудани ё нокифояи иншооти коркард

③ Барои коркарди махсулот кувваи коргарй намерасад

④ Кафолат додан душвор аст, ки махсулоти коркардшуда бо нархи баландтар фурухта мешавад

⑤ Дигар сабаб (лутфан нишон диҳед _____)

1-6 Агар шумо маҳсулоти ҳудро коркард кунед, ҳавасмандии шумо чист?

① Метавонам маҳсулоти коркардшударо бо нархи баландтар аз нархи тару тоза фурӯшад

② Дар мавсими ҳосилғундорӣ аз консентратсияи маҳсулот дар бозор канорагирӣ карда, талабот ва пешниҳодро назорат карда метавонам

③ Истифодаи анборе, ки маҳсулотро дар муддати тӯлонӣ бехатар нигоҳ медорад, имконпазир аст

④ Талабот аз корхона ё ширкат ба махсулоти коркардшуда

⑤ Дигар (лутфан нишон диҳед _____)

1-7 Вақте ки маҳсулоти ҳудро пас аз коркард мефурӯшед, шумо ба ҳисоби миёна чанд фоизро бо нархи баландтар мефурӯшед, назар ба он вақте ки шумо фавран пас аз ҷамъоварии ҳосил маҳсулоти тару тоза мефурӯшед? (ҳушк кардан, шарбат тайёр кардан)

* дар асоси таҷрибаи шумо дар соли 2022 ё 2023

– Ду (2) маҳсулоти асосии худ ва навъи коркардеро, ки мекунед, нависед

Афзоиши ми ёнаи нарх	**Навъи кор кард** (хушк кар дан, шарбат кардан)	Нархро байни коркардшуда ва тару тоза муқоиса кунед				
		① 0~5%	② 6~10%	③ 11~20%	④ 21~40%	⑤ Зиёда а з 40%
Якум маҳсу лот _____	_____					
Дуюм маҳсу лот _____	_____					

2. Нигоҳдории маҳсулоти кишоварзӣ

Посухдиҳандаҳои зерҳадаф: Хоҷагии калони деҳқонӣ, минаравҳо / дилер, ширкатҳои нигоҳдории / коркард

2-1 Ба ҳисоби миёна, чанд фоизи маҳсулоти шумо бо мӯҳлати нигоҳдорӣ ба бозор мебарояд?

Нархи интиқол	① Дарҳол пас аз ҷамъ оварии ҳос ил	② Дар дох или 1 мох	③ Дар дох или 2-3 моҳ	④ Дар дох или 4-5 моҳҳо	⑤ Баъд 5 моҳ	сум
(мисол) тиёз	*50%*	*30%*	*10%*	*7%*	*3%*	*100%*
Якум (1)						

_____						
Дуюм(2) _____						

2-2 Маҳсулоти асосии ҳудро чӣ гуна нигоҳ медоред?

① Заминро мекобем ва дар зери замин нигоҳ медорем

② Дар фазои беруна бо истифода аз бом, торҳои сояафкан ва ғайра.

③ Дар ошёнаи хона ё анбор дар ҳарорати хонагӣ

④ Е дигар намуд (лутфан нишон диҳед _____)

2-3 Агар шумо маҳсулоти ҳудро дар як анбори ҳунук нигоҳ медоред, ки қобилияти назорат кардани ҳарорат ва намиро дорад, дар кучо ҷойгир аст?

① Сугд

② Хатлон

③ Дигар (лутфан нишон диҳед _____)

2-4 Агар шумо маҳсулоти ҳудро нигоҳ надоред, сабаб чист?

① Пули фурӯш лозим аст

② Набудани ё нокифоя будани иншооти нигоҳдорӣ

③ Кафолат намедихад, ки махсулоти захирашуда бо нархи баланд фурухта мешавад

④ Сифат он қадар хуб нест, аз ин рӯ онҳоро нигоҳ доштан лозим нест

⑤ Хароҷоти нигоҳдорӣ (истифодаи анбор ва ғ.) хеле гарон аст, аз ин рӯ фоида ба даст овардан душвор аст

⑥ Дигар сабаб (лутфан нишон диҳед _____)

2-5 Агар шумо маҳсулоти ҳудро нигоҳ доред, ҳавасмандии шумо чист?

① Пас аз нигоҳ доштан мумкин аст, ки маҳсулотро бо нархи баландтар фурӯшам

② Барои пешгирии консентратсияи маҳсулот дар бозор ва паст шудани нарх дар мавсими ҳосилғундорӣ

③ Дигар сабаб (лутфан нишон диҳед _____)

2-6 Вақте ки маҳсулоти ҳудро пас аз нигоҳдорӣ мефурӯшед, шумо ба ҳисоби миёна чанд фоиз бо нархи баландтар аз он вақте ки шумо фавран пас аз ҷамъоварӣ маҳсулоти тару тоза мефурӯшед? (хушк кардан, шарбат тайёр кардан)

* дар асоси таҷрибаи шумо дар соли 2022 ё 2023

– Ду (2) маҳсулоти асосии худ ва навъи коркардеро, ки мекунед, нависед

Афзоиши миёнаи нарх аз рӯи мӯҳлати нигоҳдорӣ		Нархро байни нархи нигоҳ дошташуда ва тару тоза муқоиса кунед				
		① 0~9%	② 10~40%	③ 41~60%	④ 61~80%	⑤ Зиёда аз 80%
Якум(1) _____	Пас аз 1-2 моҳ					
	Пас аз 2-4 моҳ					
	Пас аз 5-6 моҳ					
Дуюм(2) _____	Пас аз 1-2 моҳ					
	Пас аз 2-4 моҳ					
	Пас аз 5-6 моҳ					

3. Зарурат ва аҳамияти такмили коркарди маҳсулоти кишоварзӣ дар Тоҷикистон

* Посухдиҳандаҳои зерҳадаф : Ҳоҷагии калони деҳқонӣ, минаравҳо / диллер, ширкатҳои нигоҳдорӣ / коркарди маҳсулот, татқиқотчиҳо/профессорҳо, Ҳукумат/кормандони ҷдавлатӣ
* Муайян карда шудааст, ки аз сабаби набудани иншооти коркард (хушккунак, шарбат ва гайра) ва нигоҳ доштан, тамоюли нархҳо калон буда, назорат кардани талабот ва пешниҳоди маҳсулоти хочагии кишлок баъди ҷамъоварии хосил душвор аст.

– Дар хоначае, ки ба ҷавоби шумо мувофиқ аст, аломати чек (√) гузоред.

– Фикр кунед, ки барои беҳтар кардани коркард ва нигоҳдории маҳсулоти кишоварзӣ дар сатҳи минтақавӣ ва ҷумҳуриявии Тоҷикистон чӣ зарур аст.

– ТАНҲО ЯК аломати чек (√) гузоред (Барои ҳар як категория шумораи аломати чек бояд як бошад)

Категория (коркард/нигаҳдорӣ)	Зеркатегория	миллӣ	минтақавӣ	
		Точикистон	Хатлон	Суғд
1. Аҳамияти минтақавӣ	① Хатлон			
	② Суғд			
2. Аҳамият аз рӯи адад (танҳо як еро интихоб кунед)	① Пиёз			
	② Сабзӣ			
	③ Ангур			
	④ себ			
	⑤ Зардолу			
	⑥ Райс			

3. Аҳамияти муқоисавӣ байни инфрасохтор ва зеҳнӣ	① Таҳқиқот			
	② Зеҳнӣ			
4. Аҳамияти бахши инфрасохтор	① Дастгоҳи интихоб ва бастабандӣ			
	② Муассисаи коркард (хушккунӣ).			
	③ Нигоҳдорӣ			
5. Аҳамияти бахши зеҳнӣ	① Тадқиқот ва рушд (R&D)			
	② Захираҳои инсонӣ			
	③ маълумоти техникӣ			
6. Адад дар мавриди интихоб ва бастабандӣ бештар ниёз дорад	① Пиёз			
	② Сабзӣ			
	③ Ангур			
	④ себ			
	⑤ Райс			
7. Маводи бештар ниёзманди кор кард (хушк)	① Пиёз			
	② Сабзӣ			
	③ Ангур			
	④ себ			
	⑤ Райс			
8. Маҳсулоте, ки бештар ба нигоҳдорӣ ниёз дорад	① Пиёз			
	② Сабзӣ			
	③ Ангур			
	④ себ			
	⑤ Райс			
9. Мавзӯи бештар ниёзманди рушди захираҳои инсонӣ	① Пиёз			
	② Сабзӣ			
	③ Ангур			
	④ себ			
	⑤ Райс			
10. Мавзӯи бештар ниёзманди ом узиши техникӣ	① Пиёз			
	② Сабзӣ			
	③ Ангур			

	④ себ			
	⑤ Райс			
11. Имконияти бештари содирот	① Пиёз			
	② Сабзӣ			
	③ Ангур			
	④ себ			
	⑤ Райс			

4. Зарурат (аҳамият) аз рӯи номгуй

* Посухдиҳандаҳои зерҳадаф : Хоҷагии калони деҳқонӣ, минаравҳо / дилер, ширкатҳои нигоҳдории / коркарди маҳсулот, татқиқотчиҳо/профессорҳо, Ҳукумт/кормандони лдавлатӣ

– Дар хоначае, ки ба ҷавоби шумо мувофиқ аст, аломати чек (√) гузоред.

< Эзоҳ>
- Муҳимият: ① Ҳеҷ муҳим нест ② Кам муҳим ③ Миёна муҳим ④ Муҳим ⑤ Хеле муҳи м
- Зарурат: ① Ҳеҷ зарур нест ② Кам зарур ③ Ба таври миёна зарур ④ Ҳатмӣ ⑤ Хеле за рур
- Потенсиал: ① Потенсиал нест ② Потенсиали каме ③ Потенсиали миёна ④ Потенсиал ⑤ Потенсиали хеле зиёд

Мавод: Пиёз						
Категория	**Тафсилот**	**Кам**	←	**Муҳимият Зарурат Потенсиал**	→	**Баланд**
		①	②	③	④	⑤
Назорати таъминот	Муҳимияти назорати таъминот					
Такмили умумӣ	① Таҷҳизот					
	② Зеҳнӣ					
Таҷҳизот (инфрасохтор)	① Имконоти интихоб ё бастабандӣ					
	② Муассисаи коркард (хушккунӣ).					
	③ Нигоҳдорӣ					
Зеҳнӣ	① Тадқиқот ва рушд (R&D)					
	② Захираҳои инсонӣ					
	③ маълумоти техникӣ					
Содирот	① Зарурати содирот					
	② Потенсиали содирот					

Мавод: Сабзӣ						
Категория	**Тафсилот**	**Кам**	**←**	**Муҳимият Зарурат Потенсиал**	**→**	**Баланд**
		①	②	③	④	⑤
Назорати таъминот	Муҳимияти назорати таъминот					
Такмили умумӣ	① Тачҳизот					
	② Зеҳнӣ					
Тачҳизот (инфрасохтор)	① Имконоти интихоб ё бастабандӣ					
	② Муассисаи коркард (хушккунӣ).					
	③ Нигоҳдорӣ					
Зеҳнӣ	① Тадқиқот ва рушд (R&D)					
	② Захираҳои инсонӣ					
	③ маълумоти техникӣ					
Содирот	① Зарурати содирот					
	② Потенсиали содирот					

Мавод: Ангур						
Категория	**Тафсилот**	**Кам**	**←**	**Муҳимият Зарурат Потенсиал**	**→**	**Баланд**
		①	②	③	④	⑤
Назорати таъминот	Муҳимияти назорати таъминот					
Такмили умумӣ	① Тачҳизот					
	② Зеҳнӣ					
Тачҳизот (инфрасохтор)	① Имконоти интихоб ё бастабандӣ					
	② Муассисаи коркард (хушккунӣ).					
	③ Нигоҳдорӣ					
Зеҳнӣ	① Тадқиқот ва рушд (R&D)					
	② Захираҳои инсонӣ					
	③ маълумоти техникӣ					

Содирот	① Зарурати содирот					
	② Потенсиали содирот					

Мавод: Себ						
Категория	**Тафсилот**	**Кам**	**←**	**Муҳимият Зарурат Потенсиал**	**→**	**Баланд**
		①	②	③	④	⑤
Назорати таъминот	Муҳимияти назорати таъминот					
Такмили умумӣ	① Таҷҳизот					
	② Зеҳнӣ					
Таҷҳизот (инфрасохтор)	① Имконоти интихоб ё бастабандӣ					
	② Муассисаи коркард (хушккунӣ).					
	③ Нигоҳдорӣ					
Зеҳнӣ	① Тадқиқот ва рушд (R&D)					
	② Захираҳои инсонӣ					
	③ маълумоти техникӣ					
Содирот	① Зарурати содирот					
	② Потенсиали содирот					

Мавод: Биринҷ						
Категория	**Тафсилот**	**Кам**	**←**	**Муҳимият Зарурат Потенсиал**	**→**	**Баланд**
		①	②	③	④	⑤
Назорати таъминот	Муҳимияти назорати таъминот					
Такмили умумӣ	① Таҷҳизот					
	② Зеҳнӣ					
Таҷҳизот (инфрасохтор)	① Имконоти интихоб ё бастабандӣ					
	② Муассисаи коркард (хушккунӣ).					

	③ Нигоҳдорӣ					
Зеҳнӣ	① Тадқиқот ва рушд (R&D)					
	② Захираҳои инсонӣ					
	③ маълумоти техникӣ					
Содирот	① Зарурати содирот					
	② Потенсиали содирот					

*** * Ташаккур барои вақт ва ҳамкорӣ ****

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