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WAYS TO IMPROVE THE PERSONNEL TRAINING SYSTEM IN THE CONTEXT OF INNOVATIVE DEVELOPMENT OF AGRICULTURE IN THE REGIONS



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**WAYS TO IMPROVE THE PERSONNEL TRAINING SYSTEM
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AGRICULTURE IN THE REGIONS**

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This monograph is dedicated to the scientific and theoretical study of the stages of formation and development of human capital and its factors in the processes of modernizing and innovatively developing economic sectors; identifying the factors that influence them; and exploring a person's cognitive abilities in training qualified personnel - namely, the ability to perceive, analyze, and make decisions about realities, phenomena, objects, and information, to foresee the results, and to apply them in practice. Furthermore, it focuses on creating opportunities to methodologically assess the impact of qualified personnel on the efficiency of production and management in the activities of business entities.

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MUNDARIJA

	KIRISH	4
I BOB	QISHLOQ XO‘JALIGIDA MALAKALI KADRLAR TAYYORLASH VA TA‘MINOTI TIZIMINING ILMIY-USLUBIY ASOSLARI	
	.....	6
1.1	Qishloq xo‘jaligini innovatsion rivojlantirishda oliy malakali kadrlar tayyorlash va ta‘minoti tizimining ilmiy-nazariy va tashkiliy asoslari	6
	.....	6
1.2.	Qishloq xo‘jaligida oliy malakali kadrlarga bo‘lgan talab va ular faoliyati samaradorligini aniqlashning ilmiy-uslubiy asoslari	20
	.....	20
1.3.	Qishloq xo‘jaligida malakali kadrlar tayyorlash va ta‘minoti tizimini innovatsion tashkil etishga oid rivojlangan davlatlar tajribasi va uni mamlakatimizda qo‘llash imkoniyatlari	31
	.....	31
II BOB	QISHLOQ XO‘JALIGINI OLIY MALAKALI KADRLAR BILAN TA‘MINLASH DARAJASI VA TIZIMI RIVOJLANISHINING HOZIRGI HOLATI	49
2.1.	Respublika qishloq xo‘jaligiga oliy malakali kadrlar tayyorlash tizimining holati va ularga bo‘lgan talabning ta‘minlanish darajasi	49
	.....	49
2.2.	Qashqadaryo viloyati qishloq xo‘jaligini kasbiy mutaxassisliklar bo‘yicha malakali kadrlar bilan ta‘minlash darajasi va muammolari	66
	.....	66
III BOB	QISHLOQ XO‘JALIGI TARMOQLARI UCHUN IXTISOSLASHGAN YUQORI MALAKALI KADRLAR TAYYORLASH VA TA‘MINOTI TIZIMI SAMARADORLIGINI OSHIRISH, YO‘NALISHLARI	
	.....	81
3.1.	Qishloq xo‘jaligida yuqori bilimli va malakali kadrlar tayyorlash va ta‘minoti tizimini davlat tomonidan qo‘llab-quvvatlash yo‘llari	81
	.....	81
3.2.	Qishloq xo‘jaligi tarmoqlarida kasbiy mutaxassisliklar bo‘yicha malakali kadrlar tayyorlash tizimini takomillashtirish yo‘nalishlari	98
	.....	98
3.3.	Innovatsion ishlab chiqarish va tashkiliy-boshqaruv shakllarining rivojlanishi sharoitida Qashqadaryo viloyati qishloq xo‘jaligi kadrlariga bo‘lgan talabning prognoz parametrlari	112
	.....	112
	XULOSA VA TAKLIFLAR	113
	FOYDALANILGAN ADABIYOTLAR RO‘YXATI	119

INTRODUCTION

In today's world, where digital management systems and information-communication tools are being formed based on the effective utilization of human factors and capital, abilities and potential through the introduction of innovations, especially in the future, it holds significant importance as the key determinant and core of productive forces in the overall societal development, as well as in the socio-economic progress of economic sectors. Currently, due to the globalization trends in the economy and population growth, meeting the demand for agricultural products, on one hand, requires enhancing product quality and labor productivity through the introduction of innovations, modern complex computerized programs, and technical-technological advancements; on the other hand, ensuring the sector with highly qualified specialists, particularly those with higher education, who can meet these processes and requirements, is of paramount importance.

Globally, numerous scientific-research works are being conducted aimed at providing agriculture with qualified personnel. In this regard, according to data from the Organization for Economic Co-operation and Development (OECD), "the share of higher education holders among the population aged 25-34 is 69.6% in the Republic of Korea, 61.8% in Canada, 60.7% in Japan, 56.2% in Ireland, 55.6% in Lithuania, 51.2% in Switzerland, 50.8% in the United Kingdom, 49.4% in the USA, and 46.9% in France"¹. According to World Bank data, as a result of advancements in genetics, by 2030, agriculture will face not only the challenge of increasing production volumes but also ensuring the organic quality of products and preserving their natural state, which becomes a pressing issue. To achieve this, it is essential to equip the sector with qualified specialists². Therefore, the task of providing agriculture with

¹ Organization for Economic Co-operation and Development (OECD). <https://data.oecd.org/chart/5Hc6>

² The role of FAO in genetic resources. <http://www.fao.org/genetic-resources/en/>

qualified specialist personnel is given special attention not only for employment but also for solving issues such as cultivating organic and ecologically clean products and preserving the national gene pool of crops.

However, in practice, due to cadre shortages and objective and subjective (human-related) reasons, disruptions occur in the integration of science-education-practice. From this perspective, as stated by the leader of our state, "If we have set the goal of transforming Uzbekistan into a developed country, we can achieve it only through rapid reforms, knowledge-enlightenment, and innovations. For this, first and foremost, we need to nurture a new generation of knowledgeable and qualified cadres who are initiative-taking reformers, capable of strategic thinking, and ready to enter the arena.....[3]". This task, which is multifaceted and requires specialization in agriculture, necessitates a comprehensive approach to the issue of training and supplying highly qualified specialists, including those with higher education, as well as developing scientific-practical recommendations on utilizing modern methods to promote the integration of science – research – education – production.

CHAPTER I. SCIENTIFIC-METHODOLOGICAL FOUNDATIONS OF THE SYSTEM FOR TRAINING AND SUPPLYING QUALIFIED CADRES IN AGRICULTURE

1.1. Scientific-theoretical and organizational foundations of the system for training and supplying highly qualified cadres in the innovative development of agriculture

In the current conditions where economic globalization, international division of labor, and economic relations are deepening on a global scale, and complex digital technologies and information-communication tools are rapidly developing and being implemented, ensuring the integration of our country's national economy and science sector at the international level and promoting their innovative development requires enhancing the competitiveness of cadres trained for economic sectors, making rational and effective use of their potential, and strengthening their impact on the efficiency of product (goods, services) production. Indeed, effectively addressing these priority tasks will create a solid foundation for the innovative development of our national economy and science sector in the future, as well as for further expanding integration ties with prestigious foreign higher education and research institutions.

It should be emphasized that the reforms and truly positive changes implemented in our country's higher and secondary specialized education system during the years of independence indicate the formation of a unique system for training and retraining higher and secondary educated specialist cadres that meets the requirements of world standards. The upcoming task consists of continuously improving this system. In this regard, starting from today, from the perspective of creating a layer of highly qualified creative specialists who have deeply mastered information-communication tools and programming models and can apply them purposefully and effectively in practice, it is necessary to

develop, introduce, and direct research works towards innovative topics in modern knowledge areas in all higher education institutions (HEIs).

In particular, for the multifaceted agriculture with its unique characteristics, it is of great importance to radically improve the quality of training agronomists, zootechnicians, veterinarians, entomologist-agronomists, engineer-technicians, economists, accountants, as well as other relevant cadres suitable for the functions of enterprises and state bodies related to this sector's activities; to strengthen the material-technical base of specialized higher and secondary specialized educational institutions and modernize their scientific-technical equipment based on innovations; to introduce modern advanced pedagogical teaching and information-communication technologies into educational processes; and to systematically enhance and retrain the qualifications of scientific-pedagogical cadres and specialists. To address these issues, on May 24, 2017, the President of the Republic of Uzbekistan adopted the targeted Decree No. PQ-3003 "On Measures to Radically Improve the System for Training Engineer-Technical Cadres for Agriculture and Water Management Sectors."

In the current period, where emphasis is placed on the innovative development of agriculture and the use of modern intensive technologies and methods tailored to the products of each of its branches, analyses show that the disproportion between the demand and supply of cadres, as well as the changes that have occurred in the above-mentioned economic management and property relations, precisely require a radical improvement of the system for training highly qualified cadres. In this regard, the main requirements for cadres include continuously enhancing their education, professional skills, and knowledge; being initiative-taking, active, and psychologically curious, aspiring, and loyal to their profession; adhering to a healthy lifestyle; and being well-informed about achievements and available information in our country and worldwide within the scope of their profession and position. Therefore, in our opinion, researching the theoretical and methodological foundations for identifying problems, errors, shortcomings, and negative

trends that hinder the formation of cadres' potential in agriculture is of great importance.

The analysis of scientific sources related to this topic shows that the category of "cadres" is understood in direct connection with concepts such as "labor force," "human capital," "labor resources," "personnel," "qualified specialist," and "human factor." Such an approach can be considered justified in many respects. However, in our view, in the process of training highly educated cadres and qualified specialists, it is necessary to take into account the person's cognitive abilities, that is, as noted above, their capabilities, potential, and experience in perceiving surrounding objects, realities, events, and information, anticipating them in advance, and making correct decisions based on analysis, as well as implementing them in practice. In addition, qualities such as approaching one's profession with confidence, affection, and patience also play a special role.

In particular, qualified cadres, that is, the labor resources that include the creative active part of the population, are a very broad concept in terms of content and essence, and operate in direct interconnection with the concept of "cadres' potential." In modern economic dictionaries, "labor resources" are defined as "the economically active and able-bodied, as well as the physically and mentally healthy part of the population engaged in labor activity." Additionally, labor resources are "the part of the population possessing the necessary knowledge, intellectual capabilities, and required physical indicators for working in the national economy," and "the number of labor resources reflects the society's 'reserve' of labor force and living labor potential necessary to satisfy its needs"³.

In our opinion, from an economic perspective, labor resources are considered an economic category that encompasses, on the one hand, production, and on the other hand, the processes of formation, distribution, and utilization of cadres' potential. Based on this, we can

³ Wikipedia open encyclopedia. <https://uz.wikipedia.org/wiki/Kadrlar>

say that the concept of cadres' potential is directly related to the category of "labor resources" and is one of its constituent elements.

The concept of "cadres" is essentially a term that is used relatively frequently and in most cases, which mainly describes the categories of managers and qualified specialists who directly carry out activities in enterprises, companies, and sectors that are close in terms of specialization. For example, according to the definition of the economist R. Kolosova, "cadres" are a group of people who possess special professional qualifications based on the specific aspects of sectors and enterprises and who conduct permanent activities in this sector, constituting a part of labor resources."⁴

In the Academic Encyclopedia, "Cadres are individuals possessing relevant knowledge and experience"⁵ is given as a definition, while K.Yu. Maslov puts forward the idea that qualified cadres are the main resource of production and their knowledge and experience are the guarantee of effective activity.⁶ N. Gluneh, the founder of "IT Group," acknowledges that cadres are not only the high quality of the services provided but also an integral part of the entire company's success⁷.

Regarding the issue of qualified cadres related to agriculture, S. Kensuken emphasizes that the main production source of agricultural enterprises is labor resources, and its quality and efficiency are fully dependent on business results and financial stability. According to him, "the development of agricultural enterprises is highly sensitive to the qualifications of employees, their level of knowledge, motivation, and ability to solve social and economic problems"⁸. In the Explanatory Dictionary of the Uzbek Language, "cadre is an employee, worker, or staff member of an enterprise or institution who has special training"⁹ is given as a definition, while in the Wikipedia encyclopedia, it is defined

⁴ R. Kolosova. Economics of Personnel. Page 244

⁵ https://technical_translator_dictionary.academic.ru

⁶ Maslov K. Yu. Qualified personnel as a resource of the enterprise // Young Scientist. — 2016. — No. 2. — Pp. 547-550. — URL <https://moluch.ru/archive/106/25149/>

⁷ <http://itgroup.spb.ru/pages/advantages/cvaluation>

⁸ S. Kensuken "Qualified personnel in agriculture" // M: - 2015. - No. 7. <https://helpiks.org/5-82170.html>

⁹ Explanatory Dictionary of the Uzbek Language. "Uzbekistan National Encyclopedia," 2006, page 291. <https://archive.org/details/izohlilugat5jild/page/n3/mode/2up>

as "cadres are the main composition of qualified employees in enterprises, institutions, firms, joint-stock companies, banks, trade unions, and public organizations"¹⁰.

Many opinions and considerations have been expressed by economist scholars regarding the content and essence of the concept of cadres specifically inherent to agriculture. In the course of the research, generalizing them, in our view, it can be understood from two perspectives: broad and narrow senses. If the concept of cadres in a broad sense expresses workers, peasants, entrepreneurs, managers, and specialists, then in a narrow sense, the concept of cadres is understood as the qualified (higher and secondary specialized educated) part of those engaged in physical and mental labor.

Based on the above ideas, in conclusion, it would be correct to conditionally understand "cadres" as managers and specialists who have undergone special professional training for a certain period (short and long). Cadres are stratified into 4 levels from a classical perspective according to the content of their labor activity and functional duties: managerial cadres, specialist cadres, service-providing cadres, and worker cadres. Thus, the common aspect of the concept of cadres reflects their connection to possessing a certain specialty and necessary knowledge and skills, and they form a group of workers and specialists who embody a certain potential and have personal, business, and professional preparedness.

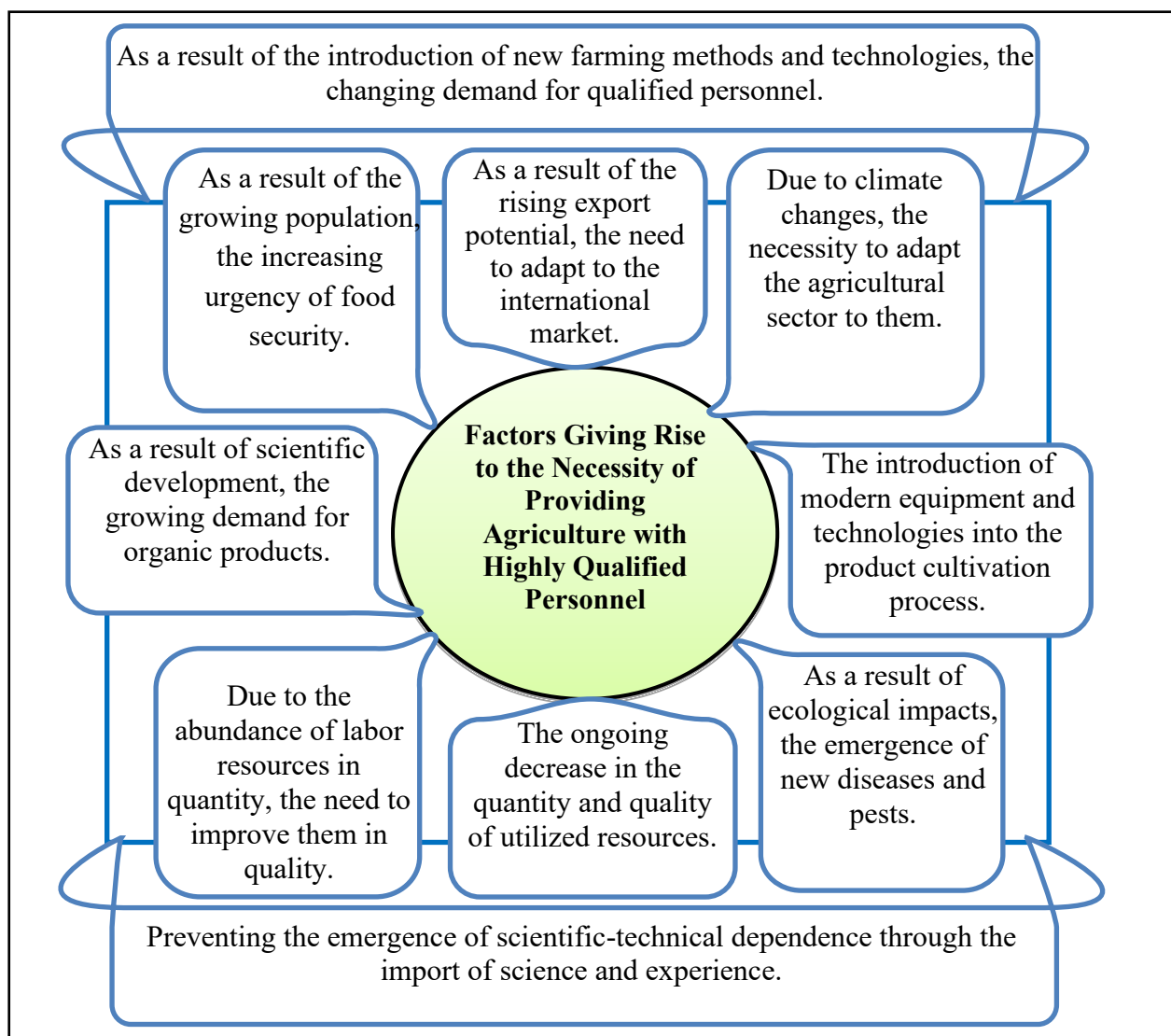
The main difference of the concept of "cadres" from the concept of "labor resources" is that cadres directly participate in production and service provision processes, are considered full-fledged members of that team based on contractual relations between the worker and the employer, and in turn, obey the established rules and regulations in the given enterprise. In terms of content and essence, "cadres' potential" expresses the composition of cadres who are directly engaged in labor activity in economic sectors and enterprises, possess special knowledge

¹⁰ Wikipedia open encyclopedia. <https://uz.wikipedia.org/wiki/Kadrlar>

and skills, and have undergone professional training at certain intervals. In general, cadres should not be understood as factors or resources; after all, cadres are the main force that drives economic processes, resolves them, and also ensures the transition to a market economy. In particular, according to the "Classifier of Main Positions of Employees and Professions of Workers," specialists of farmer households are included in the category of employees, while engineer-mechanics, agronomists, zootechnicians, veterinarians, accountants, economists, and other specialists permanently working in farmer households are included in the category of cadres. Physical persons performing basic agro-technological processes (tractor drivers, drivers, irrigators, shepherds, milkers, auxiliary workers, and others) are considered agricultural workers¹¹.

The practice of human society's development also shows that human capabilities have a decisive importance in achieving any goal. Therefore, forming cadres' potential and organizing its rational management deserve special attention, playing an important role in finding positive solutions to a wide range of issues, ensuring the synergetic effect of using cadres' potential, and their internal and external motivation. In recent times, in the conditions of frequently occurring extraordinary various technogenic events, pandemics, and other unexpected situations, the necessity of effectively using internal capabilities, natural resources, and the knowledge and skills of scientifically potential cadres is becoming urgent, and this requires taking into account the following circumstances (Figure 1.1).

¹¹ Regulation on Regulating Labor Relations in Farmer Households and Determining the Minimum Norms for the Number of Employees and Wage Fund, Paragraph 3



1.1-rasm. Factors Giving Rise to the Necessity of Providing Agriculture with Highly Qualified Personnel ¹²

At the same time, there are also several factors influencing the preparation of qualified specialists and highly educated personnel for agriculture. By studying these factors, it becomes possible to approach the problems in the field not merely based on their current state, but by investigating their root essence. In particular, it requires studying the factors affecting the education system by dividing them into groups such as organizational, economic, social, and legal factors (Figure 1.2).

¹² Compiled by the author

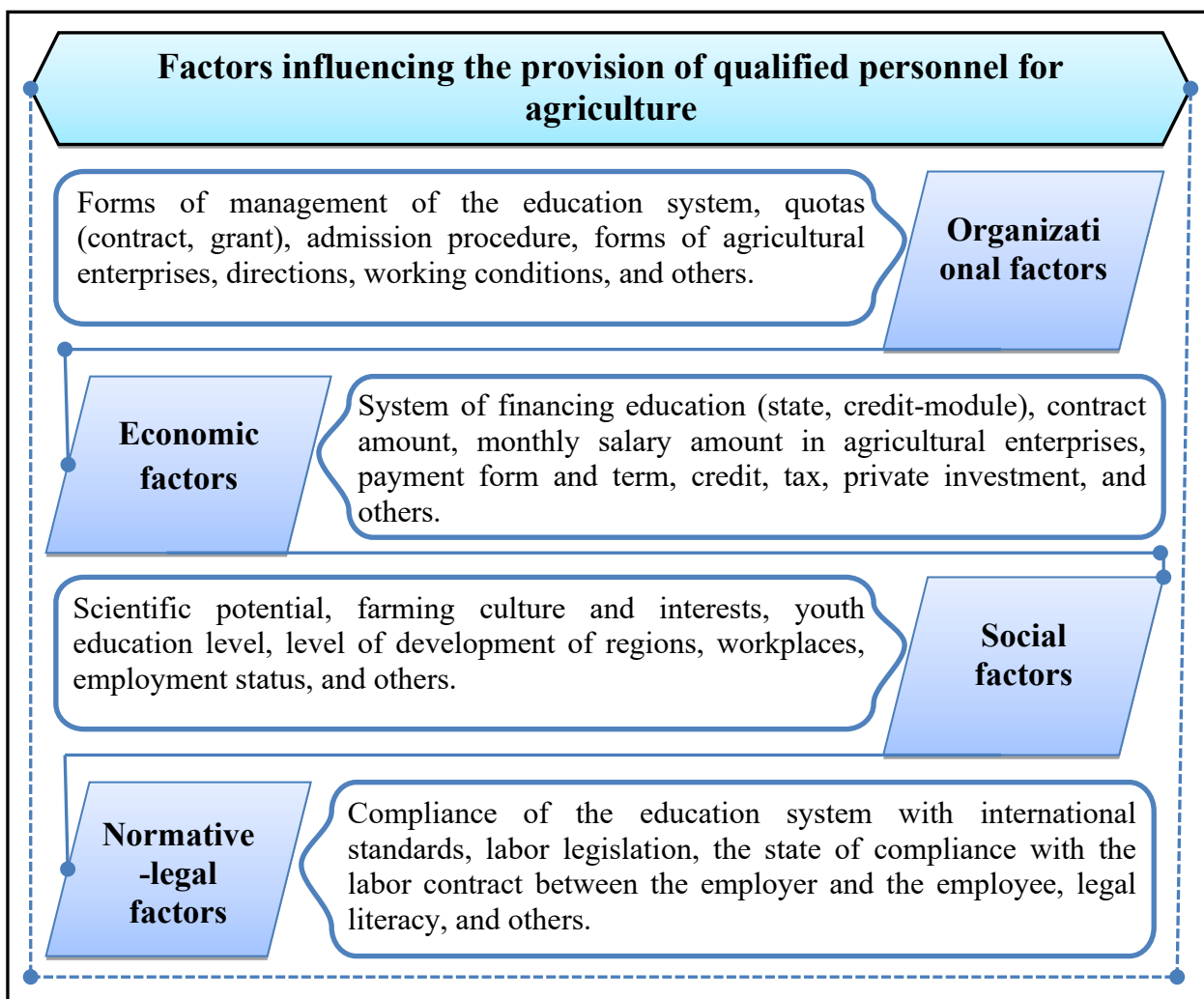


Figure 1.2. Factors influencing the provision of agriculture with qualified personnel

From the first years of independence, a number of regulatory legal acts of our state were adopted to reform the personnel training system based on the requirements of international standards. In particular, the adoption of the Law of the Republic of Uzbekistan "On Education" in 1992 and the "National Program for Personnel Training" in 1997 laid the legal foundation for this. According to it, the stages of personnel training are divided into such stages as preschool education, general secondary education, secondary specialized, vocational education, higher and postgraduate education, advanced training and retraining of personnel, and extracurricular education (Fig. 1.3).

According to this, the first stage, covering the years 1991-2005, can be characterized as the stage of creating the organizational and legal framework for this system. At this stage, the system comprised institutions that trained qualified personnel, such as agricultural technical schools, vocational colleges, higher education institutions, research institutes, and professional development centers, which were distinguished by differences in their educational formats, admission procedures, and program durations.

In the second stage, which spanned from 2015 to 2022, the procedures within the system for training qualified personnel changed slightly. Specifically, a 3-year education in colleges became mandatory. The interview-based admission process for higher education institutions was abolished and made more stringent, while part-time and evening forms of education were discontinued.

In the third stage, that is, starting from 2024, a new era began in the system of training personnel for agriculture. At this stage, admission to higher education institutions is organized on the basis of tests and interviews. The duration of study in bachelor's degree programs is 4 years. For graduates of higher schools and technical colleges, a 3-year junior bachelor's stage has been introduced, with admission to the second year based on an interview.

Stage	Form of Educational Institution	Duration of Study	Form of Study	Specific Features
1 1991-2005 years. Stage of creating the organizational-legal basis.	Agricultural technical colleges	3 years	Full-time, evening	Entrance exams were organized in written and oral forms, education in technical schools and colleges was on a voluntary basis, and full-time, evening, and correspondence education
	Agricultural colleges	3 years	Full-time, evening	
	Higher education institutions	5 years 4+2 years	Full-time, evening,	
	Research institutes	3 years	Full-time	
	Skills upgrading centers	3 months	Full-time	
2 2005-2019 years. Stage of improving the cadre training system.	Agricultural colleges	3 years	Full-time	Admission based on test results, education in colleges was voluntary-compulsory and only in full-time form.
	Higher education institutions	4+2 years	Full-time	
	Research institutes	3 years	Full-time	
	Skills upgrading centers	2 months	Full-time	
3 From 2019 to the present. Stage of professional education in cadre training.	Agricultural technical colleges	2 years	Full-time, extramural	Admission based on test and interview, study duration of 3 and 4 years, full-time, correspondence, and joint education forms are available, and cadres are being prepared under special conditions for production and scientific
	Agricultural colleges	3 years	Full-time	
	Higher education institutions	4+2(1) years 3+2(1) years	Full-time, evening,	
	Research institutes	3 years	Full-time	
	Skills upgrading centers	1 months	Full-time	
	Higher schools	2 years	Full-time	

1.3-rasm. Stages of development of the system for training qualified personnel for agriculture in our country¹³

It should be noted that in this stage the introduction of full-time and extramural (correspondence) forms of study, as well as joint education programs, has created new opportunities for students. In the master's degree stage, graduates oriented toward production are trained in a one-

¹³ Compiled on the basis of the author's research

year format, while those wishing to continue scientific research are trained in a two-year format. Another important aspect of this stage is the introduction of the professional education system. In order to align education with international standards, primary, secondary, and secondary specialized professional education systems have been implemented.

Overall, the system of training personnel for agriculture is organizationally and economically more complex than the personnel training systems of other sectors and therefore differs fundamentally from them. In world practice, it constantly requires state support. In this regard, significant work has been carried out in our country in recent years to develop the sector, and targeted legal and regulatory documents have been adopted. In particular, the following resolutions of the President of the Republic of Uzbekistan were adopted:

Resolution No. PQ-3704 of 8 May 2018 “On measures to radically improve the system of training highly qualified personnel with higher education at Tashkent State Agrarian University”;

Resolution No. PQ-3703 of 8 May 2018 “On the establishment of the Samarkand Institute of Veterinary Medicine”;

Resolution No. PQ-4795 of 30 July 2020 “On additional measures to further improve the agrarian education system”¹⁴.

Thanks to the structural, organizational, and economic reforms carried out, qualified personnel needed for agriculture are currently trained in secondary specialized vocational colleges and lyceums, technical colleges, and higher education institutions, while scientific personnel are trained in the forms of basic doctoral studies, trainee researcher, and independent researcher after higher education. Today, in the higher education system there is 1 university and 4 institutes specialized in training personnel for agriculture, with 6 branches operating in the regions (Figure 1.4).

¹⁴ www.lex.uz – National database of legal documents of the Republic of Uzbekistan

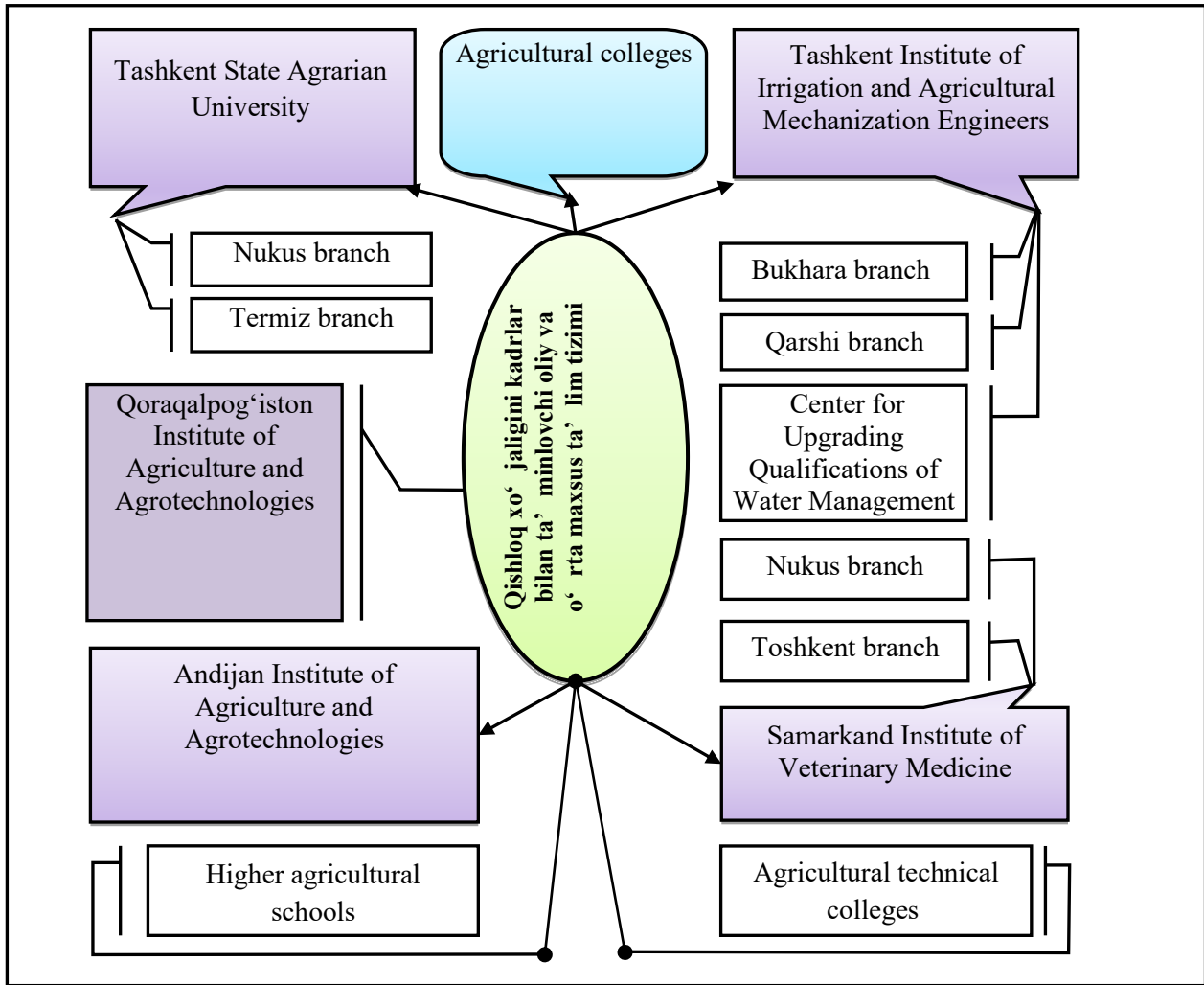


Figure 1.4. Higher and secondary specialized educational institutions providing personnel for agriculture¹⁵

In providing agriculture with scientific personnel, the branch research institutes (RIs) and the National Center for Knowledge and Innovations in Agriculture, which coordinates their activities and scientific results, play a special role. To date, numerous innovative developments have been created and introduced into practice in the institutes that are part of the Center. Currently, the National Center includes 9 research institutes and 44 experimental stations (Figure 1.5).

¹⁵ Compiled by the author

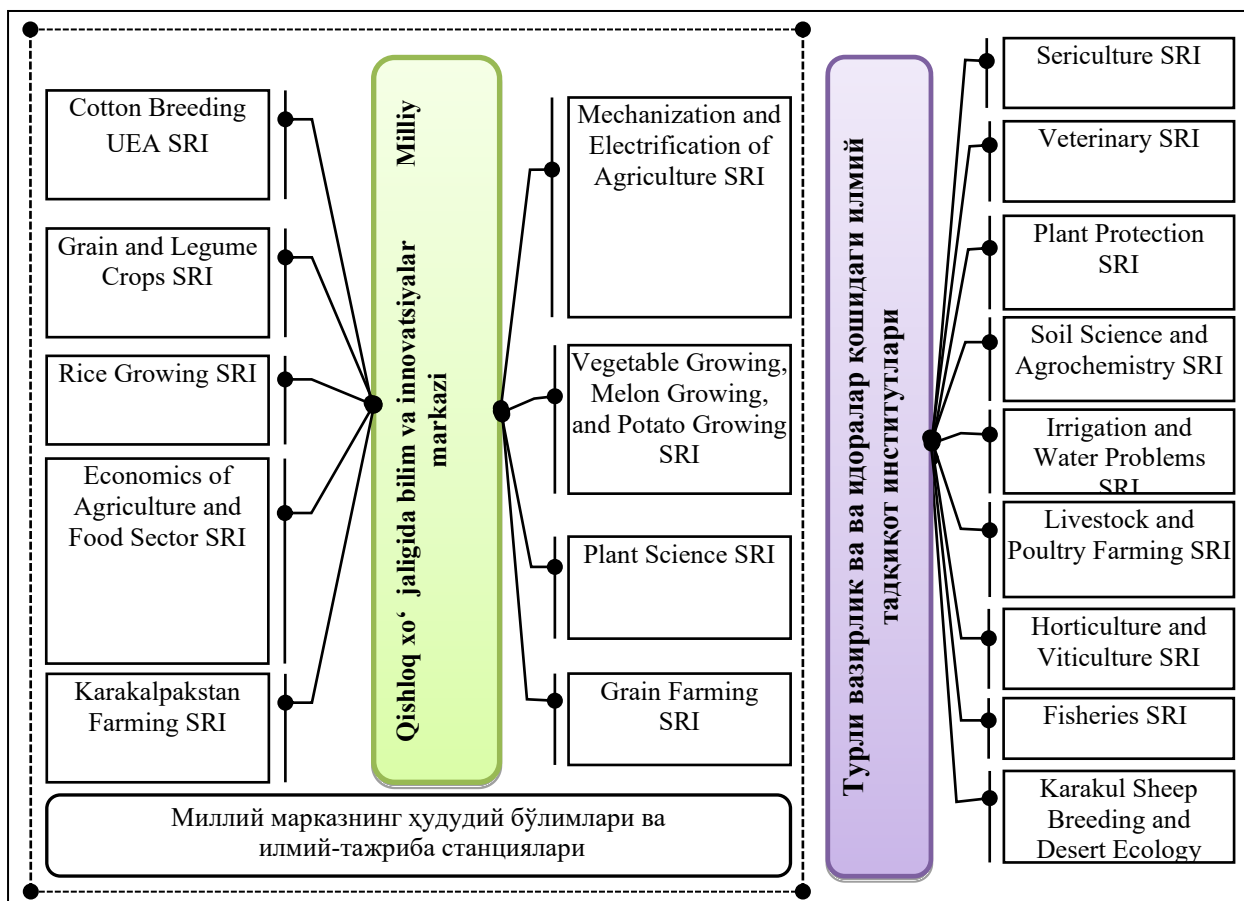


Figure 1.5. Research institutions training scientific personnel with high potential for agriculture¹⁶

Along with this, the establishment of effective cooperation between scientists and direct agricultural producers, the provision of mutual consultations and recommendations throughout the season, and the organization of professional development trainings have ensured the integration of science and practice. As a result, a solid foundation has been created for the development of agricultural science and for organizing a system of training qualified personnel for the sector in full accordance with international standards. If we express the National Center’s capacity in the system of training scientifically competent personnel in numerical terms, the total number of employees currently stands at 2,685, of whom 820 (30.5%) are scientific staff. Among them are 7 academicians, 14 corresponding members, 98 Doctors of Science,

¹⁶ Compiled by the author

280 Doctors of Philosophy, and 421 employees without scientific titles. In addition, research institutes operating within various ministries and agencies related to the sector are also effectively contributing to the provision of agriculture with qualified scientific personnel.

1.2. Scientific and Methodological Foundations for Determining Demand for Qualified Personnel in Agriculture and Assessing the Efficiency of Their Activities

The country's transition to market relations has also brought about fundamental changes in the requirements for personnel — particularly for qualified specialists in agriculture — as well as in their training and the effective utilization of their practical activities. The deepening integration of Uzbekistan's national economy into the global economic system and the intensifying processes of economic globalization require a completely new mindset and modern approaches from all employees and managerial specialists working at every level of agricultural management.

For enterprises and entrepreneurs, the ability to forecast changes in market conditions, accurately identify their place in the market, and focus not on immediate profit but on long-term sustainable development has become critically important. Practice has clearly demonstrated that organizing the supply of qualified personnel and specialists based on these and similar tasks significantly expands the possibilities for farms to manage their production processes effectively. Therefore, it is now a pressing issue for every agricultural enterprise to plan and properly organize its personnel needs based on the types of products it produces, its capabilities, and its economic potential.

During the transition period and in subsequent stages in our country, agricultural enterprises paid insufficient attention to placing orders for personnel and to personnel planning. This neglect gave rise to a number of problems. In recent years, however, substantial work has been carried out in this area. In solving personnel-related issues in the agrarian sector,

emphasis has shifted toward quality criteria, with particular attention now being given to the training of highly qualified specialists in narrow, specialized fields.

A market economy based on healthy competition clearly demonstrates that, in order to ensure the sustainability of their operations, producers and service providers must plan not only technical and technological modernization but also the systematic improvement of their personnel structure and the continuous upgrading of staff qualifications.

A number of scientific studies and economic publications¹⁷ have presented methods for determining and planning personnel demand in agriculture, as well as for accurately assessing both the future development potential of employees working in the sector and their contribution to raising production efficiency. These works offer methodological recommendations on the use of various approaches in the quantitative and qualitative planning of personnel, including normative methods, staff-unit planning, balance methods, mathematical modeling, constructive calculations, comparative analysis, and expert evaluation.

For instance, the normative method is based on the current status of staff positions, their occupancy rates, and the assessment of existing personnel needs, using labor expenditure required to perform the necessary volume of work within the time frames stipulated by labor legislation as the primary criterion. The staff-unit method relies on assigning specific tasks to specialists and determining the corresponding number of staff positions. The balance method, in turn, reflects the possibilities of meeting the demand for qualified personnel by filling higher-education staff units as well as positions for mid-level specialists with appropriate experience.

However, every country requires its own specific methodological approaches to determining personnel demand in agriculture, taking into

¹⁷D.V. Parshukov, "Forecasting the state of the labor market in the agriculture of the Krasnoyarsk Territory", Epoch of Science No. 8, 2016, p. 60; V.G. Gusakov, N.A. Starovoitova, "Formation of incomes of agricultural workers", Publishing House "Belarusian Science", 2009, 179 p.

account the current level of agricultural development, farming culture, management system, range of cultivated products, and overall economic potential. This is because the training of qualified specialists for agriculture and the staffing of production according to their specializations possess a number of distinctive features that demand careful consideration of sector-specific conditions. In particular, the territorial distribution and volume of labor resources vary significantly across regions, as does their quality. For example, agriculture currently experiences surplus employment, the bulk of which consists of low-skilled labor.

In most developed countries, the share of employment in agriculture does not exceed 3–6 percent. In particular, this indicator stands at 2.6 percent in Australia, 4.0 percent in Spain, 1.5 percent in Canada, 1.3 percent in the United States, 2.6 percent in France, and 4.8 percent in South Korea, while the level of qualification of their agricultural workforce is considerably higher¹⁸.

It is well known that the level of employment in the sector is directly influenced by core production indicators in agriculture — particularly the degree of mechanization, the technical equipment of labor, and the efficiency of its utilization. Indirect factors include the income levels of the country's population and the unemployment rate. For example, agricultural employment accounts for 25–26 percent in China and more than 43 percent in India.

Although the level of employment in Uzbekistan's agriculture is steadily declining, it nevertheless remains relatively high.

It should be noted that the ratio of unskilled to skilled labor in agriculture, the increasing scale and complexity of production, the use of high-yield crop varieties and advanced technical equipment, the expansion of intensive horticulture, smart-technology-based greenhouses, livestock farms, product storage facilities, and the growing

¹⁸Source: G20 countries: Share of employment in agriculture. https://www.economicdata.ru/economics.php?menu=macroeconomics&data_type=economics&data_ticker=AgricultureEmploy

share of high-productivity pedigree livestock all generate a correspondingly greater need for qualified personnel. At the same time, the current situation requires the introduction of intensive, resource-saving technologies in agricultural sectors, higher crop yields and livestock productivity, and an elevated level of mechanization of production processes. These measures will create opportunities to redirect surplus labor currently engaged in agriculture to other sectors of the economy — a clear demand of the modern era. From this perspective, within the framework of labor relations in agriculture, it is essential to take into account the quantitative and qualitative indicators related to the following three directions, along with their interrelationships (see Figure 1.6). In particular:

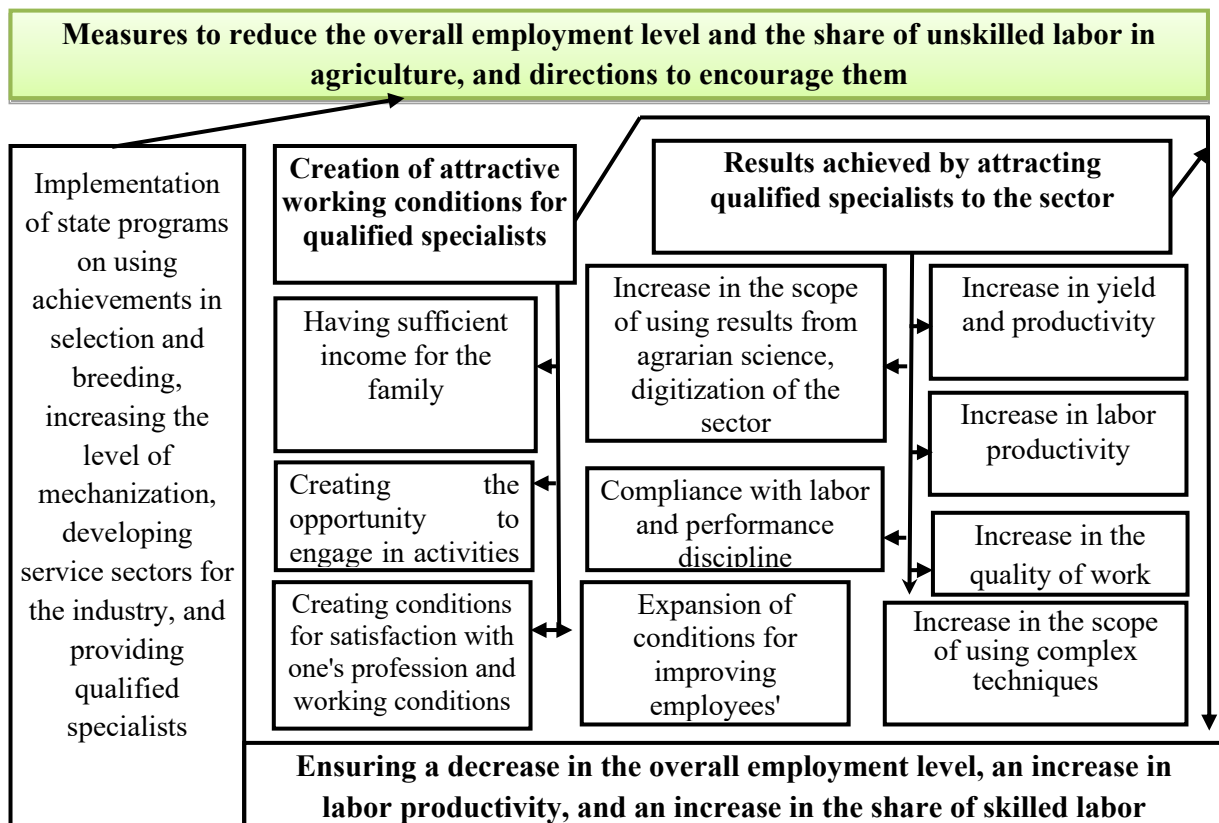


Figure 1.6. Measures to Reduce Overall Employment and Unskilled Labor in Agriculture and Directions to Encourage Them

- Optimization of employment in agriculture based on intensive factors and digital technologies, development of production,

diversification, and other measures to reduce the level of employment and the share of unskilled labor;

- Increasing the share of skilled labor by improving the material interest of employees involved in the production process of agricultural products (mainly through salary amounts) and enhancing working and rest conditions for employees;

- Providing qualified specialists to the fields of agricultural product production, product processing, and service provision, etc.

It should be emphasized that the level of provision of qualified specialists in the sector is also influenced by the seasonal characteristics of product production and labor in agriculture, resulting in uneven employment throughout the year not only for working employees but also for qualified cadres. The manifestation of seasonality in labor force utilization is explained by the disproportionality between production time and the work period. In addition, existing shortcomings such as the shortage of technical equipment, the level of mechanization of agrotechnical measures and the use of innovative technologies, low income of farmers, and insufficient opportunities to purchase modern equipment also negatively affect the overall employment level in the sector.

Taking into account the above and other negative situations, the current demand for necessary qualified specialists and workers in agriculture is determined based on the Regulation "On the Procedure for Regulating Labor Relations in Farms and Determining the Minimum Norms for the Number of Employees and the Wage Fund," approved by the joint decision of the Ministry of Agriculture and Water Resources and the Ministry of Labor of the Republic of Uzbekistan dated August 1, 2016, in accordance with the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 311 dated November 3, 2015, "On Measures to Further Improve the Provision of Highly Educated and Highly Qualified Cadres to the Agriculture and Water Management Sectors."

According to it, for crop production, land area is taken as the basis, and for livestock production, the conditional number of livestock heads is considered, calculated using the following formula (1).

$$MMu = O'm(Chbs) * Mk1 + O'm(Chbs) * Mk2 ++ O'm(Chbs) * Mkn \quad (1)^{19}$$

Here, O'm - the land area used for the production of crop products, hectares; Chbs - the conditional livestock head count; Mk1-n - the established normative number of specialists for each position in accordance with the norms, persons.

However, the number of qualified specialists and the amount of unskilled, seasonal workers determined based on these norms do not take into account factors such as labor intensity, the level of use of high-productivity equipment, high-yielding livestock breeds, or the development of intensive horticulture. At the same time, it should be emphasized that the sharp increase in labor productivity in agriculture due to the use of digital technologies and agricultural equipment that performs several combined operations at once also leads to changes in the normative need for labor force in agriculture. In addition, the breeding of livestock and poultry species based on advanced technologies in livestock sectors, the increase in the scope of artificial insemination, the expansion of intensive orchard areas, and the introduction of technologies such as drip and sprinkler irrigation will cause changes in the composition and share of qualified specialists. Therefore, it will be necessary to use adjustment coefficients to calculate the norms for the number of highly qualified and unskilled employees required for the agricultural sector, and in this regard, the factor-based approach presented in Figure 1.3.1 is recommended.

Thus, within the framework of the recommended factor methodological approach:

¹⁹ Regulation on the procedure for regulating labor relations in farms and determining the minimum norms for the number of employees and the wage fund, paragraph 6

a) The existing norms for the number of qualified and unskilled employees in agriculture are taken as the basis;

b) It is taken into account that the share of unskilled employees' labor in the total composition of employees in agriculture should decrease;

c) Factors influencing the growth of labor productivity in agricultural sectors are taken into account, including:

- Increase in labor productivity due to the appearance of high-productivity equipment in the composition of agricultural technical tools;
- Increase in labor productivity due to the introduction of digital technologies and technical tools;
- Increase in labor productivity due to intensive and labor-saving technologies (drip irrigation areas, intensive orchards, smart farms, smart greenhouses, etc.);

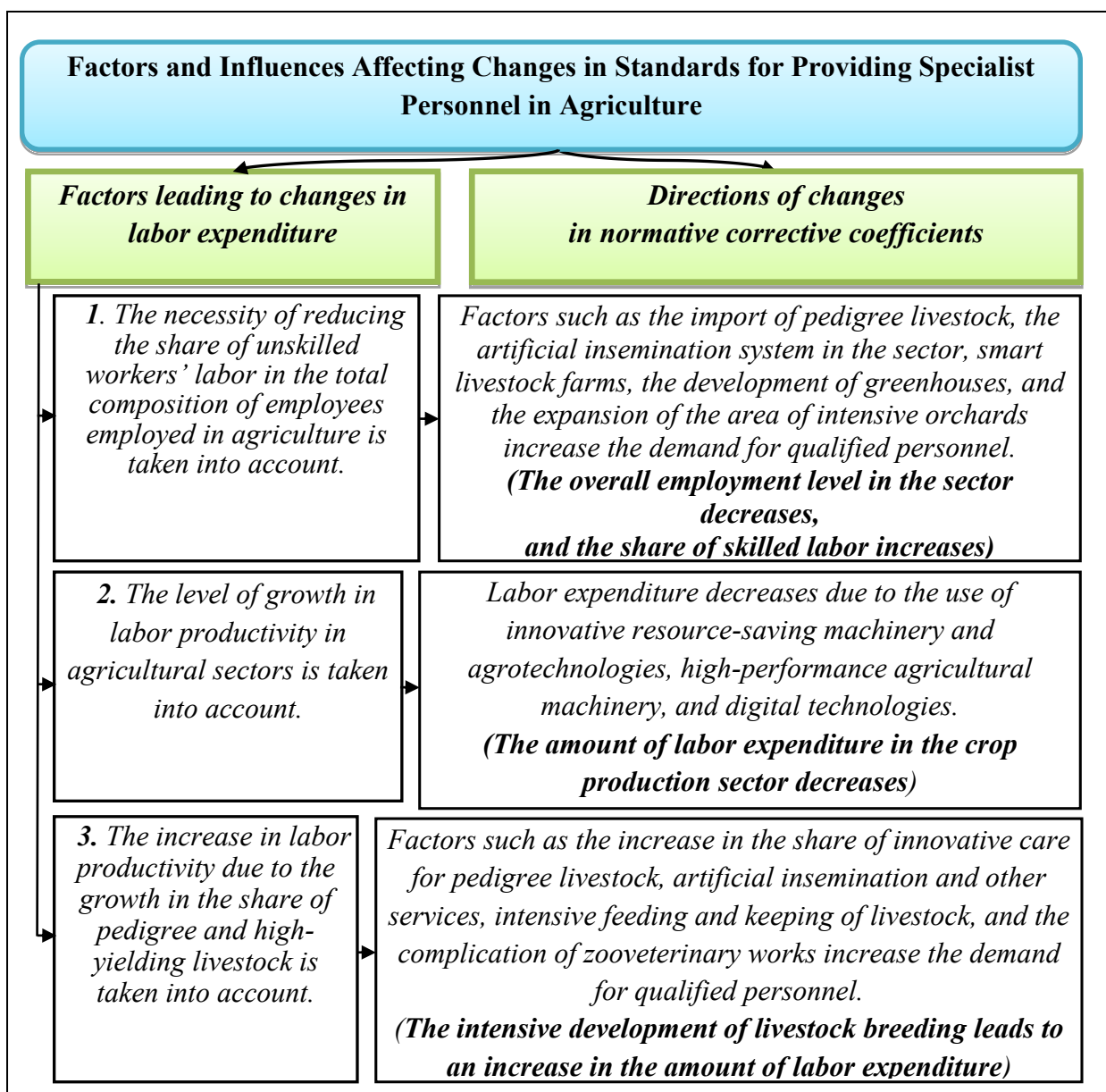


Figure 1.3.1. Methodological approach to the factors and influences affecting changes in the standards for the supply of specialist personnel in agriculture ²⁰

g) increase in labor productivity due to a higher share of pedigree and high-yielding livestock, and so on.

In summary, the adjustment coefficients for the average number of qualified specialists required in the agricultural sub-sectors are calculated

²⁰Source: Developed on the basis of the author's research.

separately for crop production and livestock farming. Therefore, based on the recommended methodological approach, the following formula is proposed for determining the adjustment coefficients (UTK) for the standards governing the required number of qualified specialists and workers in the agricultural sub-sectors (crop production and livestock farming):

$$Y_{TK} = (MM_y \times YBT_K) + (MC_y \times YBC_K) \quad (2)$$

where:

MMU – number of qualified specialists required in the crop production sub-sector according to existing norms, persons;

MSU – number of unskilled workers required in the crop production sub-sector according to existing norms, persons;

UBTK and UBSK – adjustment coefficients applied respectively to the standards for the required number of qualified and unskilled personnel in the crop production sub-sector.

When determining the adjustment coefficients, separate calculations are performed for the normative numbers of qualified specialists (higher education) and unskilled workers within the relevant economic entities, taking into account changes in labor productivity in the crop production and livestock farming sub-sectors.

Specifically, to calculate the adjustment coefficient (UBTK) for the demand for qualified and unskilled specialists in the crop production sub-sector of agricultural enterprises, the following formula may be used:

$$YBT_K = \frac{MMM_{(2016)}}{MMM_{(TTT)}} \quad (3)$$

where:

MMM(2016) – volume of crop production output per qualified specialist in an agricultural enterprise in the base year 2016 (kg). Relevant indicators for each type of product must be taken into account.

MMM(ttt) – average volume of crop production output per qualified specialist in an agricultural enterprise over recent years (3–5 years of data is recommended) (kg). Relevant indicators for each type of product must also be taken into account.

The application of the above methodological approach in the livestock farming sub-sector has some differences. This is because the growth in labor productivity in livestock farming is determined not only by the introduction of technological equipment, but also by the increased use of pedigree livestock relative to local (non-pedigree) animals. Pedigree livestock requires more skilled and less unskilled labor compared with local breeds. In addition, imported pedigree animals are more susceptible to diseases, less resistant to parasites, and subject to other objective factors during their adaptation period to local conditions; therefore, they require greater involvement and closer supervision by qualified specialists. For these reasons, the normative number of qualified and unskilled specialists for livestock enterprises (ChBTK) is determined using the following formula:

$$\text{ЧБТ}_K = \frac{\text{MMM}_{(2016)}}{\text{MMM}_{(ttt)}} \div 1,5 \quad (4)$$

Here, the coefficient of 1.5 has been established by experts based on many years of practical testing. It reflects the growth rate of labor productivity resulting from the use of pedigree high-yielding livestock in the activities of an agricultural enterprise. In practice, this coefficient changes in line with the increase or decrease in the share of pedigree livestock within the herd.

1.3. Experiences of developed countries in the innovative organization of training and supply of qualified personnel in agriculture and possibilities for their application in our country

Research shows that the system for training higher-education

specialists for various sectors of the economy in developed foreign countries has been formed in a distinctive manner, with structural differences from one country to another. In some states a one- or two-tier education system has been established, while in others it takes a three- or four-tier form. For example, in a four-tier system, graduates are divided into junior specialists and specialists (incomplete higher education), bachelors (basic higher education), masters or highly qualified specialists (full higher education), and doctors of science (academic degree). A three-tier system is accepted in many countries and divides personnel into bachelors, masters, and persons with academic degrees. Applicants for higher education may study full-time, part-time, evening, or extramural modes. The duration of study ranges from four to nine years, depending on the personnel training system and the specific specialization.

Training qualified personnel for the economy is a pressing task for every country. It enables citizens to acquire high skills and experience for the local and international labor markets, creates a foundation for the development of the economy and business entities, and serves other socio-economic objectives. In today's environment of global economic integration, the personnel training system also demands inter-state cooperation, coordination, and the introduction of international standards. Therefore, it is essential to study the experience gained in individual countries, implement their positive aspects in practice, and ensure competitiveness in the labor market by training personnel in line with the standards of developed nations. Accordingly, our research has examined the experience and results achieved by a number of countries that have attained relatively high outcomes in training qualified personnel for agriculture, and has assessed the possibilities of applying certain aspects of their practices in our national context.

In particular, Belarus places special emphasis on ensuring the sustainable development of agriculture and food security. The sector accounts for an average of 7.5 % of the country's gross domestic product. In recent years, particular attention has been given to

modernizing the sector and attracting personnel with up-to-date knowledge. Currently, there are 54,500 managers and specialist personnel working in Belarusian agriculture, covering 94.5 % of demand; consequently, an additional 3,600 specialists (5.5 %) are still required. At the same time, an average of 8,000 personnel (14 %) leave the sector each year. The main reasons cited are the complexity and multi-functionality of agricultural work, irregular working hours, and, in most cases, relatively low wages. Of the personnel currently employed in the sector, 45.5 % hold higher education qualifications, and 26 % of them are of retirement age.

Today, Belarus has 4 higher education institutions and 28 colleges that train qualified personnel for the agricultural sector. Each year they produce approximately 2,000 graduates with higher education and 3,300 with secondary specialized education. The scientific potential in the sector's higher education institutions is relatively high: 1,590 professors and lecturers are currently working, of whom 94 are doctors of science and 725 are candidates of science. This gives a scientific potential of 52.7 % (20 % of whom are over 60 years of age). For comparison, the national average is 46 %, while the figure for institutions under the Ministry of Higher Education is 47 % and for those under the Ministry of Health is 52 %.²¹

Analysis of the scientific potential of agricultural higher education institutions in Belarus by institution shows that the higher education institution with the highest scientific potential (59.3 %) is the Vitebsk State Academy of Veterinary Medicine. Of the total 320 professors and lecturers working there, 27 hold the degree of Doctor of Science and 169 hold the degree of Candidate of Science (Table 1.1).

Table 1.1

²¹ 12 бет (42 бет ЖБ олиш керак)

Scientific potential of higher education institutions in Belarus's agricultural sector²²

Higher education institution	Total number of professors and lecturers, persons	Of which, persons		Scientific potential, %
		Doctor of Science	Candidate of Science	
Belarus State Agricultural Academy	529	28	239	50,4
Belarus State Agrarian-Technical University	429	31	186	50,5
Vitebsk State Academy of Veterinary Medicine	320	27	169	59,3
Grodno State Agrarian University	324	17	148	50,9
Total	1612	103	742	52,7

In Belarus, the scientific potential of higher education institutions is assessed on the basis of their material and technical base, the activities of the research institutes they contain, the work of scientific and innovation centres, and the level of commercialization of scientific projects. Currently, the four agricultural higher education institutions operating in the country include a total of 2 research institutes, 30 research laboratories, 9 scientific centres, and 5 scientific innovation structures (Table 1.2).

Support for these structures and their sustainable development places primary emphasis on attracting young people to science and on the level of commercialization of the scientific developments that have been created. In this regard, it should be noted that the Belarus State Agrarian-Technical University has achieved the highest indicators.

In conclusion, the following directions can be listed as the main achievements in the system of training qualified specialists for the agricultural sector in Belarus. In particular:

Table 1.2

Scientific structures within higher education institutions training qualified specialists for the agricultural sector in Belarus²³

²² S.A. TARASENKO "Cooperation and priority areas of scientific and innovative activities of educational institutions and scientific organisations of Russia and Belarus". Proceedings of the International Scientific-Practical Conference. Gorki, BSAA, 2018, 57 pp.

Structures	Belarus State Agricultural Academy	Belarus State Agrarian-Technical University	Viteb State Academy of Veterinary Medicine	Grodno State Agrarian University	Total
Research institutes	0	1	1	0	2
Research laboratories	4	14	9	3	30
Scientific centres	5	0	0	4	9
Innovation structures	1	1	1	2	5

- the main institutions training specialists for the sector are organized in the form of academies;

- the establishment of research institutes, laboratories and scientific centres within higher education institutions;

- coordination with Russian educational standards, which have a relatively large labour market, in order to ensure the competitiveness of the trained specialists in the labour market;

- the wide involvement of students in scientific-research processes and their material stimulation;

- attention paid to the commercialization of created innovative products and to ensuring both the scientific and material interests of young people by involving students in these studies.

The main distinctive feature of the US experience in this process is that, along with state institutions, i.e. higher education universities operating under the direct assistance and control of the state, private universities and higher education institutions also function, which in turn creates a high level of competition in the personnel training system. In the USA, obtaining higher education is mainly on a contractual payment basis, and the education and personnel training system is considered one of the most prestigious in the world. There are more than 3,000 higher education institutions of various directions in the USA, and personnel training for agriculture is organized in a multi-directional manner. This

²³ S.A. TARASENKO "Cooperation and priority areas of scientific and innovative activities of educational institutions and scientific organisations of Russia and Belarus". Proceedings of the International Scientific-Practical Conference. Gorki, BSAA, 2018, p. 58.

includes the agricultural education system, which mainly consists of training farmers, improving their qualifications, training specialists for farm enterprises, as well as training specialists in a wide range of specializations for interrelated sectors involved in the storage, processing and sale of grown agricultural products. The majority of farmers, more than half, have secondary specialized education, while one-fourth are higher-educated (mainly owners of large farm enterprises) farmers. The demand for specialists in agricultural sectors is estimated at an average of 50,000 people across the country, and taking this need into account, US agricultural higher education institutions train 32–34 thousand qualified specialists per year..

Personnel training for agriculture in state-owned higher education institutions of the USA began in 1862, when the Morrill Act was adopted by Congress, according to which more than 5.3 million hectares of federal central government-owned land were transferred to the states. Agricultural colleges were established using the income from the use of these lands²⁴. In those times, these colleges were called land-grant colleges; in particular, in 17 states these colleges were established on the basis of universities, while in the remaining cases they were established as separate agricultural or technical colleges, and in some cases as combined agricultural and mechanization colleges. At present, typical universities have emerged as a result of the merger of several colleges.

Due to the increased role of universities and colleges formed on “land-grant” lands in training personnel for agriculture and solving scientific-technical problems, special laws related to the sector were adopted in 1887 and 1914. According to the law adopted in 1887, it became mandatory to establish experimental stations within agricultural colleges in each state that are specialized in testing and placing agricultural crops. They were granted the authority to test and approve the developments obtained in the research process at the colleges. The obligation to monitor these experiments and widely introduce their

²⁴ The Development of American Agriculture. A Historical Analysis. Washington. 1999, p. 241–242

results was assigned to the US Department of Agriculture. The scientific research conducted in colleges and their experimental stations is directed at solving territorial, national and international-level problems at the expense of funds allocated by the states.

The “Land-Grant” Act adopted in 1914 laid the foundation for the formation of federal programmes financing the promotion among farmers and the population of new methods and scientific-practical recommendations developed in colleges and universities. Within their framework, the control over the fulfilment of tasks for promoting and applying innovative products and solutions in animal husbandry and crop production, as well as agro-technical-technological methods, is assigned to the Department of Agriculture. It is noteworthy that all scientific-research and experimental work is carried out in cooperation with college teachers and students, which has solved the issue of fully linking the practical training of students receiving education in the agricultural sector.

To implement these services, at the state level a director is elected from among the professors and lecturers of the colleges; he/she operates on the principle of dual subordination, simultaneously performing the duties of college director and directly subordinating to the US Department of Agriculture within the scope of his/her powers. According to this system, existing problems in the states are analysed at the level of a commission established under the Department of Agriculture, and on the basis of the commission’s decision the future scientific-research directions to be implemented by the experimental stations are determined in the next stage. In addition, an extension service has been established with the participation of colleges for the dissemination of new knowledge and skills related to agricultural production, which to this day continues to be of great importance in the development of US agriculture and in the introduction of achieved scientific and technical achievements into production. It is noteworthy that more than 5,500 university and college professors and lecturers are currently involved in this service. Another noteworthy aspect is that

nearly 70% of the bachelors currently being trained and 9 out of 10 doctors of science have received their education at colleges and universities based on “Land-Grant”. In addition, since the 1980s of the last century, special courses and programmes specialized in improving the qualifications of specialists have been established at universities and colleges.

At the same time, it should be noted that higher education institutions with “land-grant” status constitute only part of American higher education and they can be divided into 4 main groups²⁵.

The first group can include the 16 agricultural colleges and universities established in 1890 under the Morrill Act for the education of the black population on “Land-Grant” lands.

The second group consists of agricultural colleges and universities financed by the states, which provide bachelor’s degrees on the basis of 4-year programmes in the field of agricultural sciences. Some of them have preparatory courses on a 2-year programme, while others award master’s and doctoral degrees in agricultural sciences.

The third group consists of private agricultural higher education institutions. The teaching programmes there are designed for 4 years, and in some cases education is also provided on the basis of 1–2-year programmes.

The fourth and largest group is mainly composed of 2-year colleges, which are financed by the relevant local funds and provide specialization in household management and agriculture over 2 years.

The experience of Germany in personnel training is also noteworthy. Because in this country the system of training professionally qualified personnel for agriculture is carried out in accordance with the educational directions of production-technical educational institutions, taking into account the functions of industrial and agricultural

²⁵ L. Lasy W.B. Science. Agriculture and Politics jf Research. Boulder. Colorado, 1997. p49-97 . ser L.E. Providing experimental education for crop-science students.-J.of Agronomic education, 1998,v. 12.p.73-74

organizations. Such a personnel training system covers almost 60% of the economically active population. Personnel training for the management system is carried out in dozens of German universities and special higher schools that have faculties in the agricultural direction. An important feature of the personnel training system for agriculture is that entry to the sector's higher education institution first requires completion of production practice, the duration of which can range from 1.5 months to 12 months.

The system for training higher-educated personnel for agriculture is set at 4–5 years. The period of study consists of two stages: initial and main. During the first two-year stage with four semesters, students study natural and mathematical sciences (biology, chemistry, ecology, physics, statistics). In the second stage, the basics of agricultural production, crop culture, agricultural machinery, economic and social sciences are taught. During the second stage of education, students choose a specialization direction based on their abilities and interests. In universities and special higher schools, along with the basics of agriculture, animal husbandry, plant science and land use, agroecology, education is provided on market economy basics, agro-economics, agro-informatics, quality management, market analysis, marketing and trade basics, management and other subjects.

In general, in Germany, due to factors such as almost complete provision with highly qualified personnel in agricultural sciences and their high professional skills, and the constant introduction of innovative agro-technologies, only 2% of the population is employed in agriculture, and the share of agriculture in gross national product constitutes 1.5%. It is noteworthy that even with this 2% employment, 90% of the country's demand for food products is met through internal capabilities²⁶.

Another successful and noteworthy aspect of the German vocational education system is that the process of ensuring the professional readiness of personnel is carried out organically together

²⁶Popkov A. Agriculture of Germany // Agrarian Economy. – 2006. – L. – p. 5–8.

with the educational institution and the employing organization or enterprise at the same time. In addition, many educational institutions have their own training-production farms equipped with the necessary agricultural machinery, where advanced agro-technologies are tested and applied. The state and business support these farms in the following directions:

- all income from the sale of products of training-experimental farms is used for the development of the educational institution;
- training-experimental farms pay only a preferential value-added tax (7% for food products), while other similar enterprises are taxed at a 50% rate;
- the state allocates long-term interest-free loans for the development of training-experimental farms;
- the state provides a subsidy of 1,840 euros per hectare for growing agricultural products to these farms;
- new machinery is provided to training-experimental farms by factories free of charge for one year, and after one year the machinery park is updated.

In addition, conditions are created for students of educational institutions to undergo internship or practice in one of the agricultural enterprises interested in attracting qualified personnel.

Carrying out professional training on the basis of specific enterprise practice is equally beneficial for both the student receiving education and the production enterprise: the student has a guarantee of employment, while the employer has the opportunity to train the necessary personnel and select the highest-qualified and most knowledgeable ones from among the personnel. Therefore, up to 80% of the students of educational institutions have the opportunity to get a job at the place where they underwent practice. In addition, great attention is paid to the organization of special specialized courses within the system of improving the qualifications and professional retraining of agribusiness personnel in this country.

In general, at present the quality of the creative layer of personnel

and workforce is of extremely urgent importance. Globalization and sharp competition in the world market require personnel to have high qualifications. For example, in the USA highly qualified employees constitute 45% of the total workforce, and in Germany 55%.

In most developed countries, formal advisory organizations are established at agrarian educational institutions for the purpose of training farmers and other household owners through the advisory service system and regularly improving their qualifications and experience. For example, independent consultants and private advisory organizations operating on a commercial basis, as well as various advisory circles in different directions formed by farmers in the form of cooperation, operate, and their advisory programmes are regularly updated from the point of view of providing modern knowledge in subjects such as agribusiness and management, technology and economics. For example, in Germany the main large advisory organizations are the German Farmers Union (NDI) and the German Agricultural Academy. They have established active relations with the Federal (central) Ministry of Agriculture and the Ministries of Agriculture of the Lands (regions in Germany are called German lands), providing them with information-advisory and financial support.

The funds allocated for financing the vocational knowledge system are distributed proportionally among the state, federal government, Lands government and local authorities. The process of vocational training in enterprises is financed by employers, and in turn enterprises receive certain tax benefits for carrying out these activities. In particular, the system of retraining agricultural personnel and improving their professional qualifications is financed from a) state subsidies, b) agricultural enterprises, c) associations and funds, for example, the German Farmers Union.

In conclusion, it is necessary to recognize the following specific achievements of the German education system and the system of retraining personnel and improving their professional qualifications:

1. The field of vocational agrarian education is a multifaceted

system that serves to train qualified specialists with the authority to operate in various specializations and directions for agricultural sectors. This system covers various educational directions, i.e. stages from taking into account young people's aptitude for a particular profession starting from school to training higher-educated personnel and regularly improving their qualifications.

2. It improves the employment of the population by profession, the provision of enterprises with qualified personnel, strengthens the mutual relations between the production and education system, and expands the possibilities for effective use of personnel potential.

3. The system of improving the qualifications and retraining of personnel for the purpose of developing agribusiness is carried out in cooperative, private and state educational institutions as well as advisory centres serving agriculture, and their activities are supported and stimulated by the state.

4. Vocational education is based on the integration of science, education and practice, strengthens mutually beneficial relations between them, and accelerates the introduction of innovative advanced technologies into agriculture. As a result, it creates a basis for the sustainable increase in the economic efficiency of the sector through the production of high-quality and cheap agricultural products, mainly meeting the population's demand for organic food products through internal capabilities, and the application of innovative scientific developments and intensive factors to agriculture.

In our opinion, it is necessary to recognize the special importance of the Japanese experience in training personnel for agriculture and, in general, for economic sectors in the conditions of our republic, because this country also has aspects close to our mentality and traditions. Japan is a country with scarce land resources and specific agriculture, where the possibilities of providing its population with domestic food products amount to 45%, and an average of 1.6 hectares of land per farm (123 times smaller compared to the USA, 12 times smaller than the countries of the European Union).

Japanese agriculture, based on small farm enterprises, does not require training of narrowly specialized specialists, because they use the services of cooperatives they themselves have established. Therefore, emphasis is placed on training broad-coverage specialists specialized in transporting, storing, processing, selling products and providing other services for these cooperatives. Japan is one of the countries with high experience in training highly qualified personnel, including workers with specific professions and engineering-technical personnel. Currently, there are about 500 higher education institutions in Japan, where more than 2 million bachelors study, and in 584 small colleges more than 500 thousand students study for two–three years. Three-fourths of Japan’s higher education institutions are private. There is a policy in Japanese organizations to ensure long-term employment of employees, and based on this more attention is paid to young personnel rather than experienced ones; as a result the “mentor-apprentice” tradition has developed in the country, and professional skills and knowledge can be improved at the workplace itself. Therefore, there is no requirement for in-depth production practice or special training in educational institutions.

It is noteworthy that every year 60–80% of secondary school graduates enter Japanese higher education institutions. Whereas this indicator is 32% in England, 38% in France, 33% in Germany and 45% in the USA. 90% of the costs of education in higher education institutions belonging to the state and municipalities are covered from the state and municipal budgets. However, many students prefer to study in private higher education institutions where the cost of education is high and the quality of teaching is relatively modernly organized.

It is known that Japan imports 60% of food resources. Because calculations show that importing food products remains preferable to local production. Therefore, the Japanese government pays great attention to state programmes aimed at developing and introducing science at the international level. In recent years, large amounts of grant funds are being directed through the Japan International Cooperation Agency (JICA) to the agricultural and water management systems of

developing countries in the world. In addition, a system has been established for training personnel for economic sectors with many developing countries, providing education in state-owned higher education institutions and mutual personnel exchange. This system, in turn, is of great importance in providing Japanese agriculture with qualified personnel capable of analysing and solving problems at the international level.

In addition, today the experience of developed countries shows that if the processes of property creation and production are in the hands of private entities, the efficiency of resource use will be several times higher. However, in introducing a private property-based education system and regulating the organizational and socio-economic relations associated with it, the state's obligations and functions also play an important role. Therefore, for the effective organization and development of the activities of such education systems and institutions, it is appropriate to apply the principles and mechanisms of public-private partnership (DXSh).

Research shows that in the education systems of developed countries the practice of DXSh is widely used, and this system is stimulated with various supports. For example, in the State of Israel every eighth higher education institution has established a special venture company, which cooperates with private entities in the commercialization of scientific ideas, developments and innovative technologies²⁷. In addition, 26 technological incubators operate in Israel in direct cooperation with the education system, and their annual budget amounts to 400 million US dollars. Also, there are 70 venture funds financing scientific ideas in education, 14 of which are private entities, with an annual budget of 1 billion US dollars. In South Korea, the level of support for training qualified personnel by private business representatives constitutes 18.7%

²⁷ Inter-cluster interaction – the basis of innovative development of industry in St. Petersburg. – International Industrial Forum “Russian Manufacturer” 25–28 September 2012. <http://promexpo.lenexpo.ru/node/61772>.

of the total funds spent on education. Here, the focus is mainly on training specialists on an order basis²⁸.

In the current conditions, the organizational-legal basis for implementing **DXSh** has also been created in our country, and it is being gradually introduced into the education system.

In general, the analysis of the personnel training system in foreign countries shows that in this field each country has its own achievements and distinctive features, according to which training highly qualified personnel for agriculture is considered one of the priority directions in some developed countries, while in others deep attention is paid to training highly qualified specialists for various services specific to sectors directly related to agriculture, i.e. for the preparation, transportation, processing, packaging, sale, advertising and marketing of agricultural products.

In our opinion, in the future improvement of the system of training higher-educated personnel and qualified specialists in our republic, it is appropriate first to take as an experiment the application in practice of each country's specific features and achievements mentioned above. In this regard, it should be noted that the system formed today in our republic for training higher-educated personnel and qualified specialists for the agricultural sector cannot be said to have significant differences from the systems of developed countries.

CHAPTER II. CURRENT STATE OF THE LEVEL OF SUPPLYING AGRICULTURE WITH HIGHLY QUALIFIED PERSONNEL AND THE DEVELOPMENT OF THE SUPPLY SYSTEM

2.1. The state of the system for training highly qualified personnel for the republic's agriculture and the level of meeting the demand for them

²⁸ V.V. Kazakov. Public-private partnership: world experience and domestic practice. Bulletin of Tomsk State University. 2014. No. 386. p. 165–171

The analysis of the specific experience accumulated by the new economic entities (clusters, cooperatives, associations, etc.) that are currently operating on the basis of modern advanced technologies and market mechanisms in the innovative development of agriculture in our country, as well as in their establishment, management and product cultivation, shows that the current state and problems of the system for training higher-educated personnel and highly qualified specialists and for supplying them, both now and in the future, require study, the development of scientific proposals, conclusions and methodological-practical recommendations for their solutions.

It is known that today the significant part of agricultural products grown in our republic, i.e. 70 per cent, falls to the share of dekhkan farms and owners of household plots, which are considered small-scale forms of economic management and are based on the labour of family members. This situation naturally creates certain complexities in supplying them with qualified personnel. Taking these aspects into account, when assessing the current state of the system for supplying the sector with qualified personnel, it is appropriate to study the number of economic entities, their categories and the trends in their structural changes.

During 2018–2022, significant changes occurred both in the total number of farms and in their categories. For example, in 2015, out of the total 4,896,580 farms engaged in agricultural production, 15,871 (3.24 per cent) were farms, 4,732.0 thousand (96.64 per cent) were dekhkan farms, and 587 (0.12 per cent) were agricultural enterprises; while in 2022 their number totalled 5,265,800 and respectively constituted 9,255 (1.76 per cent), 5,164.2 thousand (98.07 per cent) and 905 (0.17 per cent) (Table 2.1).

Table 2.1

Dynamics of changes in the number of farms operating in the republic's agriculture in 2018–2022

Years	Total, thousand	Of which:
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	units		Farmer farms		Dekhkan farms and owners of household plots		Agricultural enterprises	
	Number, thousand units	Share, %	Number, thousand units	Share, %	Number, thousand units	Share, %	Number, thousand units	Share, %
2018	4896,58	100	158,71	3,24	4732,0	96,64	5,87	0,12
2019	5035,7	100	160,15	3,18	4869,4	96,70	6,15	0,12
2020	5080,4	100	147,83	2,91	4925,6	96,95	6,97	0,14
2021	5250,39	100	151,95	2,89	5089,8	96,94	8,64	0,16
2022	5265,8	100	92,55	1,76	5164,2	98,07	9,05	0,17
2020 compared to 2024, %	107,54	-	58,31	-	109,13	-	154,17	-

The structural change in the number of economic entities has, in turn, led to corresponding changes in their shares in the agricultural products grown across the republic. For example, on average over 2018–2022, 70 per cent of the agricultural products grown fell to the share of dekhkan farms, 28 per cent to farmer farms and 2 per cent to agricultural enterprises. It is noteworthy that the share of agricultural enterprises shows a steady growth trend, increasing from 1.9 per cent in 2015 to 3 per cent by 2019, i.e. by 58 per cent over five years (Table 2.2).

Table 2.2

Distribution of gross agricultural output produced in the republic in 2018–2022 by categories of farms, in per cent

Years	Total	Farmer farms	Dekhkan farms	Agricultural enterprises
2018	100	35,5	62,6	1,9
2019	100	32,9	61,5	2,0
2020	100	28,9	67,5	2,6
2021	100	27,3	70,0	2,7
2022	100	26,9	70,1	3,0
2020 compared to 2024, %	-	75,7	1,12	1,58

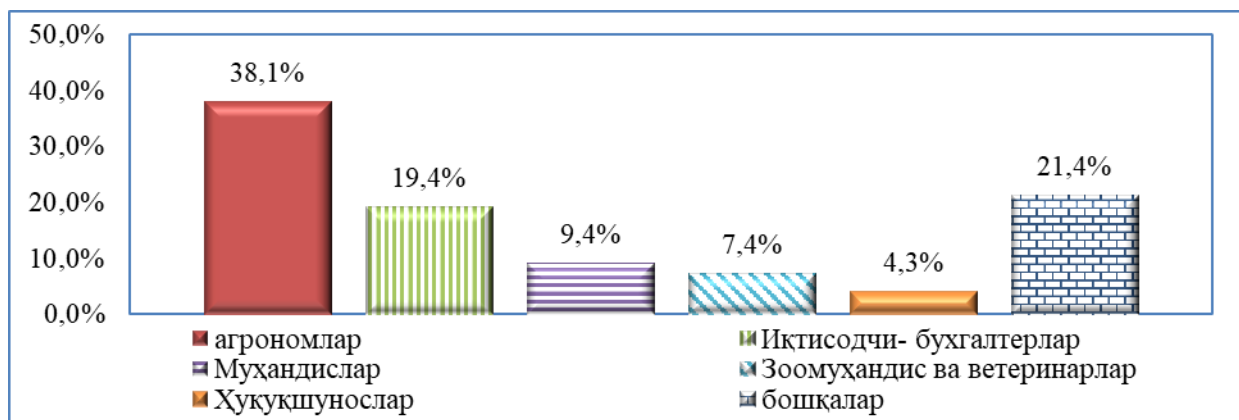
Thus, the demand for qualified specialists in agriculture can mainly arise in farmer farms and agricultural enterprises. In dekhkan farms, the demand for qualified specialists arises mainly indirectly through other service entities. From this it can be said that the development of forms of economic management in the sector and their methods of organising production directly affect the efficiency of the personnel supply system. At a time when the number of farmer farms, which form the main demand for qualified personnel, is decreasing year by year, the establishment of clusters, agro-firms, cooperatives and associations is giving impetus to the formation of new labour market structures for personnel.

According to the dekhkan farming traditions formed in our republic, the farm manager and the person running the business are usually one and the same person. This, in turn, requires broad knowledge, skills, experience and time. In the experience of developed countries, however, the farm head only organises production. Other tasks are performed by workers or service providers. The formation of such a system in our republic is hindered by the shortage of specialists at the required level, the relatively low qualifications of existing specialists, the lack of interest in working in a sector with low wages, and, at the same time, the underdevelopment of relevant service types (marketing, sales cooperatives).

As of 1 January 2024, 38.1 per cent of farm managers are agronomists, 19.4 per cent are economists, 9.4 per cent are engineers, 7.4 per cent are zootechnicians-veterinarians, 4.3 per cent are lawyers, and 21.4 per cent have other specialities (Figure 2.1).

54.5 per cent of farm managers are specialists in fields not directly related to agricultural production processes. For this reason, in our opinion, it is important not only for farmer farms but also for dekhkan farm managers and owners of household plots to further improve the system of raising knowledge and skills in the main areas such as effective use of innovative technologies for the cultivation of agricultural crops and livestock, and mastering methods for assessing their

efficiency. It is also important to organise the existing special courses and training sessions using modern information-communication tools, as well as drawing on the world’s advanced experience and achievements in each field.



2.1-rasm. Fermer xo‘jaligi rahbarlarining mutaxassisliklari bo‘yicha guruhlanishi (2022 yil holatiga)

In this process, it is appropriate, within the framework of measures currently being carried out in the localities under the “Mahallabay” and “Xonalarbay” programmes in cooperation with representatives of local government bodies and specialists, to also organise wide propaganda and agitation work among farm managers in the above directions.

In supplying agriculture and its sub-sectors with higher-educated personnel and qualified specialists by specialisation, all levels of educational institutions naturally play a special role. Analysis of the higher education institutions (HEIs) in this system and the number of specialists they trained in 2015–2019 shows that in 2019 there were a total of 102 HEIs in the republic, of which 10, or 9.8 per cent, were directly engaged in training higher-educated personnel for agriculture. This figure was 6 (7.8 per cent) in 2015, 7 (8.1 per cent) in 2017 and 9 (9.5 per cent) in 2018. That is, their number has increased by 4, or 66.6 per cent, in recent years. The total number of higher-educated personnel trained across the republic was 66.29 thousand in 2015, 64.13 thousand in 2017 and 70.79 thousand in 2019, i.e. it increased by 6.7 per cent over the last five years. Of these, the number of higher-educated personnel

trained for the agrarian sector was 4.76 thousand (7.18 per cent of the total) in 2015, 4.81 thousand (7.5 per cent of the total) in 2017 and 5.50 thousand (7.7 per cent of the total) in 2019 (Table 2.3).

Table 2.3

Number of HEIs operating in our republic and the number of higher-educated personnel being trained in them

Indicators	Years:					2022 compared to 2018, %
	2018	2019	2020	2021	2022	
Total number of HEIs in the republic, units	77	81	86	95	102	132,5
Of which, number of HEIs training personnel for agriculture, units	6	6	7	9	10	166,6
As % of total	7,8	7,8	8,1	9,5	9,8	-
Total number of higher-educated personnel trained, thousand persons	66,29	64,13	67,44	70,32	70,79	106,7
Of which, number of higher-educated personnel trained for agriculture, thousand persons	4,76	4,81	5,04	5,51	5,50	115,5
As % of total	7,18	7,50	7,47	7,84	7,77	-

The HEIs training personnel for agriculture trained a total of 4,755 higher-educated specialists in 2015, of which 3,168 were in crop production, 356 in livestock farming (taking into account graduates of all institutes' livestock faculties) and 1,348 were specialists in the irrigation and melioration system; by 2019 these figures had reached 3,763, 412 and 1,741 respectively. In particular, Tashkent State Agrarian University (TDAU) and its branches trained 2,342 in 2015 and 2,518 in 2019 (growth of 7.5 %), Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (TIQXMMI) and its branches trained 1,348 in 2015 and 1,741 in 2019 (growth of 29.2 %), and Samarkand Veterinary Medicine Institute (SVMI) and its branches (taking into account the former Samarkand Agricultural Institute) trained 1,065 in 2015 and 1,245 in 2019 (growth of 16.9 %) (Table 2.4).

At the same time, in recent years, in order to effectively implement the achievements that have long been formed in the education systems of developed countries, the practice of joint education and teaching based on harmonized two-sided education standards has been introduced in cooperation with higher education institutions in those countries, and this system, in turn, creates opportunities for students to become acquainted with international achievements in the field of science. This direction also plays an important role in organising students' studies abroad. In particular, as of 2019, joint education programmes and student exchange systems have been introduced in 43 bachelor's and 10 master's degree programmes at HEIs in the republic with 28 HEIs around the world.

Table 2.4

Number of higher-educated personnel trained in 2018–2022 by HEIs in the agricultural direction, persons

Indicators	Years:					2022 compared to 2018, %
	2018	2019	2020	2021	2022	
Tashkent State Agrarian University (TSAU)	1105	1124	1198	1174	1186	107,3
Including: Andijan branch (until 2018 Andijan Agricultural Institute)	958	964	936	1054	1007	105,1
Termiz branch	-	-	-	-	-	
Nukus branch	279	286	294	321	325	116,5
Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (TIAME)	1094	1089	1183	1575	1477	135,0
Including: Bukhara branch	254	250	268	262	264	103,9
Karshi branch	-	-	-	-	-	
Samarkand Veterinary Medicine Institute (SVMI) (until 2018 Samarkand Agricultural Institute)	1065	1098	1165	1127	1245	116,9
Nukus branch of SVMI	-	-	-	-	-	
Tashkent branch of SVMI	-	-	-	-	-	
Total across the republic	4755	4811	5044	5513	5504	115,8

It should be noted that in developed countries there are various approaches to assessing the personnel training system and its efficiency;

in some countries the subsequent fate of trained personnel, i.e. their employment, is considered a pressing issue, while in others serious attention is not paid to this matter.

In 2021, out of 4,755 graduates trained for agriculture, 4,262 (89.6 per cent) were employed, of which 3,057 in their own speciality and 1,206 in other jobs. In 2019 these figures were respectively 5,504; 5,081 (92.3 per cent); 4,203 and 879. These indicators by HEI are fully reflected in the following Table 2.6. In general, the share of personnel who graduated from HEIs and found employment was 92.3 per cent in 2019 and 89.6 per cent in 2015, with a growth of 2.7 percentage points (Table 2.5).

Table 2.5

Employment status of higher-educated personnel who graduated from HEIs specialising in agriculture in 2018–2022

Indicators				Years					
				2018	2019	2020	2021	2022	
Republic-wide total	Employed	Total		4262	4331	4584	5149	5081	
		In per cent		89,6	90,0	90,9	93,4	92,3	
	Of which	In their own speciality		Total	3057	3128	3453	4069	4203
				%	71,7	72,2	75,3	79,0	82,7
		In other fields of education		Total	1206	1203	1130	1080	879
				%	28,3	27,8	24,7	21,0	17,3
Graduates of TSAU and its branches	Employed	Total		2100	2136	2224	2373	2336	
		In per cent		89,7	90,0	91,6	93,1	92,8	
	Of which	In their own speciality		Total	1457	1502	1659	1853	1876
				%	69,4	70,3	74,6	78,1	80,3
		In other fields of education		Total	643	634	565	520	460
				%	30,6	29,7	25,4	21,9	19,7
Graduates of TIIAME and its branches	Employed	Total		1221	1221	1310	1748	1591	
		In per cent		90,6	91,2	90,3	95,2	91,4	
	Of which	In their own speciality		Total	935	921	1026	1437	1399
				%	76,6	75,4	78,3	82,2	87,9
		In other fields of education		Total	286	300	284	311	193
				%	23,4	24,6	21,7	17,8	12,1
Graduates of SVM I and its branches	Employed	Total		941	974	1050	1028	1154	
		In per cent		88,4	88,7	90,1	91,2	92,7	
	Of which	In their own speciality		Total	665	705	768	779	928
				%	70,6	72,4	73,2	75,8	80,4
		In other fields of education		Total	277	269	281	249	226
				%					

		<i>education</i>	%	29,4	27,6	26,8	24,2	19,6
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Analyses show that, for example, in 2022 an average of 8 per cent of graduates started work in educational institutions, 0.1 per cent in the field of science, 3.3 per cent in industrial sectors, 41 per cent in agriculture, water and forestry, 0.7 per cent in banking, tax, insurance and finance, 5.3 per cent in the service sector, and 12.6 per cent in state and local government bodies, while 7.1 per cent continued their studies in the postgraduate education system at HEIs, master's programmes and research institutes (Table 2.6).

Table 2.6

Employment of HEI graduates in 2022 by sectors and branches, in per cent

Economic sectors and branches	HEIs training higher-educated personnel for the agrarian sector		
	TSAU and its branches	TIIAME and its branches	SVMI and its branches
Educational institutions	8,1	7,9	8,0
Field of science	0,1	0	0,1
Industrial production	2,9	3,9	3,1
Agriculture, water and forestry	46,8	36,7	44,3
Construction	3,1	4,3	4,0
Transport and communications	0,7	1,3	1,1
Healthcare and social security system	0,8	0,4	0,5
Culture and arts	0,1	0	0,2
Banking, tax, insurance and finance	0,5	0,7	0,9
Courts, prosecutor's office, internal affairs bodies	0	0,1	0,1
State administration bodies	9,7	16,7	11,4
Public organisations	3,9	4,1	3,7
Service sector	3,8	5,2	6,8
Private entrepreneurship	12,1	9,9	8,7
Other sectors and branches	1,7	0	2,4
Continuing education	5,7	8,7	6,9

However, it should be particularly noted that the majority of graduates have taken up jobs not related to their specialities. The uneven distribution of personnel trained by HEIs across economic sectors and

branches, as well as their employment in branches other than their own speciality, is caused by the following factors. In particular:

- the needs of the lowest level of the system are left out of consideration when determining demand for personnel being trained by HEIs, and mutually beneficial links between science and practice are not sufficiently established;

- the level of salaries paid to higher-educated specialists in agricultural enterprises, the form of payment and working conditions are unsatisfactory;

- preference is given to the use of seasonal workers' labour over permanently employed personnel in agricultural enterprises;

- agricultural enterprises lack the financial capacity to pay wages commensurate with the labour of qualified personnel, and so on;

- personnel turnover and similar issues arising from these factors and conditions.

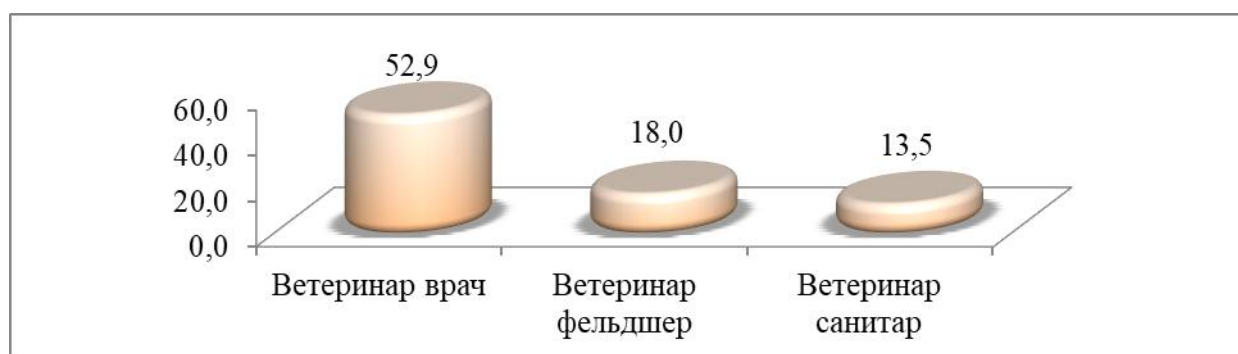
In practice, there are significant discrepancies between the demand for personnel and the level of their supply in crop production, livestock farming and water management enterprises. For example, according to norms, a total of 92,554 farmer farms specialising in cotton and grain production require 13,040 higher-educated agronomists, while in practice 12,599 agronomist personnel are working. Of these, 6,205 (49.2 per cent) are higher-educated and 6,394 are secondary-specialised agronomists. Thus, the cotton and grain production sector currently needs 6,835 higher-educated agronomists. In addition, the state of supply of agronomists to cotton and grain farmer farms by region and their qualification composition is given in Appendix 1. It should be recognised that such a situation applies not only to other crop production branches but also to various specialities.

At the same time, the issue of supplying the livestock farming branch of agriculture with higher-educated personnel and qualified specialists in the relevant specialities is also considered urgent. It is known that the veterinary service in our republic consists of the State Committee for Veterinary and Livestock Development, its

administrations in the Republic of Karakalpakstan, regions and the city of Tashkent, state centres for diagnosis of animal diseases and food safety in the Republic of Karakalpakstan and regions, 184 district and city veterinary departments, 260 veterinary-sanitary expertise laboratories at dekhkan markets, 1,411 veterinary stations, 130 district and city state centres for diagnosis of animal diseases and food safety, 27 border and transport veterinary control points, and 5 research institutes within the system²⁹.

The state of supply of the state veterinary service with veterinary specialists shows that a total of 7,504 higher-educated veterinary specialists are working in the system, of which 4,704 are veterinary doctors, 1,600 are veterinary feldshers and 1,200 are veterinary sanitarians.

However, taking into account the conditional headcount of livestock in our republic, the average supply with veterinary doctors is only 50 per cent, and for some narrow specialities it is around 20 per cent. According to norms, for example, 1,200 conditional head of livestock require 1 veterinary doctor, 1 veterinary-feldsher and 1 veterinary-sanitarian specialist. In our republic, as of 2019, there were a total of 10,727.0 thousand conditional head of livestock; therefore, 8.9 thousand specialists are needed in each of the veterinary doctor, veterinary-feldsher and veterinary-sanitarian specialities to provide all necessary services. In practice, however, they are supplied at only 52.9 per cent, 18 per cent and 13.5 per cent respectively (Figure 2.2).



²⁹ Data of the Veterinary and Livestock Development Committee

Figure 2.2. Level of provision of the livestock sector with veterinary personnel as of 2022, in percent

If we analyze this indicator by regions, the region with the highest demand for veterinary specialists is the Fergana region, while the smallest share of specialists corresponds to the Qashqadaryo region (Figure 2.3).

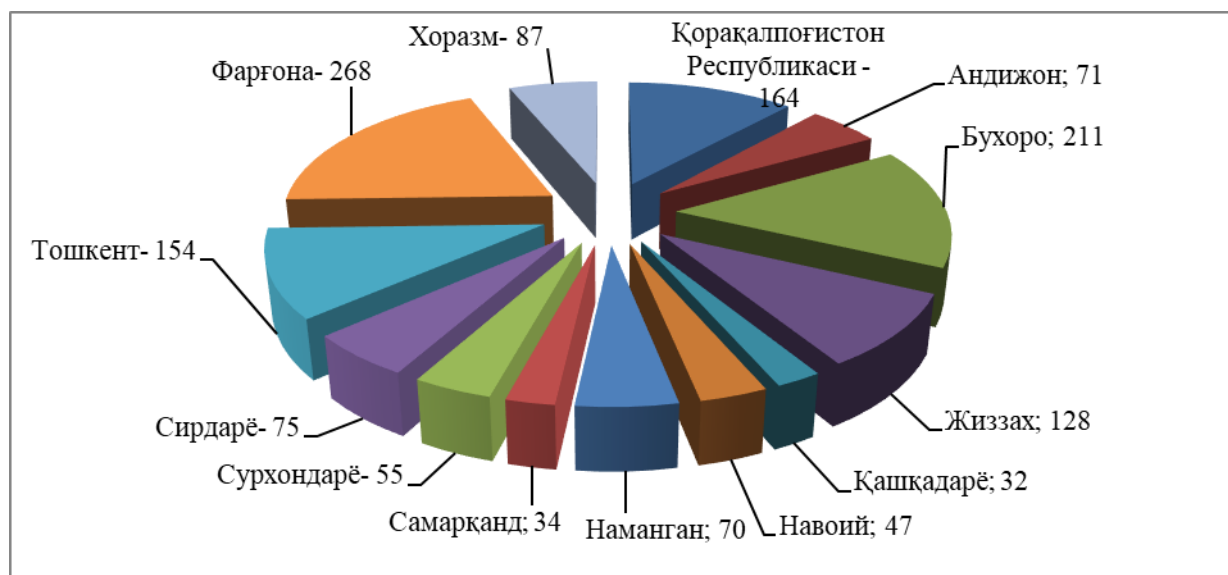


Figure 2.3. Demand of regions for veterinary personnel as of 2019, persons

Ensuring the management system of all water management organizations and hydraulic structures necessary for water resources and their use in agriculture with highly educated personnel and highly qualified engineering-technical specialists is of great importance. As of 2022, there are a total of 41,137 staff units in water management organizations, of which 7,011 persons or 17 percent have higher education and 29,717 persons or 72.7 percent have secondary specialized education (Table 2.7).

Currently, among the personnel operating in the entities of this system, 6,343 persons have higher education and 18,326 persons have secondary specialized education, and there is still a demand for an additional 668 persons with higher education and 11,391 persons with secondary specialized education. For example, there is a need to attract

255 higher-education personnel to the Sirdaryo-So‘x ITHB, 115 persons to the Zarafshon ITHB, and 81 persons to the NSE and AB.

It is known that the water sector is a large and complex branch, and although organizational infrastructure has been created to provide it with highly educated personnel, many problems that need to be solved remain regarding the employment of graduates, the level of non-settlement, finding their place in practice, and the ability to satisfy employers with their knowledge and skills.

Table 2.7

Level of staffing of water management organizations with personnel as of 2022

Tashkilot nomi	Jami shtat soni (kishi)	Oliy ma' lumotli	O' rta maxsus	Boshka kasb va o' rta ma' lumotli	Amaldagi kadrlar		Etishmaydigan kadrlar	
					Oliy	O' rta maxsus	Oliy	O' rta maxsus
Norin-Qoradaryo ITHB	1361	301	921	139	267	565	34	356
Norin-Sirdaryo ITHB	1692	371	1120	201	325	795	46	325
Sirdaryo-So‘x ITHB	1851	463	1153	235	208	699	255	454
Quy i Sirdaryo ITHB	1576	216	1160	200	216	904	0	256
Chirchiq-Ohangaron ITHB	1579	360	1001	218	290	543	70	458
Amu-Surxon ITHB	1271	296	792	183	296	747	0	45
Amu-Qashqadaryo ITHB	1533	258	1029	246	258	767	0	262
Amu-Buxoro ITHB	1052	207	698	147	190	576	17	122
Quy i Amudaryo ITHB	2629	1 032	1064	533	982	951	50	113
Zarafshon ITHB	2631	420	1826	385	305	716	115	1110
Farg‘ona vodiysi MKTB	822	131	572	119	131	401	0	171
O‘zsvvta‘mirfoy-dalanish RB	4025	549	2675	801	549	1508	0	1167
Meliorativ ekspeditsiya	2905	727	1867	311	727	1644	0	223
O‘zsvvnazorat RSI	297	152	74	71	152	73	0	1
NSE va AB	15870	1522	13742	606	1441	7414	81	6328
Markaziy texnologik va dispetcherlik xizmati	43	6	23	14	6	23	0	0
TOTAL	40167	7015	29697	4409	6343	18326	668	11391

When assessing the state of staffing in agriculture, including the analysis of permanent employees with labor books, is also considered important. For example, the annual average number of employees working in legal entities engaged in the economic activity type “Agriculture, forestry and fisheries” was 631.6 thousand persons in 2017 and 471.4 thousand persons in 2022 (Appendix 3). Of these, in 2017, 159.0 thousand persons (25.2 percent) were women and 472.6 thousand persons (74.8 percent) were men, while in 2022 these figures were 138.5 thousand (29.3 percent) and 332.9 thousand (70.7 percent), respectively.

By regions, in 2022 the largest indicators belong to the Fergana (54.1 thousand persons) and Andijan (54.8 thousand persons) regions, while the smallest indicators correspond to the Navoiy (17.3 thousand persons) and Sirdaryo (15.0 thousand persons) regions. According to their data, in 2018, 6.5 percent had higher education, 65.9 percent had secondary specialized education, and 27.6 percent had secondary education, while by 2022 these figures were 6.4 percent higher, 68.9 percent secondary specialized, and 24.7 percent secondary education (Table 2.8).

The analyses show that the level of provision of agricultural enterprises with highly educated personnel remains very low. This has a negative impact on the effective organization of product cultivation, storage, delivery to consumers, and sales processes. Therefore, we believe that it is necessary to develop the following measures and implement them in practice. In particular:

- organizing the system of cultivation and sale of agricultural products on the basis of a business plan, investing in attracting highly qualified personnel who have the opportunity to introduce precise analytical data, marketing strategy, and innovative technologies;

- stimulating the activities of highly educated personnel to increase the profitability level of the main agricultural products, including products produced on a contractual basis;

Table 2.8.

Education of employees with labor books working in legal entities of the economic activity type “Agriculture, forestry and fisheries”, in percent

Regions	2020 year				2021 year				2022 year			
	Total	higher	special secondary	secondary	Total	higher	special secondary	secondary	Total	higher	special secondary	secondary
Republic average	100,0	6,5	65,9	27,6	100,0	6,2	65,7	28,1	100,0	6,4	68,9	24,7
Republic of Karakalpakstan	100,0	7,2	72,5	19,8	100,0	5,1	75,9	19,0	100,0	5,4	80,1	14,9
Andijon	100,0	6,6	59,1	34,3	100,0	4,9	49,6	45,5	100,0	5,4	56,6	38,0
Bukhara	100,0	5,2	60,9	33,5	100,0	4,8	66,8	28,4	100,0	4,1	59,2	36,4
Jizzakh	100,0	11,7	74,4	13,6	100,0	11,3	75,0	13,4	100,0	11,6	83,2	5,3
Kashkadaryo	100,0	5,7	69,9	24,3	100,0	7,3	68,7	24,0	100,0	9,3	69,6	21,2
Navoiy	100,0	6,4	76,4	17,3	100,0	7,1	79,5	13,4	100,0	7,1	72,6	19,5
Namangan	100,0	4,2	68,9	26,8	100,0	4,1	72,8	23,3	100,0	4,5	69,9	25,6
Samarkand	100,0	8,8	63,8	27,4	100,0	7,3	65,9	26,7	100,0	7,9	70,1	22,0
Surkhandaryo	100,0	9,4	68,4	21,8	100,0	10,6	72,2	16,7	100,0	9,6	75,9	13,9
Sirdaryo	100,0	6,1	77,6	16,4	100,0	6,2	74,0	20,5	100,0	8,2	84,5	7,3
Tashkent	100,0	8,2	55,8	35,8	100,0	9,3	65,5	25,0	100,0	8,4	70,6	20,9
Fergana	100,0	2,9	61,3	35,9	100,0	3,0	57,6	39,5	100,0	3,7	64,5	32,1
Khorazm	100,0	6,0	73,1	20,9	100,0	5,3	71,2	23,5	100,0	4,6	74,6	20,8

-improving the system for increasing the modern knowledge and skills of managers and specialists of agricultural enterprises, establishing experience in transitioning from traditional methods to innovative technologies in product production, strengthening the labor motivation of employees, and providing material incentives, etc.

2.2. Level of provision of agriculture in the Qashqadaryo region with qualified personnel by professional specialties and its problems

As of January 1, 2022, the share of the Qashqadaryo region's gross regional product in the republic's gross domestic product was 7.1 percent. During this period, 8,923.9 thousand soums of products and services were produced per capita in the region. The agriculture, forestry, and fisheries sector has a significant share in the region's main economic indicators, accounting for an average of 48 percent of the region's gross product in 2018–2022. In the volume of agricultural products, the crop production sector accounted for 61.8 percent and the livestock sector for 38.2 percent. By types of farms, 66.6 percent of the total volume of agricultural production belongs to dehqon (personal subsidiary) farms, 32.4 percent to farmer farms, and 1 percent to agricultural enterprises. In 2022, 12.9 percent of the total cotton, 13.4 percent of grain, 5.8 percent of potatoes, 6.2 percent of fruits and berries, 6.0 percent of grapes, 4.9 percent of vegetables, 11.9 percent of meat, and 10.7 percent of milk produced in the republic corresponded to the region's share ³⁰.

However, the analyses show that objective and subjective problems existing in the agricultural sectors of the region somewhat reduce the possibilities of fully utilizing the region's economic-production potential. One of the main reasons for this is the need to recognize the problems in providing the region's agriculture with highly educated personnel and qualified specialists. Therefore, although a certain amount of work is currently being carried out in this regard in the region, it is appropriate to pay special attention in the future to measures aimed at further arousing and stimulating the interest of young people in entering higher education institutions of agriculture. The figures show that in 2015, the number of students admitted from the region to the republic's higher education institutions was 12,547 persons, of whom 12 percent studied in agricultural education institutions, while in 2022 these figures were 18,457 persons (5,910 more than in 2018) and 15 percent, respectively (Table 2.9).

Table 2.9

³⁰ Data from the Statistics Committee, www.stat.uz

Dynamics of the number of students studying in the republic's higher education institutions from the Qashqadaryo region and their distribution by directions

Indicators		Years:				
		2018	2019	2020	2021	2022
Total number of students studying in higher education institutions, persons		12547	13984	16547	17658	18457
Of which, number of students studying in agricultural education directions, persons		1505	1817	2151	2474	2768
Of which:	TSAU and its branches	467	545	731	816	830
	THAME and its branches	421	527	667	693	913
	SVMI and its branches	376	472	495	668	720
	Other HEIs with related directions	241	273	258	297	304
Share of those studying in agricultural directions relative to the total, %		12,0	12,4	13,1	14,0	15,0

The distribution and share of highly educated personnel operating in the agricultural sector of the region by enterprise sectors in 2018–2022 is reflected in the following Table 2.10.

Table 2.10

Distribution and share of highly educated personnel operating in the region by agricultural enterprise sectors, persons

Years	Total number of highly educated personnel operating in agricultural enterprises	Of which:							
		Farmer farms		Clusters		Cooperatives and agrofirms		Other forms of economic entities	
		total	share, %	total	share, %	total	share, %	total	share, %
2018	4642	448	9,7	-	-	56	1,2	106	2,3
2019	518	501	9,7	-	-	63	1,2	107	2,1
2020	5323	514	9,7	-	-	76	1,4	107	2,0
2021	4139	373	9,0	21	0,5	87	2,1	112	2,7
2022	3609	313	8,7	26	0,7	103	2,8	116	3,2

Today, special attention is also paid to the organization of clusters, agrofirms, and cooperatives, which are highlighted as modern and promising directions in agriculture, and as a result of optimizing the number of farmer farms and land areas, these indicators have changed somewhat. For example, in 2022, out of the total 3,609 highly educated

personnel operating in all types of farms, 8.7 percent or 313 persons are in farmer farms, 0.7 percent or 26 persons in clusters, 2.8 percent or 103 persons in cooperatives and agrofirms, and 3.2 percent or 116 persons in other forms of farming.

Qualified personnel operate not only in direct production farming entities but also in state management bodies of agriculture. As of 2019, a total of 2,651 personnel were working in 17 such bodies in the Qashqadaryo region, and currently there is a demand for an additional 223 qualified personnel (Table 2.11).

Table 2.11

Level of education of personnel operating in state management bodies in the Qashqadaryo region, persons (as of 2022)

Agriculture management bodies	Total number of employees	Of which by education:			Demand for higher-educated personnel
		Higher	Secondary special	Secondary	
Qashqadaryo region agriculture department	56	45	11	0	5
Qashqadaryo region plant quarantine territorial inspection	47	33	14	0	4
Qashqadaryo region ecology and environmental protection department	167	147	20	0	7
Qashqadaryo region state center for animal disease diagnosis and food safety	52	20	32	0	7
Qashqadaryo region veterinary department Qarshi city veterinary division	20	5	15	0	6
Qashqadaryo region veterinary department	42	14	20	8	8
Uzbekistan Livestock Scientific Research Institute Qashqadaryo branch	8	3	4	1	1
Veterinary Scientific Research Institute Qashqadaryo scientific experimental station	5	3	2	0	1
Grain and Legume Crops Scientific Research Institute Qashqadaryo branch	82	42	39	1	6
Regional department of the Agricultural Scientific Production Center	5	4	1		0
“Seed Development Center Qashqadaryo region territorial department” LLC	72	25	42	5	6
Amu-Qashqadaryo irrigation systems basin department	814	215	364	235	56
Qarshi main canal irrigation system department based on the Amu Qashqadaryo irrigation systems basin department	160	136	24	0	7
Pump stations and energy department under the Amu-Qashqadaryo irrigation systems basin department	914	156	761	0	84

Qashqadaryo state forest enterprises	114	48	66	0	16
Region forestry department	19	11	8	0	2
Total	2651	951	1453	250	223

It is known that solving the issue of training personnel by specialties and providing them at the normative level largely depends on the specialization direction of agricultural production entities, as well as the types and volumes of products grown in them. In this regard, the analyses show that, for example, out of 11,440 farmer farms operating in the region in 2019, 6,319 (55.2 percent) specialized in cotton-grain growing, 378 (3.3 percent) in vegetable and melon growing, 2,985 (26.1 percent) in horticulture and viticulture, and 588 (13.9 percent) in livestock (Table 2.12).

Table 2.12

Number of farmer farms operating in the Qashqadaryo region and their specialization directions, units (as of 2022)

Region and districts	Total number of farmer farms	Of which by specialization:				
		Cotton-grain growing	Vegetable and melon growing	bog‘dorchilik va uzumchilik	Horticulture and viticulture	Other specializations
Total for the region	11440	6319	378	2985	1588	170
G‘uzor	806	535	20	105	145	1
Dehqonobod	636	345	1	127	162	1
Qamashi	562	405	11	57	89	0
Qarshi	809	474	16	182	137	0
Koson	1384	821	24	332	206	1
Kitob	970	269	90	507	101	3
Mirishkor	1034	685	35	192	118	4
Muborak	478	261	32	56	117	12
Nishon	731	486	12	50	64	119
Kasbi	561	407	16	98	33	7
Chiroqchi	1692	1048	11	425	202	6
Shahrisabz	841	254	65	387	126	9
Yakkabog‘	932	329	45	464	87	7
Shahrisabz sh.	4	0	0	3	1	0

Practice shows that demand for qualified personnel can usually be formed only in cotton-grain and livestock farmer farms. In other

directions, attention is not paid to attracting personnel. Because, as is known, farmer farms usually organize production relying on the labor of seasonal workers. This is explained by factors such as the seasonality of agriculture and product type production and sales processes, and the timing of agrotechnical measures. The studies show that the number of employees working in the region's farmer farms was 147,686 persons in total in 2018, of which 59,007 persons (40.0 percent) were seasonal workers, while in 2022 these figures were 69,035 and 32,695 persons (47.4 percent), respectively (Table 2.13).

Table 2.13

Education of permanent employees in farmer farms in the Qashqadaryo region, persons

Districts	2017 yil				2018 yil				2019 yil			
	Total	Higher education	special secondary	secondary	Total	Higher education	special secondary	secondary	Total	Higher education	special secondary	secondary
Qashqadaryo viloyati	89680	5140	62710	21840	50470	3730	34670	12080	33510	3130	23310	7070
Districts::												
G'uzor	5570	70	5500	8	2100	50	2030	20	1750	120	1560	70
Dexqonobod	2150	90	2040	10	1530	310	1220	12	1470	330	1130	10
Qamashi	7210	410	6490	310	4430	120	4300	10	2590	60	2530	10
Qarshi	5230	630	2460	2140	4340	810	2620	920	2880	380	1860	650
Koson	10310	600	6380	3330	8500	80	2860	5560	3750	400	1850	1490
Kitob	7940	350	4670	2920	4370	360	3050	960	3760	320	2710	730
Mirishkor	9490	620	3650	5220	5070	320	4680	70	3270	180	2790	300
Muborak	3280	30	3240	10	1800	30	1770	11	1090	10	1080	10
Nishon	7510	870	4010	2620	3830	360	1630	1850	1840	220	850	770
Kasbi	9290	560	5660	3080	5790	580	3440	1770	4480	390	2370	1720
Chiroqchi	11400	60	11120	220	2000	150	1770	90	2690	280	2360	50
Shahrisabz	4000	330	1950	1720	3050	330	1930	800	1840	210	1050	570
Yakkabog'	6320	510	5550	260	3650	220	3400	30	2110	250	1160	710

The tendency of decreasing the number of employees in farmer farms by region and districts can mainly be explained by the reduction of cotton areas in recent years and the gradual transfer of a certain part of them to cotton-textile clusters.

The analysis of the qualification composition of permanent employees in the region's farmer farms shows that in 2018, out of the

total 8,968 working employees, 514 persons had higher education, 6,271 persons had secondary specialized education, and 2,184 persons had secondary education, while in 2022, out of the total 3,351 employees, 313 persons had higher education, 2,331 persons had secondary specialized education, and 707 persons had secondary education. These data by the region’s districts are reflected in Appendix 4.

It is noteworthy that in recent years, cotton-textile and other direction clusters have also taken an important place in attracting qualified personnel. For example, in the “Indorama agro” LLC cotton-textile cluster in the region, there are a total of 720 staff units, while as of 2019 there was a demand for only 1 higher-educated accountant, and currently an employee with secondary specialized education and practical experience is working in this position (Table 2.14).

It should be noted that due to the convenience of working conditions in clusters, the provision of employees with high-salary permanent jobs, and other factors, full staffing with highly educated personnel is creating the basis for their effective operation. In addition, for comparison of staffing, the activities of the “Indorama agro” LLC cotton-textile cluster and the “Halil ota” multi-branch farmer farm in the Chiroqchi district were studied monographically. The farmer farm had 76 hectares of arable land and 52 conditional head of livestock in 2018 and operated with 9 employees, of whom 2 had higher education, 5 had secondary specialized education, and 2 had secondary education. In 2022, the total land area reached 83.4 hectares and livestock reached 82 head.

Table 2.14

Staffing of the “Indorama agro” LLC cotton-textile cluster in Kasbi district of the Qashqadaryo region (as of 2022)

Position name	Existing staff unit	Of which		Number of personnel actually operating	Of which	
		Higher educated	Secondary specialized		Higher educated	O‘rta maxsus ma’lumotli
Executive	5	5	0	5	5	0
Agronom	7	7		7	7	0
Water	605	36	569	605	36	569

specialist						
Mechanic	87	17	70	87	17	70
Human resources department	6	5	1	6	5	1
Accountant	7	5	2	7	4	3
Ecology department	1	1		1	1	0
Technical safety department	2	2	0	2	2	0
Total	720	78	642	720	77	643

This growth, in turn, has also affected the number of personnel. In this year, compared to 2018, the total number of employees in the farm increased by 4 persons, the number of highly educated personnel increased by 1 person, the number of personnel with secondary specialized education increased by 2 persons, and the number of personnel with secondary education increased by 1 person (Table 2.15).

However, the analyses show that not only in the above-mentioned farmer farm, but in the majority of farms in the region, in 70-80 percent of cases, highly educated personnel work in the positions of farm manager, lawyer, and accountant, while in other positions personnel with secondary specialized and secondary education are operating. The relatively low potential of the personnel in them is mainly due to the lack of financial opportunities to provide suitable conditions and pay wages worthy of highly educated personnel. For this reason, a social survey was conducted by dividing the respondents into 2 groups in order to study problems such as the knowledge, education, qualifications, ability to meet modern requirements, and non-settlement of agricultural employees in the monographically selected districts.

Table 2.15

Dynamics of staffing of employees of the “Halil ota” multi-branch farmer farm in Chiroqchi district by education

Indicators	Years:				
	2018	2019	2020	2021	2022
Farm land area, ha	76	76	83,4	83,4	83,4
Number of livestock, conditional head	52	52	68	76	82
Total number of employees in the	9	9	11	11	13

farm, persons						
Employees with higher education	Total	2	2	3	2	3
	Share, %	22,2	22,2	27,3	18,0	27,3
	Annual average salary, thousand soums/person	7463	9645	10986	12254	14787
Employees with secondary specialized education	Total	5	5	6	6	7
	Share, %	55,6	55,6	54,5	54,5	53,8
	Annual average salary, thousand soums/person	3250	3450	4350	4350	5850
Employees with secondary education	Total	2	2	2	3	3
	Share, %	22,2	22,2	22,2	27,5	27,3
	Annual average salary, thousand soums/person	3250	3450	4350	4350	5850
Number of seasonal workers, persons		70	75	84	90	90

In order to obtain reliable and correct answers, appropriate questions were selected for the two groups of respondents, and the opinions, proposals, and recommendations expressed by the majority of them during direct communication were taken into account. In particular, the first group of respondents was asked to answer and evaluate the question “Do the knowledge, qualifications, behavior, and experience of employees coming to the enterprise today as qualified personnel meet the requirements of today?” For the second group of respondents, questions were posed about whether the current conditions created by employers, the monthly salary paid, work regime, and similar situations satisfy qualified personnel and employees, and they were also asked to provide proposals for solving problems in this regard. The total number of respondents was 100 persons, of whom 80 percent were men and 20 percent were women.

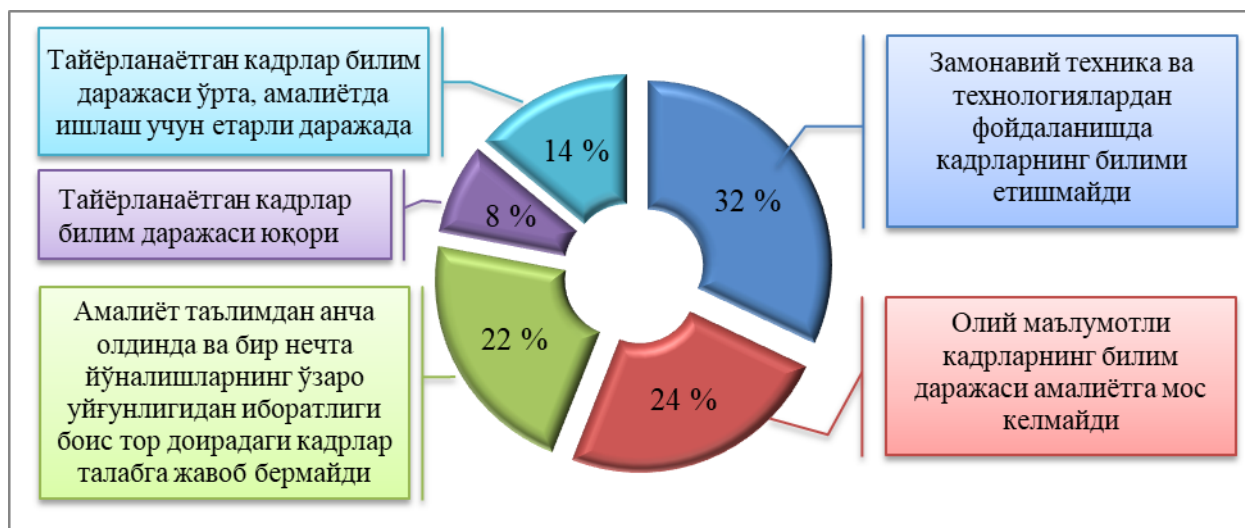


Figure 2.4. Knowledge and skills of the highly educated personnel being trained, in percent (The average indicator of survey participants is taken into account)

The first group of respondents was drawn from 50 agricultural enterprises, 1 cluster, 45 farmer farms, 1 agrofirma, and 3 experimental-support farms. For the second group, 30 higher-educated and 20 secondary-specialized-educated employees with agricultural specialties were selected. The following Figure 2.4 shows the share of respondents who participated in the questions selected for the survey and the answers given to them.

In general, summarizing the results of this survey and taking into account the entry of modern technologies into agricultural production and the great need for highly educated personnel and specialist employees in narrow specialties, in our opinion, it is appropriate in the future to focus primarily on training qualified personnel and specialists on the basis of the STEM program, which creates opportunities to solve problems in several directions.

Because the ability of highly and secondary-specialized-educated personnel to adapt to today's rapidly developing technological new production and management processes (adaptation), and to fully master their cycle, requires gaining long-term experience, which is of particular importance especially in the agrarian sector. However, in practice, the

level of non-settlement of personnel is high, and interested parties interpret this differently in their own way. In particular, according to 38 percent of employers, personnel usually come with the desire to get a job on a short-term contract basis, while 28 percent believe that the high salary in other sectors reduces the attractiveness of agricultural enterprises in the labor market (Figure 2.5).

Employer's attitude toward the high level of staff non-settlement

Employee's attitude toward the high level of staff non-settlement



Figure 2.5. Attitude of employers and job-seeking employees regarding staff non-settlement in agriculture, in percent (The average indicator of survey participants is taken into account)

It is appropriate to pay special attention to the attitudes expressed by the respondents participating in the survey regarding one of the main problems directly related to agriculture – the amount of salary and the form of payment. Because, according to the long-standing experience formed in our republic, the system of payment (incentives) in agricultural enterprises, especially farmer farms, operates on the basis of mutual oral contracts such as payment in kind or allocating land for repeated crops to their employees. However, it is necessary to emphasize separately that the question of whether this system always corresponds to the interests of

employees or not is the main problem on the agenda. In this regard, 42 percent of respondents consider permanent (monthly) cash payment appropriate, while 30 percent noted that the importance of cash or in-kind payment does not matter (Figure 2.6).

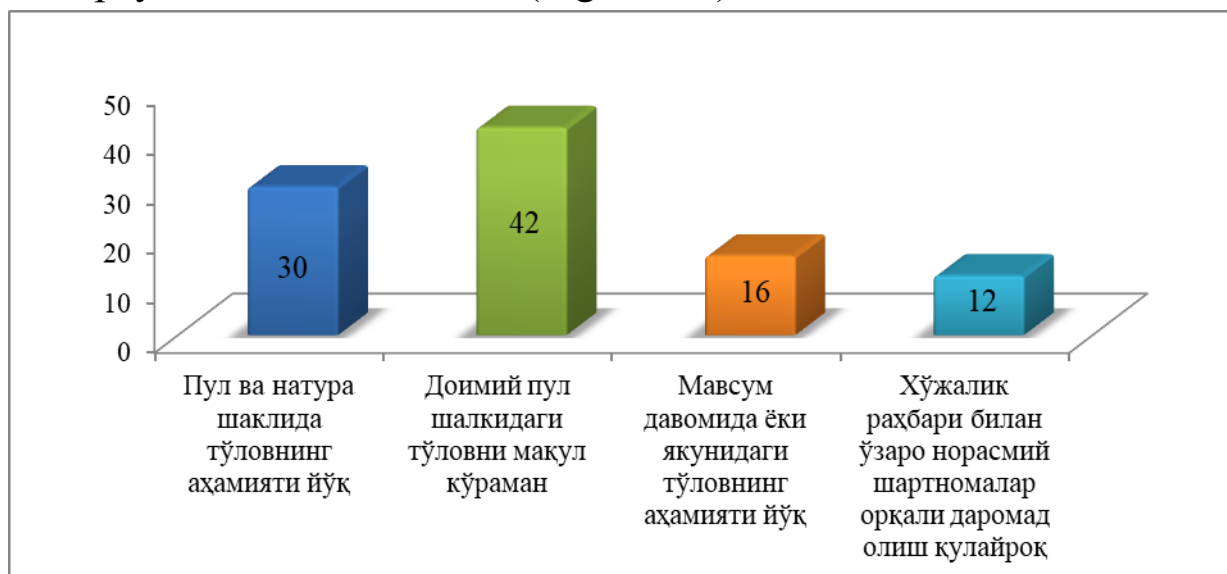
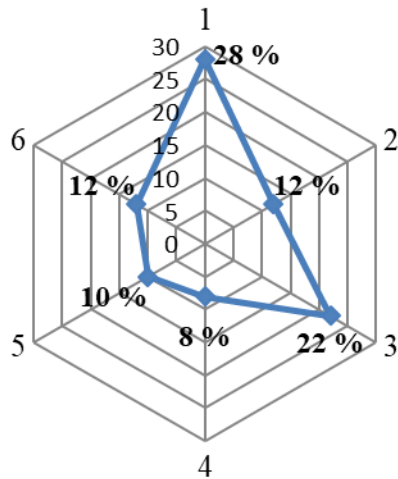


Figure 2.6. Opinions on the form and timing of salary paid to employees in agricultural enterprises (The average indicator in the survey is taken into account)

Also, those who consider the importance of payment during the season or at the end of the year as unimportant constitute 16 percent, and those who indicated that it is convenient to work on the basis of an informal, oral agreement with the farm manager constitute 12 percent. It is noteworthy that the majority of those supporting payment only in kind are employees without higher education. 42 percent of respondents with higher education indicated that they are interested in engaging in highly profitable activities in the labor market that correspond to their specialty, qualifications, and work experience.

The opinions of the heads of agricultural enterprises regarding in which direction highly educated personnel and specialists show greater adaptability in practice and can meet employer requirements were studied. The results of the survey conducted in this direction in cotton-grain and livestock farms are presented in the following Figure 2.7.



- 1 Agricultural mechanization
- 2 Accounting
- 3 Plant protection
- 4 Economics
- 5 Water management specialists
- 6 Agronomy

Results of the survey conducted in farms in the cotton-grain growing direction, in percent

Results of the survey conducted in farms in the livestock direction, in percent

- 1 Zootechnics
- 2 Veterinary medicine
- 3 Veterinary pharmacy
- 4 Veterinary diagnostics and laboratory works
- 5 Agricultural mechanization

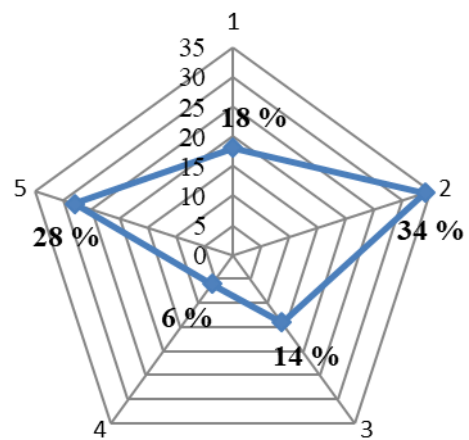


Figure 2.7. Adaptability of highly educated specialists

The survey results show that in farms in the cotton-grain growing direction, personnel with specialties in mechanization, accounting, and plant protection find their place more easily, while in the livestock direction there is high demand for specialists who graduated in zootechnics and veterinary directions, and their level of adaptability to the workplace and conditions is relatively high.

In general conclusion, in our republic, particularly in the Qashqadaryo region, the demand for highly educated personnel trained for the agrarian sector has formed differently across agricultural enterprise sectors. The number of highly educated employees in the composition of personnel operating in farmer farms is relatively high,

which mainly corresponds more to cotton-grain farms; however, it is appropriate to recognize that the level of provision of fruit-vegetable growing, potato growing, and melon growing sectors with highly educated personnel is low. Because, according to the survey results, it is necessary to recognize as priority tasks the implementation in practice of measures aimed at improving the financial potential and working conditions of employer enterprises for highly educated personnel and qualified employees in agriculture-related specialties, creating opportunities to pay salaries at the demand level, and solving problems of material incentives. In this, it is appropriate to develop a system of using the levers of “forming demand” and “stimulating supply” in the agricultural labor market by the state.

CHAPTER 3. PRIORITY DIRECTIONS FOR IMPROVING THE EFFICIENCY OF THE SYSTEM OF TRAINING AND PROVIDING SPECIALIZED HIGHLY QUALIFIED PERSONNEL FOR AGRICULTURAL SECTORS

3.1. Ways of state support for the system of training and providing highly educated and qualified personnel in agriculture

As previously noted, the globalization of the world economy, changes in natural-climatic conditions, and the development of real sectors based on innovative digital information-technology tools, the increasing demand for ecologically clean organic products, especially factors such as the degradation of agricultural crop areas, in turn ensure the growth trend of the share of complex intellectual technical-technological labor in societal development and, therefore, make the fundamental improvement of science fields and scientific-research directions, as well as the system of training and providing qualified personnel, an objective necessity.

The validity of this necessity is also explained by the strategic tasks facing each state at the international level, namely, the need to strengthen its own food security and internal supply, and to solve issues of external economic and resource dependence to the maximum extent through internal opportunities. However, the solution to this is not only related to indicators such as natural-geographical favorable location, the availability of arable lands, their productivity and total yield, per capita provision levels, but also directly linked to the influence of society's social capital on them. Because, in the socio-economic development of society, highly educated personnel with high knowledge, skills, and qualifications play a special role as the national wealth of society in the production of products (services), improving their quality, delivering them to consumers, and effectively organizing complex intellectual labor processes.

The development of the above situations and trends brings two important issues to the agenda in the world economy, namely, first,

imposing legal and economic restrictions relative to national genetic banks of agricultural products, pursuing a protection policy aimed at preventing their genetic distortion in world market segments, and second, due to the increasing share of the private sector in agrarian sector scientific-research works in developed countries and the fact that new varieties and technical-technological solutions developed as a result of scientific research are aimed at generating income by entrepreneurs, attention is being paid to continuous strict control by the state and legal protection as intellectual property. Therefore, in developed countries, the financial funds allocated to education and science are increasing year by year and are maintained at high shares relative to GDP (10 percent in the USA, 7 percent in Japan, 8.6 percent in Korea, 6.4 percent in Turkey, and others).

In recent years in our country, despite positive changes in the preparation, retraining, and provision of highly educated personnel and qualified specialists based on state order in the agrarian education system, in our opinion, it requires further strengthening the mechanisms of state support and stimulation for this important field, which can be explained by the following situations. In particular:

- the increasing application of foreign countries' scientific achievements in order to create the potential of personnel capable of operating in new forms of farming with knowledge, qualifications, and experience;

- the growing interest in paying special attention to training specialists with modern knowledge and skills by attracting private investors to the education system and establishing private educational institutions;

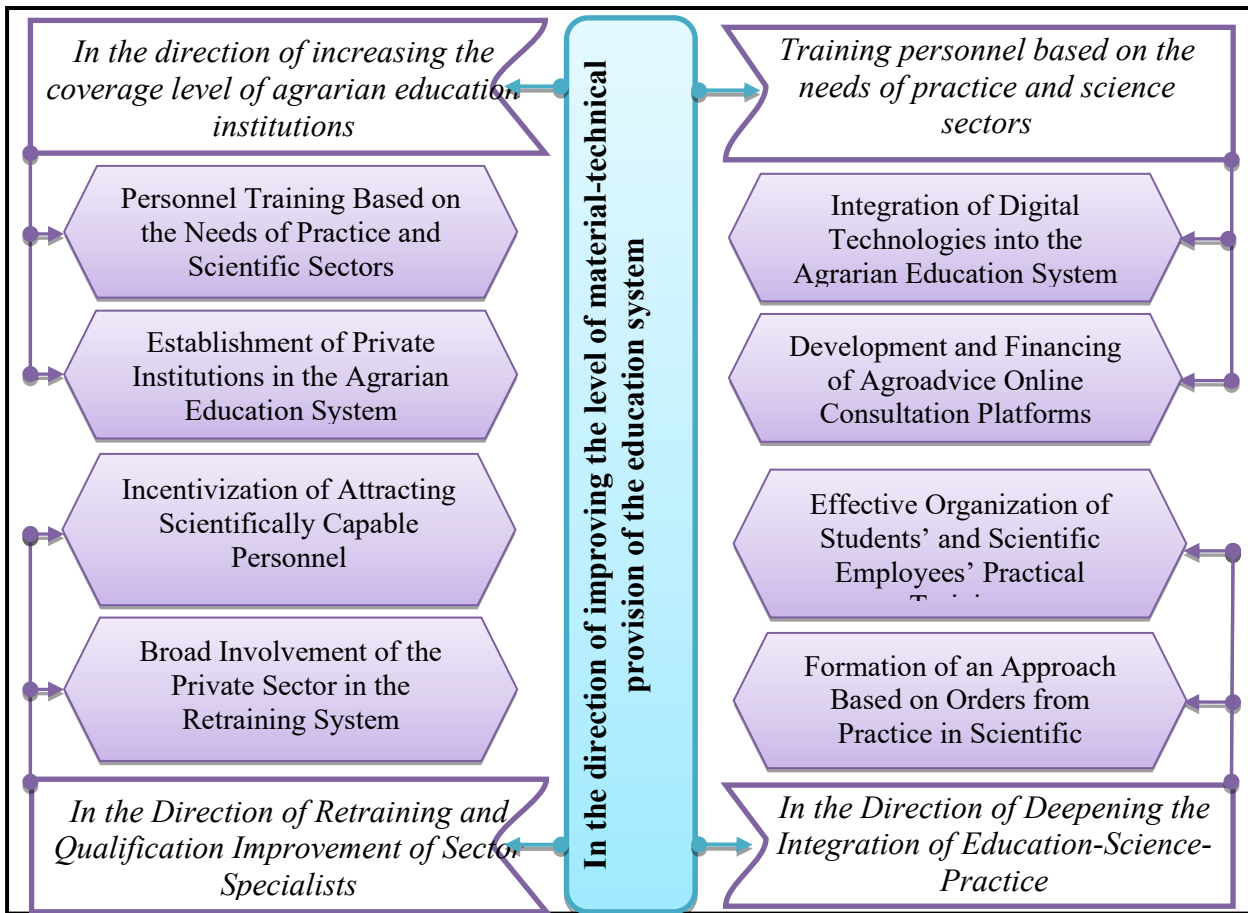


Figure 3.1. Directions of state support for the system of training highly qualified personnel in the agrarian sector

- taking into account the specific characteristics of each sector, the increasing demand for narrow-range specialists and their deeper knowledge acquisition, scientific research developments, and strengthening the integration of science-practice, etc.

Considering the above most important situations, in our opinion, the main directions that are important to focus on for state support of the system of training and providing qualified personnel for agriculture are reflected in the following Figure 3.1.

In general, the mechanisms of state support for any sector or field of the economy in market conditions, in turn, create the basis for the effective use of financial sources of private investors, and this system is organized through public-private partnership on a contractual basis in the practice of developed countries (Figure 3.2).

Considering the above, in our opinion, as one of the directions of state support for the system of training highly educated personnel and their retraining in the agrarian sector, it is appropriate to rely on special approaches, including in the establishment of private higher education institutions. Indeed, in recent years in our country, foreign private higher education institutions or their branches in our country's HEIs are being established. Therefore, in evaluating the effectiveness of investments made in state support for the system of training highly educated qualified specialist personnel in the agrarian sector, the "PMP" (plus-minus+plus) model widely used in foreign countries is considered important. However, in this model, the result of investments and support levers made in the education sector by the state or private sector may not be visible in a short time and may even give a "minus effect" for a certain period, which is assessed as a natural situation, and during this period no evaluation is given to the effectiveness of the results³¹.

³¹ <https://www.thesimpledollar.com/investing/science-emotions-and-investing/>

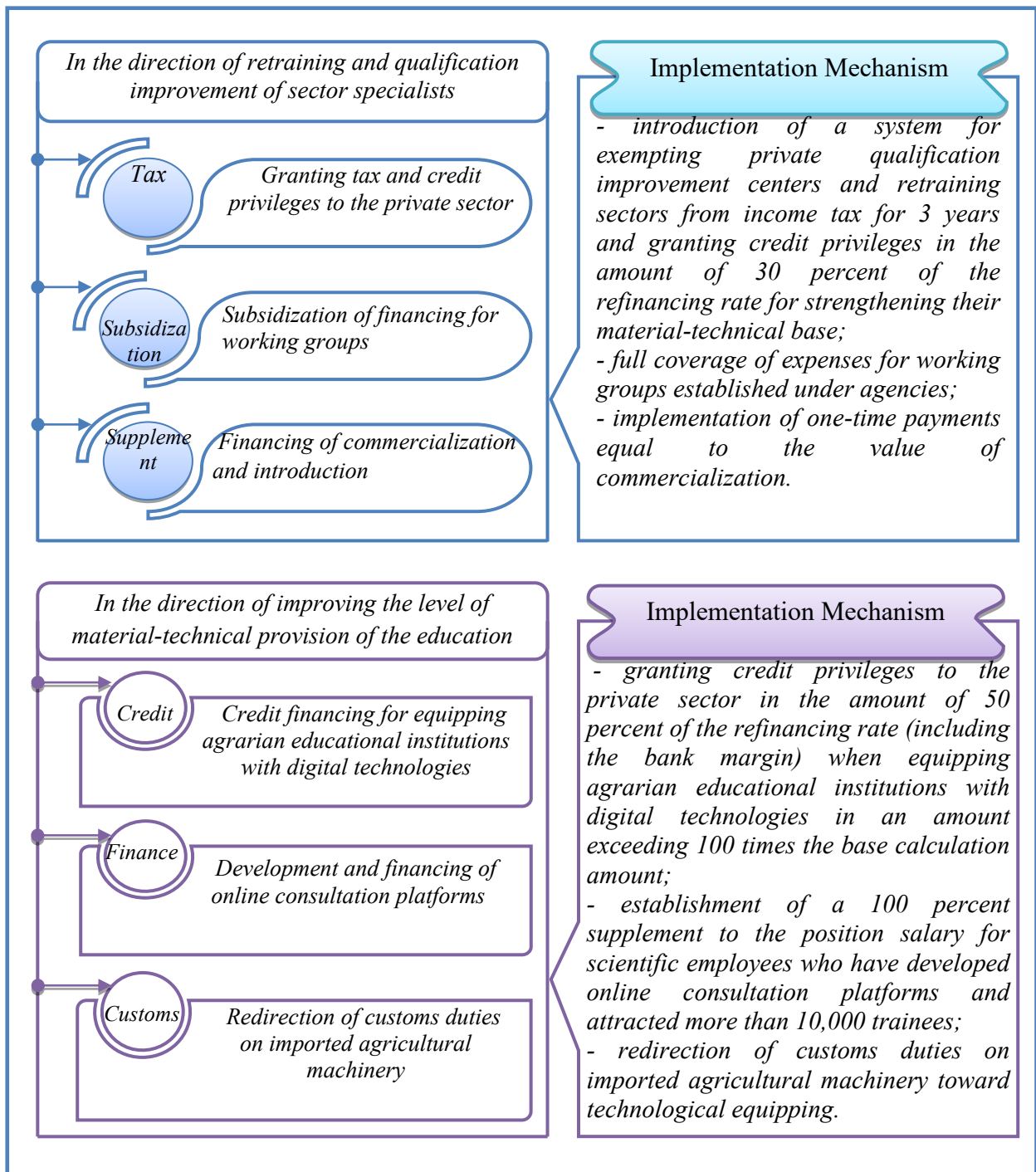


Figure 3.2. Mechanisms of State Economic Incentives for Personnel Training and Qualification Improvement in the Agrarian Sector

Thus, the mismatch of interests between the parties, the fact that the effectiveness of relations does not become immediately visible in the short term or turns into short-term practice, leads to the emergence of the

following negative situations between scientifically capable employees and employers. In particular:

- in most labor contracts concluded between scientific employees and employers, issues related to business trips are not provided for or are not fully disclosed;

- in the majority of cases, either the employee or the employer fails to comply with the contract terms, and the contract is not revised annually taking into account the rate of increase in prices for goods and services;

- the procedures and normative documents related to business trips for scientific employees establish minimum amounts for sending them on business trips and covering related expenses, etc.

Because the education, knowledge, qualifications, experience, and scientific developments of a scientific employee constitute his/her intellectual wealth, and this wealth yields results only when there is material (or moral) interest in its utilization. Therefore, it is appropriate to introduce one of the following methods of state regulation and economic incentivization to address such situations:

- transfer to the private sector of types of services such as providing scientific-practical advice and assistance to agricultural specialist personnel in the regions, their training and retraining, and development of sources and mechanisms for financing them;

- formation of working groups composed of experienced and scientifically capable personnel by sector and direction, and creation of an incentivizing system for their financing;

- in the commercialization or practical introduction of scientific-research results, paying special attention to financing issues such as retraining, training in the use of scientific results, and promotion through the estimates and project documents developed, among others.

In the first case, it is appropriate to introduce a system of exempting private qualification improvement centers and retraining institutions from income tax for 3 years, directing the tax-exempt funds toward material-moral incentives and strengthening their material-technical

base, as well as granting credit privileges for these purposes. In this regard, an analysis of economic indicators related to the establishment of private qualification improvement centers was conducted (Table 3.1). According to the analyses, under conditions where various privileges are provided by the state, the expenses related to organizing training courses twice a month in stationary or mobile forms by the private sector can be recovered in 3.3 years, while without privileges — in 6 years. Most importantly, through temporary tax holidays and other financial support measures, state expenditures are reduced while creating conditions for higher quality and efficiency of services provided by the private sector under competitive conditions.

In the second case, working groups are formed on a competitive basis and from initiative scientifically capable personnel by sector and direction. In this regard, it is required to introduce a transparent and open system for their financing, as well as to develop precise amounts and mechanisms of payment based on the results of qualification improvement and retraining of agricultural employees in the regions by the working groups.

Table 3.1

Economic Indicators of Establishing a Center for Qualification Improvement of Agricultural Employees by the Private Sector in Qashqadaryo Region (prices as of 2020)

№	Indicators	Unit of Measurement	Quantity
1.	Trainee capacity	persons	60
2.	Course duration	days	30 (15 days × 2 times)
3.	Number of directions	units	2
4.	Jalb etiladigan sohadagi mutaxassislar soni yetuk	nafar	3
	Total income	thousand soums	52520
5.	Total expenses	thousand soums	34735
5.1.	Of which, total with salary deductions	thousand soums	17000
5.1.1.	For center employees	thousand soums	11000
5.1.2.	For involved specialists	thousand soums	6000
5.2.	Elektr energiyasi sarfi	thousand soums	295

5.3.	Depreciation deductions		thousand soums	4166
5.4.	Taxes and mandatory payments	Without privileges (5%)	thousand soums	1672
		With privileges (0%)	thousand soums	0
5.5.	Credit expenses	Commercial credit (28%)	thousand soums	18652
		Preferential credit (8%)	thousand soums	10274
5.6.	Other expenses		thousand soums	3000
6.	Jami foyda		thousand soums	17785
7.	Payback period		months	40

When involving scientifically capable personnel in working groups, it is appropriate to preserve their base salary at the main place of work, base additional payments on paid services in cases of excess workload and detachment from position duties, and ensure they occur with the consent of the parties and free from administrative interference.

Currently, employees of scientific-research institutes are involved to provide scientific-technical advice and guidance to agricultural producers in the regions. This creates opportunities for the rapid introduction of the institute's scientific developments and innovative novelties into practice and for conducting pilot experiments. However, it should be noted that the lack of precise methodological foundations, mechanisms, and normative procedures related to the commercialization of existing scientific developments, as well as their non-implementation, results in extremely slow integration between producers and researchers in the commercialization of innovative novelties.

In the experience of developed foreign countries, special attention is given to increasing the scientific-technical knowledge and skills of agricultural producers, incentivizing the practical application of modern innovative developments, and their commercialization. At the initial stages, both buyers and sellers equally benefit from state incentive mechanisms. In particular, buyers receive tax and credit privileges corresponding to the financial resources spent on introducing innovative developments, while sellers gain the opportunity to receive one-time payments in the amount of commercialization.

Under current conditions where new mechanisms for financing innovative developments are being introduced, in our opinion, the Ministry of Innovative Development, as the leading body coordinating scientific-research activities and pursuing a unified state policy, must play an important role in the commercialization of scientific-research results aimed at forming modern knowledge and skills among agricultural employees. Incentives for scientific employees from the funds of the “Fund for Support of Innovative Development and Innovative Ideas” established under the Ministry should be carried out in the form of a one-time payment equal to the amount of commercialization, exempt from all taxes and mandatory payments. This procedure will serve as an incentive mechanism for the scientific employee to introduce his/her scientific-research results into practice, deliver them to agricultural employees, improve qualifications, and train in technological aspects related to the use of the novelty.

The condition of the material-technical base of higher education institutions directly affects the ability of trained highly qualified personnel to adapt to new forms of agrarian entrepreneurship, modern methods, and tools, and its continuous improvement and modernization creates the foundation for personnel to quickly adapt to practice. However, the insufficient financial capacity to continuously equip educational institutions with modern equipment and educational-experimental devices requires new economic approaches in the sector. Therefore, in our view, it is necessary to focus on attracting private entrepreneurs operating in agriculture or related to it to higher education institutions on the basis of public-private partnership and to develop methods for their economic incentivization. Based on the experience of developed countries and ongoing agrarian reforms in our country, in our opinion, the private sector can be incentivized, for example, by granting credit privileges in the amount of 50 percent of the refinancing rate (including the bank margin) when equipping agrarian higher education institutions with digital technologies in an amount equivalent to 100 times the base calculation rate.

The emphasis on developing the digital economy, the adoption of the relevant state program, and its urgency in the context of the pandemic have led to a sharp increase in the level of use of digital technologies between producers and service providers. Particularly significant results have been achieved in areas such as conducting distance learning courses and seminars, providing consultations and skills. In the future, it is appropriate to pay special attention to the development of distance education, especially through online consultation services, to continuously improve the knowledge and qualifications of producers and the system of personnel retraining. For this purpose, it is necessary to incentivize scientific employees who have developed online consultation platforms and attracted more than 5,000 trainees with a 100 percent supplement to their position salary. It is proposed that these funds be allocated to the development fund of the organization by introducing relevant amendments to Resolution of the Cabinet of Ministers dated December 24, 2019, No. 1030 “On the Procedure for Additional Payments to Employees with Scientific Degrees Engaged in Scientific, Scientific-Pedagogical, and Labor Activities in State Organizations in the Fields of Science and Education”³².

Along with this, it is proposed to direct customs payments for imported agricultural machinery and technologies aimed at modernizing the material-technical base and educational laboratories of agrarian higher education institutions toward production modernization. In this case, financial resources can be allocated to the extra-budgetary funds of the institution.

It is known that today there are discontinuities between higher education, science, and production, i.e., their integration is not ensured. Scientific-research institutes are not sufficiently involved in the personnel training process in higher education, and scientific research in them is conducted without stemming from the real needs of economic sectors. The lack of systematic training of highly qualified scientific and

³² <https://lex.uz/docs/4662181>

scientific-pedagogical personnel leads to a decline in the scientific potential of higher education institutions.

Therefore, ensuring mutually beneficial integration of education, science, and practice, as previously emphasized, must be recognized and addressed as one of the urgent problems of today and especially the future. The mechanism for the development of integration based on market laws is to ensure the independent mobility of participants on the basis of material interest; therefore, by studying the main shortcomings existing in current practice regarding material incentivization of entities participating in integration, we consider it possible to introduce the following support measures (Figure 3.3).

It is known that since 2016, applicants have been admitted to higher education on a targeted admission basis. However, this also does not fully meet the demand for highly qualified personnel in the regions. In this regard, not only organizational but also economic issues await resolution, as the trained highly qualified specialists face obstacles to the effective use of labor resources due to the insufficient availability of jobs, salaries, and conditions at the required level for personnel in these regions.

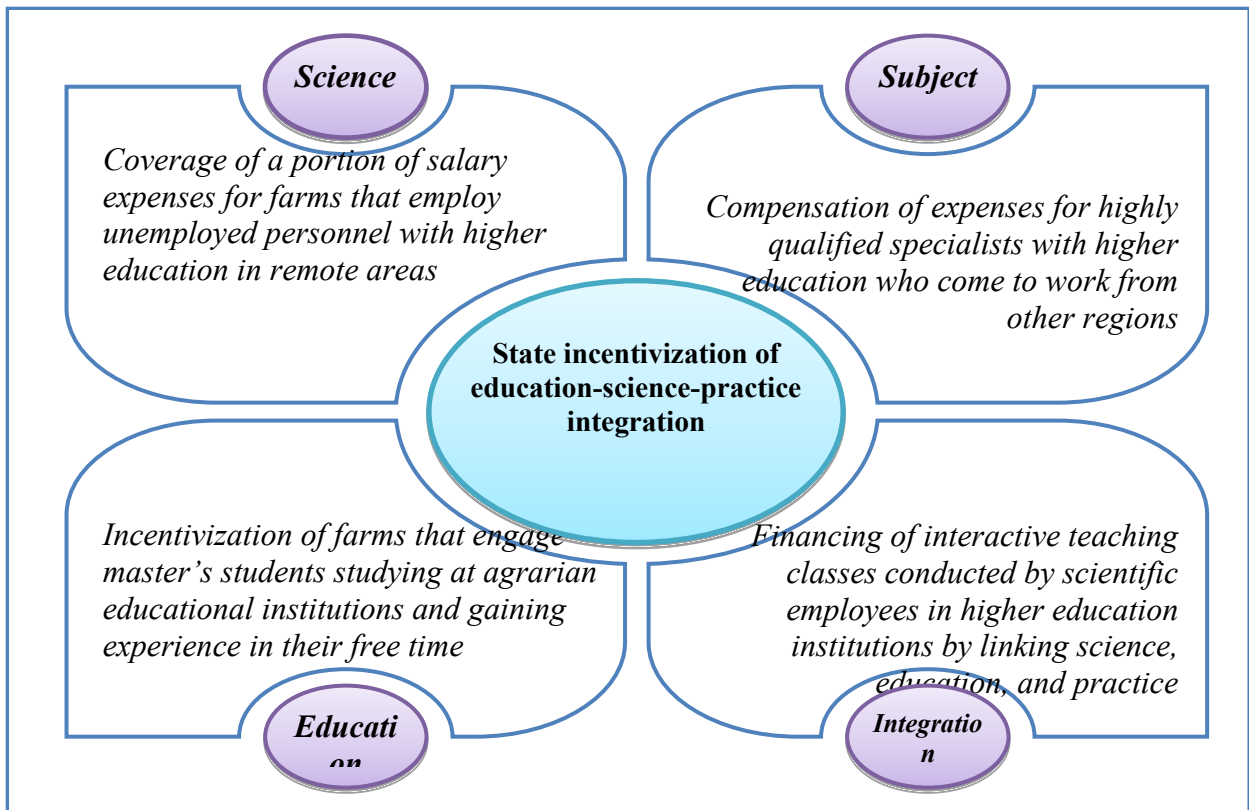


Figure 3.3. Directions of Education-Science-Practice Integration and the System of State Incentives for Them

Because research findings indicate that managers of farms in remote areas show interest in increasing production efficiency through the broad and rapid implementation of scientific achievements by employing personnel with higher education; however, they face organizational-economic difficulties in providing the necessary salary levels and conditions for such personnel. Therefore, in our view, it is appropriate to provide economic incentives for farms in remote areas that employ personnel with higher education in agricultural specialties by having the state cover 50 percent of the salary expenses for such personnel (or an amount not exceeding five times the base calculation amount) and exempt them from salary-related deductions.

It is well known that the dependence of agriculture on natural-climatic conditions and resources not only necessitates the cultivation of certain types of products in specific regions but also directly influences their agro-technologies. This, in turn, requires narrowly specialized

qualified experts for non-traditional crops newly introduced to a given region. Within the framework of state educational programs, it is possible to train personnel with higher education in narrowly specialized fields on a targeted quota basis for such regions; however, these graduates face difficulties in finding employment matching their profession and in applying their knowledge and skills in practice. Moreover, the targeted quota system negatively affects the admission of knowledgeable applicants to higher education institutions on the basis of healthy competition.

Under such conditions, in our opinion, it is more appropriate not to rely on targeted quotas, but rather to admit applicants on the general principle and according to interrelated specialties, while incentivizing graduates to work in remote areas. In addition, it is necessary to compensate and incentivize the expenses of highly qualified specialists with higher education who come to work from other regions — particularly monthly salaries, living, or transportation costs — by raising them to the level of incentives corresponding to the performance indicators of the qualified specialist's activity, based on a tripartite agreement. Furthermore, it is of great importance to apply incentive mechanisms to ensure the integration of education and practice by involving master's students studying at agrarian educational institutions, who are gaining experience in their free time, in the production of agricultural products. Because involving students who do not yet possess sufficient knowledge, skills, and work experience in production to a certain extent creates opportunities to ensure employment for surplus labor in the labor market. In such cases, it is possible to introduce an incentive procedure by covering a certain portion of the expenses related to involving students and master's students in production from relevant funds or by directly paying such funds to the students.

Taking into account the above circumstances and requirements, in our view, one of the modern methods for coordinating the agrarian labor market and ensuring employment of personnel is the development of outstaffing services and the introduction into practice of mechanisms for

state incentives for entities (agencies, firms, etc.) engaged in this activity, which is of significant importance. Outstaffing, unlike outsourcing, is a type of service provided by an employer entity temporarily assigning its employees — with their consent — to other legal entities to perform specified labor duties for a defined period, based on tripartite labor contracts or collective agreements³³.

It is known that the outstaffing service began to take shape in the world economy, particularly in the United States, in the 1960s, and by 1990 its role in the economy and social life had increased significantly following developments in management. The legal foundations created for this service in the 1980s–1990s were further improved until 2000. At present, the United States is one of the leading countries in the use of this service, while in Russia demand for it began to emerge from 1998 onward due to the effects of economic crises.

The intensive development of the economy, the rapid introduction of innovative goods, developments, and technologies, the intensification of problems related to ensuring employment, and similar trends make the use of outstaffing services — including in agriculture — one of the key tasks on today's agenda. To provide organizational support from the state for this service, it is necessary to apply the following mechanisms and methods for promoting outstaffing services, training and retraining qualified personnel suitable for this type of service, and incentivizing the relevant system (Figure 3.4).

It is known that today the financial weakness of agricultural enterprises, especially the majority of farmer and peasant farms, prevents the employment of separate specialists for each direction, while the seasonality of production does not allow paying salaries to engaged employees throughout the year, thereby negatively affecting the provision of the sector with qualified personnel.

³³ <https://lex.uz/docs/5055690>

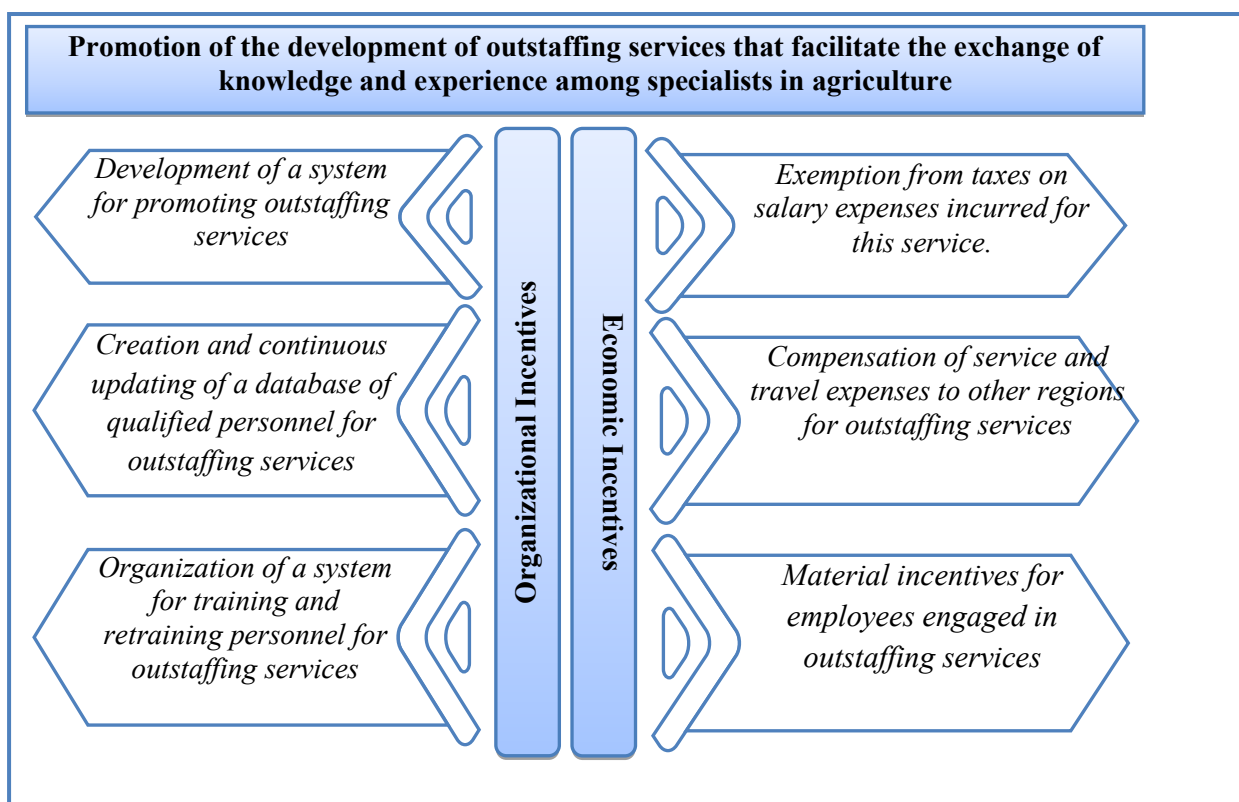


Figure 3.4. Ways to Develop Outstaffing Services for the Exchange of Knowledge and Experience among Specialists in Agriculture

Therefore, in our opinion, to provide economic incentives for outstaffing services, it is necessary to introduce mechanisms such as exempting salary expenses from taxes, fully covering travel service expenses to other regions, and providing material incentives to employees engaged in this service. These mechanisms and measures, in turn, create the following opportunities through the development of outstaffing services in agriculture. In particular:

- reduction of costs associated with searching for personnel possessing modern knowledge and experience in agricultural production;
- decrease in the level of personnel shortage in farms;
- simplification of engaging highly qualified employees in seasonal work in agriculture;
- prevention of overloading one worker with multiple duties in agricultural enterprises by filling vacant positions with low demand in the labor market;

-enabling several agricultural enterprises to jointly use the services of one qualified employee;

-achievement of rapid dissemination of modern knowledge, achievements, and advanced experience among agricultural producers, among others.

In conclusion, it should be particularly emphasized that among the important future tasks are the provision of Uzbekistan's agriculture with qualified personnel, state support for the system of retraining and qualification improvement of existing personnel, mechanisms for material and moral incentivization of highly qualified personnel with higher education in the implementation of innovative scientific-research results, and the organization and introduction of new outstaffing services in a manner consistent with the interests of the parties.

3.2. Directions for Improving the System of Training Qualified Personnel in Professional Specialties in Agricultural Sectors

In recent years, taking into account the prospects for the development and specialization of agricultural sectors by region, targeted and address-specific measures have been implemented aimed at training highly qualified personnel in in-depth specialties in the field, introducing international education standards and information-communication technologies. The reforms carried out have made it possible to improve the quality of the educational and training process, enrich it with innovative content, and create opportunities for students to develop skills in independently acquiring new knowledge.

Especially noteworthy are the Resolution of the President of the Republic of Uzbekistan dated July 30, 2020, No. PQ-4795 "On Measures to Further Improve the Agrarian Education System" and the Resolution of the Cabinet of Ministers dated March 19, 2020, No. 172 "On Additional Measures to Further Improve the System of Retraining Reserve Personnel for the Agro-Industrial Complex and Raising Their Qualifications," adopted since 2017, which are of significant importance

and outline the strategic tasks for the development of this sector. In particular, the directions for addressing these tasks include further improving the quality of personnel training in agriculture in the future, strengthening students' professional skills through the organic integration of theoretical and practical classes, equipping higher education institutions in agriculture with modern educational-production equipment, machinery, and tools, as well as revising the content of specialized subjects and curricula based on modern educational plans.

It should also be emphasized that special attention is given to ensuring the integration of science, education, and production in the agrarian sector in relation to the supply of personnel in agriculture, their training and retraining, the introduction of modern information and digital technologies into the educational process, and improving the system of training personnel with sufficient knowledge and skills in advanced foreign experience and agro-technologies, taking into account the prospects for regional development.³⁴ In this regard, as previously noted, the “Agribusiness and Management” center for retraining managerial and specialist personnel for agro-industrial sectors and raising their qualifications was established as a state institution under the Tashkent State Agrarian University, and its branches in Samarkand; their main tasks were defined.

Furthermore, the adoption of Resolution of the Cabinet of Ministers of the Republic of Uzbekistan dated December 15, 2020, No. 788 “On Approval of the Strategy for Innovative Development of the Agrarian Education System until 2030” has provided a very important legal basis for diversifying the higher education system operating in the agricultural sector, defining its priority directions, and elevating the process of training highly qualified specialist personnel with modern knowledge and high moral-ethical qualities to a qualitatively new level based on advanced educational technologies.

³⁴ refers to the Presidential Resolution PQ-4795 of July 30, 2020, as cited in the original.

Based on the above resolutions and other normative-legal documents, in recent years, a number of modern forms and methods of education have been introduced into the system of training and retraining qualified personnel for the agrarian sector. In particular:

- training personnel with modern knowledge in the application of innovative resource-saving technologies in agriculture, the introduction of “smart agriculture” and digitized agro-technologies;

- gradual introduction of the credit system in education;

- establishment of special groups for talented students selected from second-year students, trained based on separate educational programs;

- commencement of the educational process for master's specialties in agriculture from January;

- introduction of special three-year educational programs in bachelor's degree for graduates of technical colleges;

- implementation of educational programs for training associate degrees (Associate degree) integrated with bachelor's degree directions in higher education;

- graduates of associate degree programs being granted the right to enroll in a special three-year program in corresponding bachelor's degree directions at Tashkent State Agrarian University and its branches without entrance examinations through interview, with the obligation to work continuously for three years after graduation in accordance with distribution;

- establishment of the agrobiological faculty as an independent legal entity within the structure of Tashkent State Agrarian University;

- introduction of modern corporate governance methods, in particular ERP automated accounting systems, GMS production management, and BIQ quality management systems;

- establishment of special groups among third-year students for training specialists with necessary knowledge and skills in citrus, subtropical, and tropical crop cultivation technologies;

- organization of training courses for arborists (tree care specialists) for landscaping departments and other relevant organizations;

- introduction of information systems in the organization and control of educational and management processes, creation of convenient conditions through the application of distance learning forms for students' independent education;

- implementation of joint educational programs (double degree) in agriculture;

- widespread introduction of modern technologies and interactive teaching methods (E-Minbar electronic platform), development of students' independent educational and practical activities (case studies, coaching, etc.), as well as ensuring remote interaction between teachers and students (webinar technologies), and modular, object-oriented, and dynamic educational environments (Moodle) aimed at developing innovative and analytical thinking;

- successful graduates of technical colleges continuing their studies from the second year in corresponding bachelor's degree directions at higher education institutions in agriculture based on individual interview without entrance examinations;

- setting the duration of master's training in agriculture at 1 year, and for talented students engaged in scientific and scientific-pedagogical activities — at 2 years, among other new methods and tools being introduced.

However, the current tasks — such as diversifying agricultural production in sectors, establishing property relations in line with market demands, strengthening inter-farm cooperation ties, digitizing the sector, and organizing smart agriculture based on IT technologies — require a fundamental qualitative improvement of the personnel training and retraining system. Moreover, due to the fact that the ongoing reforms in the sector, rapidly introduced modern intensive resource-saving technologies, and advanced practices are not adequately reflected in students' curricula, methodological teaching aids fully meeting modern requirements for educational directions are not provided, and the educational-laboratory base of higher education institutions in agriculture is morally and physically outdated, students do not acquire modern

knowledge and skills, resulting in difficulties in their employment in their specialty.

Due to the lack of in-depth analysis of supply and demand for specialist training in the agrarian sector, gaps have emerged in the labor market, creating a need for highly qualified personnel with higher education in directions of introducing innovative and information-communication technologies into the sector. In addition, due to the insufficient use of advanced experiences from foreign research and higher education institutions in continuously raising the scientific potential, professional knowledge level, and practical experience of professors and teachers in higher education institutions, as well as ensuring their professional superiority and mastery, gaps have arisen between students and teachers. As a result, shortcomings in training scientific and scientific-pedagogical personnel in line with labor market requirements and directing scientific research toward solving urgent practical problems negatively affect the modernity and effectiveness of scientific activity.

Furthermore, students' industrial and qualification internships are not sufficiently linked to the production processes of sectoral enterprises and organizations at the required level; moreover, students' tendency at the end of this process to merely obtain relevant documents serves as an obstacle to graduates acquiring sufficient practical skills to a certain extent. Another shortcoming is the absence of assigned responsible staff for students undergoing internships at enterprises and organizations, and the lack of defined obligations, which limits the opportunities to enhance students' practical knowledge and experience. Additionally, due to the lack of a systematic organization of career guidance activities among rural youth studying in general secondary schools, academic lyceums, and technical colleges, mechanisms for selecting talented youth for admission to higher education institutions in agriculture are absent.

Research shows that the effective scientific-research results achieved over many years through scholars' investigations have not been sufficiently introduced into agriculture and its sectors, commercialized

scientific developments, incentivized researchers, systematically involved talented youth in scientific-research work, and ensured the deep integration of education, science, and production; these problems remain unresolved. Moreover, the share of non-specialty subjects in higher education curricula that do not correspond to the specialization remains high. Currently, cooperation with buyers such as clusters and cooperatives, modern greenhouses, intensive resource-saving technology entities, and modern livestock complexes in targeted personnel training does not fully meet modern requirements.

The existence of the above problems can largely be explained by the insufficient formation of competition as well as supply and demand market laws in the current higher education system, since in such conditions great attention is not paid to the quality of the “product.” This problem can be solved by establishing non-state educational institutions that ensure a competitive environment in the higher education system. Because not only state educational institutions but also employing enterprises and organizations are not sufficiently interested in the quality of trained personnel — this remains one of the most regrettable situations in higher education.

At the same time, there is a need for fundamental improvement of the deep integration of science-education-production, strengthening close cooperation with agrarian sector entities in personnel training, and the system of promoting and introducing scientific-research results.

Currently, there are no modern private structures in our country for disseminating knowledge and innovations related to agriculture. Creating a modern innovative integrated and flexible system in the fields of agriculture, food supply, education, retraining and qualification improvement, and information-advisory services is the main goal of this priority direction. Therefore, training, retraining, and qualification improvement of workers and professionally qualified personnel operating in the sector to solve extremely important tasks such as applying new modern intensive methods and innovative resource-saving

technologies in agricultural production, digitizing production processes, and introducing “smart agriculture” is an urgent task.

It is known that in the labor process, not only material-spiritual values satisfying people's certain needs are created, but people themselves also continuously acquire experience, new knowledge and skills over the years, and enhance their creative approach abilities. For this, it is of great importance that the state creates all necessary conditions corresponding to each achieved level of production for the successful labor activity of employees, raising their required knowledge, experience, and professional skills. Employees who have acquired modern knowledge within innovative requirements themselves improve their work styles and create new materials, tools, technologies, and services. All this elevates the production process to a new quality stage and, in turn, requires highly professionally prepared employees..

Thus, in the process of production development, the primary place is occupied by the individual with high cognitive abilities and potential, and most importantly, professional mastery and skill level. Therefore, cooperatives and clusters being established and operating today, as integrated modern forms of production, feel the need for qualified personnel. Hence, in our view, before introducing modern forms and methods into the agrarian education system, it is appropriate to test them and introduce them taking into account our country's labor market and long-standing farming traditions, ensuring their practical application by considering all influencing factors, material-technical capabilities, and knowledge levels.

For this purpose, there is a need for a structure that studies and researches the introduction and testing of modern forms of qualified personnel training, ensures the organic connection of trained personnel with practice, and continuously improves methods and tools for training competitive personnel in the labor market based on producers' demands. The establishment and management of such a structure must encompass several stages, and it is appropriate to develop these stages correctly and sequentially first, then approach them comprehensively. In this regard, in

our opinion, the structure for testing and organizing modern education forms and methods related to agriculture should cover the following stages (Figure 3.5).

On the other hand, as emphasized, the possibility arises of establishing specialized centers that develop and test the stages of introducing modern education forms in agriculture in the correct and sequential order, corresponding to higher education system requirements, and their activity directions are aimed at solving existing problems in all agricultural-related entities. For example, according to monographic research results, it can be stated that today an entrepreneur who has established a modern greenhouse must not only have perfect knowledge of the specific characteristics and agro-technologies of agricultural production in the greenhouse, but also know how to combat crop diseases and pests using chemical and biological agents, correctly select seeds and seedlings, conduct marketing research, manage the greenhouse through computer programs, use modern water-saving irrigation methods and technologies, and in some cases partially repair them.

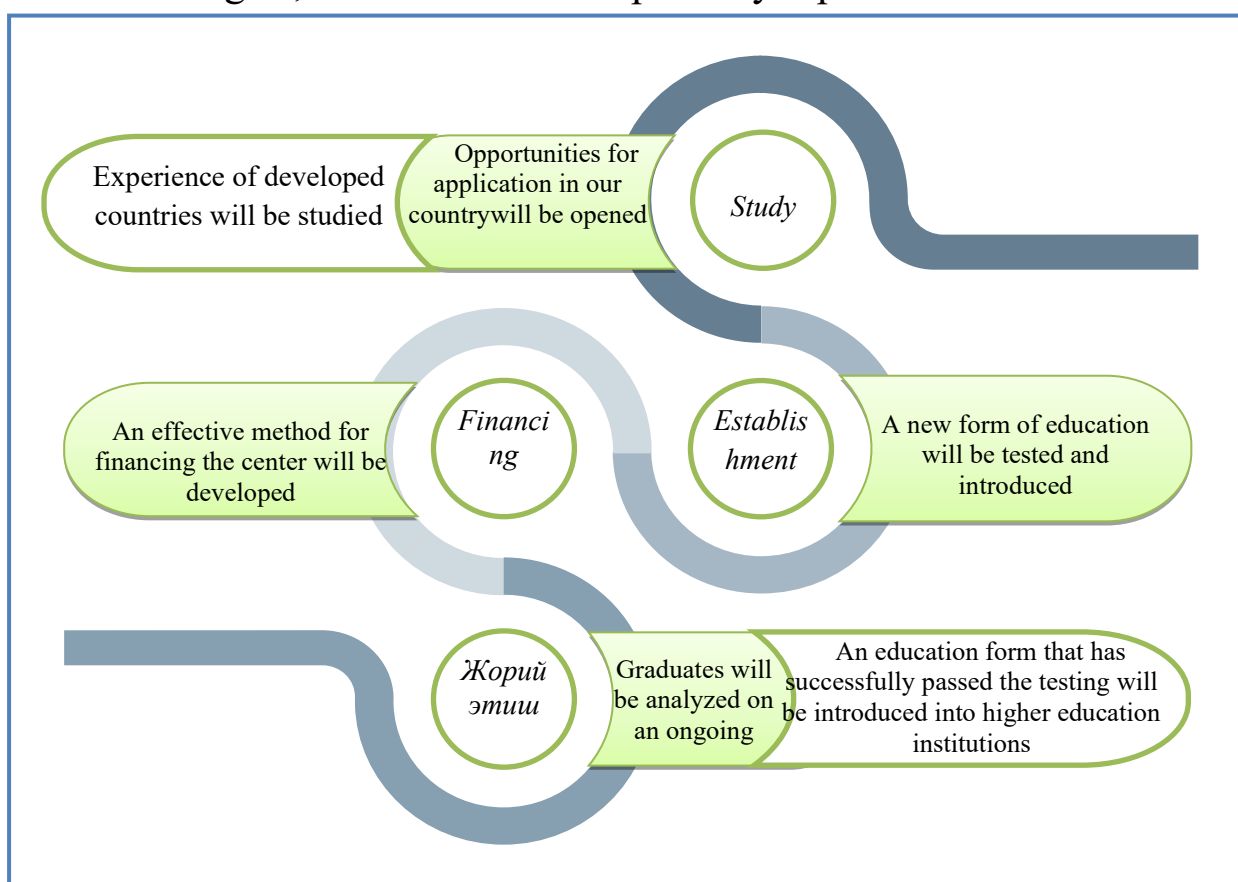


Figure 3.5. Stages of Testing and Introducing Modern Educational Forms in Agriculture

In this process, the role of the aforementioned centers is of particular importance. Therefore, according to our proposal, it is necessary to establish the “Center for Testing and Introducing Modern Educational Forms in Agriculture” and to expand the directions of its activities in the regions (Figure 3.6).

This center, in cooperation with scientific-research institutes operating in various agricultural directions, agro-clusters, cooperatives, agrofirms, and entrepreneurial entities, as well as agrarian higher education institutions and related local and foreign higher education institutions and private educational establishments, will engage in testing and introducing modern educational forms and methods being implemented therein.

Although certain types of centers are mentioned for establishment in the normative-legal documents studied above, priority in them is given to agro-technologies for agricultural product cultivation. In the center we propose, the main focus is placed on creating opportunities for comprehensively addressing, on the basis of subject integration, issues such as achieving the highest level of automation in agricultural production under the current conditions of developing digital economy, mitigating and adapting to the effects of climate change, increasing crop yields and livestock productivity, and enhancing production efficiency through the introduction of innovative technologies serving these goals, thereby organizing smart agriculture. In our opinion, this center can be established within the structure of Tashkent State Agrarian University, which serves as the anchor higher education institution for agricultural sector branches, and it will be managed by a center director appointed by and subordinate to Tashkent State Agrarian University.

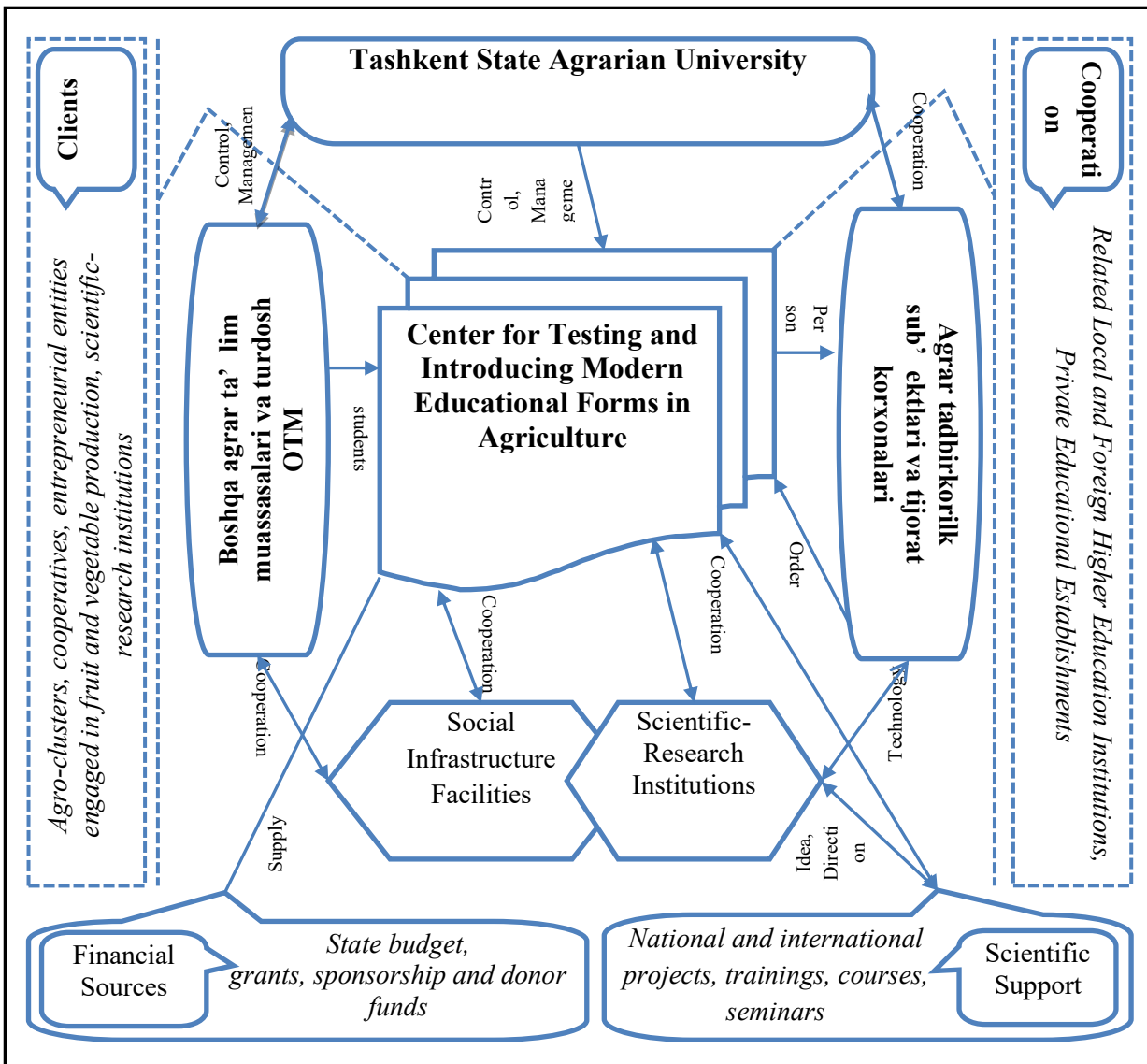


Figure 3.6. Center for Testing and Introducing Modern Educational Forms in Agriculture

The center, in turn, will have an organizational-management structure consisting of a director, his/her deputy, heads of 5 departments, and a model site (Figure 3.7).

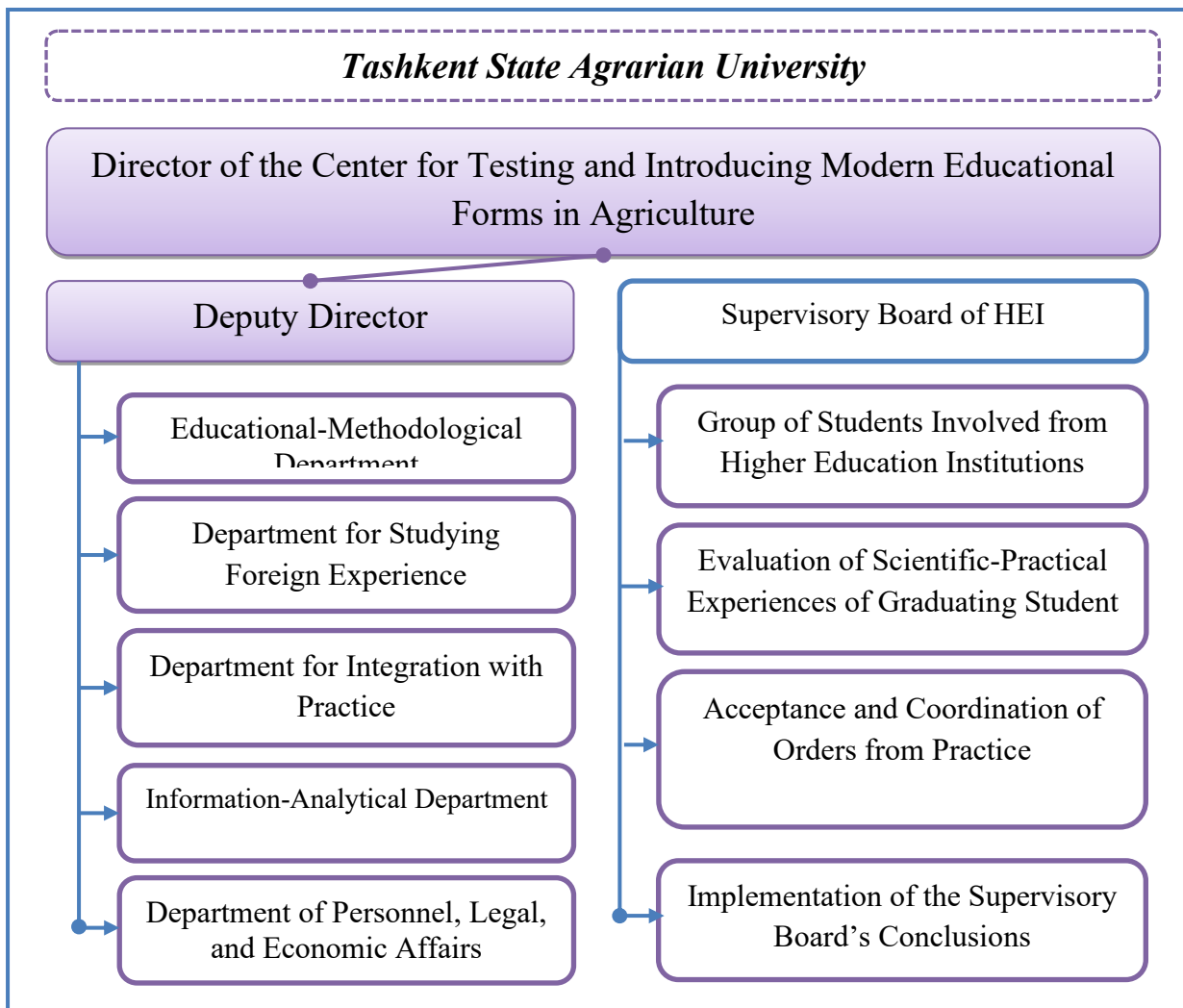


Figure 3.7. Organizational Structure of the Center for Testing and Introducing Modern Educational Forms in Agriculture

The main functions of the departments of the Center for Testing and Introducing Modern Educational Forms in Agriculture may include the following. In particular:

- continuous study of the demand for personnel in emerging professions resulting from changes in modern forms of ownership and management systems in the agrarian sector under market economy conditions;
- study of modern agrarian education forms and pathways for their introduction in countries with developed agricultural sectors;
- organization and coordination of training courses and trainings on topics of innovative development of agriculture;

- systematic organization of practical demonstration seminar-trainings at model sites, testing of innovative developments;
- preparation of brochures, booklets, flyers, and infographics dedicated to current issues in agriculture in accordance with market relations requirements, and their dissemination to target consumers;
- collection, analysis, and monitoring of information on the demand for qualified personnel in each direction of agriculture by region;
- determination of personnel supply based on current and prospective needs, by conducting statistical analyses of production and economic indicators related to agricultural sectors;
- professional training, retraining, and qualification improvement of personnel with deep mastery of cooperation and integration relations in agriculture, as well as introduction of measures to enhance personnel's practical experience directly within organizations throughout their entire professional activity;
- establishment of mutual cooperation with foreign and international organizations in the training of qualified personnel, testing and application of their innovative developments and modern experiences in the republic's practice;
- involvement of highly qualified specialists possessing scientific-practical knowledge and skills in the educational process for training students, among others.

The center's activities will be financed from state budget funds, various international grants, sponsorship, donors, various foundation funds, concessional and targeted bank credits, funds received from tuition fees, and other sources not prohibited by legislation. In addition, it is appropriate to finance the center also from the funds of higher education institutions that have directly introduced these modern forms and new methods, and for this purpose the following calculation method is proposed:

$$MM = Ts * TKM * K$$

Here, MM – amount of financing for the center, million soums;

Ts – number of students involved for the purpose of studying the modern educational form at the center, persons;

TKM – main tuition contract amount for students admitted to the educational institution, million soums;

K – coefficient accounting for and coordinating the study period at the center, i.e., representing the ratio of the total number of study days in the academic year to the number of study days in 2 semesters, accepted as equal to 0.4.

Furthermore, in cases where producers interested in the aforementioned modern educational form take the initiative and when their demand for personnel is introduced, it is possible to attract financial resources from agrarian entrepreneurs to the center, and in such cases the following formula is proposed:

$$MM = Hs * Iha * Kiu$$

Here, MM – amount of financial resources directed by the entrepreneur to finance the center, million soums;

Ts – number of qualified employees who studied the modern educational form at the center and were employed by the enterprise, persons;

Iha – amount of deductions to the wage fund based on the calculated monthly salaries of employees, million soums;

Kiu – adjustment coefficient according to the position of employees hired by the enterprise. If the employee is hired for a position related to the central management apparatus in the relevant profession, this coefficient equals 10, or if hired for an auxiliary employee position – equals 5.

In general, in today's conditions where the issue of training talented personnel capable of using modern management forms being introduced in agriculture and innovative equipment-technologies, as well as continuously raising their qualifications, is becoming increasingly

urgent, the establishment of this center creates opportunities to achieve the following positive outcomes. In particular:

➤ effective exchange of knowledge, skills, and competencies will be ensured in the training of qualified personnel required for the agricultural sector by broadly involving the private sector;

➤ professional training and qualification improvement of personnel will be achieved taking into account the current and prospective demand for qualified personnel in the agricultural sector;

➤ the demand for personnel in the agricultural sector will be determined in accordance with the specialization and diversification of enterprise production corresponding to the natural-climatic and soil conditions of regions, long-term development trends, and requirements of the human capital market;

➤ opportunities will emerge to benefit from the training of specialist personnel possessing professional mastery and skills — the unique intellectual “property” of the country — engaged in activities that organically link science and practice in various higher education institutions;

➤ highly qualified managerial-specialist personnel capable of effectively organizing their activities through the application of modern digital innovative technologies and information-communication tools, which are important in forming the “smart agriculture” system, will be trained;

➤ deep integration of education, science, innovative activity, and production in the training of qualified personnel for the agricultural sector will be ensured;

➤ in obtaining orders for personnel required by the agricultural sector, priority will be given not to state sector organizations, but to private economic entities, namely enterprises, agro-clusters, cooperatives, modern-type livestock complexes, greenhouses, and entrepreneurial entities producing fruits and vegetables.

In conclusion, the center proposed in this research work creates the opportunity to directly train qualified personnel corresponding to new

directions and forms of ownership in our country's conditions, thereby effectively addressing priority tasks such as diversification and digitization of the current economy, development of smart agriculture, introduction of innovative scientific developments and resource-saving technologies, and increasing the volume of ecologically clean organic agricultural products.

3.3. Forecast Parameters of Demand for Personnel in Agriculture in Qashqadaryo Region under Conditions of Development of Innovative Production and Organizational-Management Forms

Scientific-methodological studies conducted by scholars on forecasting periodic growth processes and trends in economic reality and indicators have substantiated that the application of econometric models and trend methods yields reliable results. However, when using mathematical apparatus methods, special attention must be paid to the correct selection of indicators expressing the development trends of each real sector of the economy or social sphere, as well as the factors influencing them, taking into account their specific characteristics. From this perspective, agriculture, with its multi-sectoral nature, the diversity of products produced in these sectors, as well as the numerous types of crops cultivated and livestock raised, requires taking into account the main factors influencing the forecasting of the need for qualified specialist personnel in all necessary specialties in the sector, which is of great importance.

The results of our research conducted on the example of agriculture in Qashqadaryo region indicate that the following conditions and indicators have a strong influence on changes in the demand for specialist personnel in this region under current conditions, namely:

- the existing state of provision with qualified personnel in the sector;
- the share of personnel with higher education in agriculture;
- the volume of investments made in fixed capital in the sector;

- the number of population employed in agriculture;
- the share of agricultural enterprises of all categories in the sector;
- the number and volume of projects being implemented in sectoral directions.

The states of strong, medium, and weak (insignificant) interrelations among these factors, as well as the degrees of their influence, have been widely analyzed in numerous foreign sources. We consider it appropriate to use them in determining changes in the demand for personnel in agriculture on the example of the region and substantiating the development trends of the personnel training and supply system in the sector. In this regard, first of all, it is necessary to establish the relevant criterion when performing any forecasting calculations. In particular, optimization serves as the main criterion in determining the number of personnel in necessary professions for agriculture.

Taking the above requirements into account, as the resulting indicator obtained on the basis of a multi-factor econometric model for Qashqadaryo region, the demand for highly qualified personnel with higher education in agriculture (Y) in persons was selected, and in the system of factors influencing it, the following were chosen: investments made in fixed capital in agriculture (x1), billion soums; number of agricultural enterprises of all categories (x2), units; share of peasant farms in the total agricultural output (x3), %; and total number of projects being implemented in agriculture (x4). For each factor, 10-year statistical data for 2011–2020 obtained from the Qashqadaryo Region Agriculture Department served as the basic basis for calculating forecast indicators of personnel numbers.

The first stage in applying the multi-factor econometric model consists of checking the multicollinearity of the interrelations among the selected factors by determining the degrees of their interdependence and influence. For this purpose, first of all, it is necessary to calculate the correlation coefficients among the selected factors. In this regard, the levels of correlation indicators expressing the correlational interrelations between the demand for highly qualified personnel with higher education

in agriculture in Qashqadaryo region and the factors influencing it are presented in matrix form in Table 3.1.1.

3.1.1-jadval

Tanlab olingan omillar o'rtasida korrelyatsion bog'lanish matritsasi

	U- Change in demand for highly educated specialist personnel in the agriculture sector, persons	X ₁ - Volume of investments in fixed capital in agriculture, billion soums	X ₂ - barcha toifadagi qishloq xo'jaligi korxonalari soni, ta	X ₃ - yalpi qishloq xo'jaligi mahsulotlari tarkibida dehqon xo'jaliklari ulushi, %	X ₄ - qishloq xo'jaligida amalga oshirilgan jami loyihalar soni, dona
U	1				
X ₁	0,9769	1			
X ₂	0,9556	0,8904	1		
X ₃	-0,3366	-0,4158	-0,1085	1	
X ₄	0,9901	0,9816	0,9398	-0,3420	1

The correlation coefficients indicate that there is an inverse relationship (-0.3366) between the change in demand for highly educated qualified specialist personnel (Y) and the share of peasant farms in gross agricultural output (X₃), suggesting that this factor is not significant in addressing the research problem. At the same time, strong positive correlations exist between the dependent variable (Y) and other factors: the number of agricultural enterprises of all types (X₂) at 0.9556, the total number of projects implemented in agriculture (X₄) at 0.9901, and the volume of investments in fixed capital in agriculture (X₁) at 0.9769.

Furthermore, the analysis of interdependencies and degrees of influence among the selected factors plays an important role in drawing relevant conclusions. For example, the correlation between the volume of investments in fixed capital in agriculture (X₁) and the share of peasant farms in gross agricultural output (X₃) is -0.4158 , which allows one to conclude that there is virtually no relationship between these variables. Similarly, an inverse correlation (-0.3420) is observed between the number of projects being implemented in agriculture and the share of peasant farms, as most of the current projects in the sector are carried out

within the activities of farm enterprises, limited liability companies, clusters, cooperatives, associations, and other types of agricultural entities.

Taking into account the factors influencing the demand for highly educated personnel in agriculture, the multiple linear correlation-regression equation can be expressed in general form as follows:

$$u = a_0 + a_1x_1 + a_2x_2 + \dots + a_nx_n, \quad (1)$$

where Y is the dependent (resulting) variable and X_1, X_2, \dots, X_n are the explanatory (influencing) variables.

Using the “Data Analysis” (Analiz dannykh) tool in Microsoft Excel and applying the ordinary least squares method, the following results were obtained (Table 3.1.2).

Table 3.1.2

Results of the Multiple Econometric Model Obtained Using the “Data Analysis” Tool in Microsoft Excel

Dependent and Independent Variables	Coefficient	t-Statistic	p-value
U - Change in demand for highly educated specialist personnel in agriculture, persons	1202,5	5,578	0,003
X_1 - Volume of investments in fixed capital in agriculture, billion soums	2,924	1,660	0,158
X_2 - Number of agricultural enterprises of all types, units	0,296	2,965	0,031
X_3 - Share of peasant farms in gross agricultural output, %	-4,681	-1,341	0,238
X_4 - Total number of projects implemented in agriculture, units	6,685	0,600	0,574

Bu yerda: bog‘liq o‘zgaruvchi – Y ; usul – eng kichik kvadratlar usuli; tanlangan davr 2011-2020 yy.; kuzatuvlar soni-10 ta. Model bilan bog‘liq boshqa ko‘rsatkichlar quyidagi darajalarni tashkil etdi.

R^2 (coefficient of determination)	0,993
Adjusted R^2	0,987
Standard error of the regression	26,8
F-statistic	183,19
Probability (F-statistic)	0,000013169

Eng kichik kvadratlar usuli asosida olingan korrellatsion-regressiya tenglamasi quyidagi ko‘rinishga ega bo‘ldi, ya’ni:

$$Y = 1202,5 + 2,924x_1 + 0,296x_2 - 4,681x_3 + 6,685x_4$$

$$(5,578) \quad (1,660) \quad (2,965) \quad (-1,341) \quad (0,600) \quad (2)$$

Demak, natijaviy ko‘rsatkich (U) va unga ta’sir ko‘rsatuvchi omillar ko‘rsatkichlari quyidagi darajalarni tashkil etdi, jumladan:

Y - qishloq xo‘jaligi tarmog‘i bo‘yicha oliy ma’lumotli mutaxassis kadrlarga bo‘lgan talabning o‘zgarishi, nafarda 1202,5 (5,578) ga;

X1 - qishloq xo‘jaligida asosiy kapitalga kiritilgan investitsiyalar, mlrd. so‘mda 2,924 (1,660) ga;

X2 - barcha toifadagi qishloq xo‘jaligi korxonalari soni, tada 0,296 (2,965) ga;

X3 - dehqon xo‘jaliklarining yalpi qishloq xo‘jaligi mahsulotlari tarkibidagi ulushi, %da -4,681(-1,341) ga;

X4 - qishloq xo‘jaligida amalga oshirilgan jami loyihalar soni, donada 6,685 (0,600) ga teng bo‘ldi. Shuningdek, modelni ifodalovchi R – kvadrat 0,993; tekislangan R–kvadrat 0,987; regressiyaning standart xatoligi 26,8; F – statistika 183,19 va ehtimollik darajasi (F - statistika) 0,000013169 ni tashkil etdi.

According to the results of this multiple econometric model, for example, an average increase of 1 billion soums in the volume of investments in fixed capital in agriculture (X_1) leads to an average increase of approximately 3 persons in the demand for highly educated qualified personnel in agriculture. This trend can be explained by the creation of additional jobs resulting from the introduction of new modern sub-sectors and directions in agriculture. Likewise, an increase of one unit in the number of agricultural enterprises of all types (X_2) causes an average increase of 0.296 units in the demand for highly educated qualified personnel, which can be attributed to the emergence of additional vacancies depending on the direction of activity.

However, an interesting aspect of the model results is that an average increase of 1 percentage point in the share of peasant farms in gross agricultural output (X_3) leads to an average decrease of

approximately 4.7 units in the demand for qualified personnel in the sector. This may be due to the fact that managing and operating a peasant farm does not necessarily require higher education specifically in agriculture-related fields. In contrast, an average increase of one unit in the total number of projects implemented in agriculture (X_4) generates demand for approximately 7 additional highly educated qualified specialists.

This tendency can be explained in the future by the development of processing industries through public-private partnership (PPP)-based projects, the greater involvement of innovative technologies leading to the emergence of new directions (including soft skills), inter-sectoral transformation processes, prioritization of sector digitization, and the resulting creation of new jobs. The increase in the number of projects being implemented in agriculture contributes to the development of product preparation, processing, storage, and export, thereby creating the basis for additional employment opportunities. Moreover, the development of supporting infrastructure and processing industries serving agriculture, as well as the growth of clusters and cooperatives, is believed to generate additional demand for qualified personnel to a certain extent.

The figures in parentheses in the model represent the t-Student criterion values indicating the statistical significance of each coefficient. The coefficient of determination $R^2 = 0.993$ demonstrates a very strong relationship between the dependent variable and the selected factors, meaning that 99.3% of the variation in demand for highly educated personnel in the sector (Y) is explained by the selected factors in the multiple econometric model. The remaining 0.7% is attributable to other unaccounted factors. The multiple correlation coefficient $R = 0.993$ (for the region) also confirms that, since $R > 0.7$, the relationship among the factors is sufficiently strong and the model is appropriately specified.

Therefore, using this selected model, it is possible to forecast the future dynamics of changes in demand for highly educated qualified personnel in agriculture in the region. For this purpose, the dynamics of

changes in the selected factors during 2011–2020 were first taken as the baseline data (Table 3.1.3).

Without presenting the primary results here, linear correlation-regression trend equations for each factor were determined using the ordinary least squares method on the basis of all calculations performed with the “Data Analysis” tool in Microsoft Excel. Specifically:

3.1.3 Table

Dynamics of Changes in the Factors Considered in the Selected Model for Agriculture in Qashqadaryo Region, 2011–2020

Years	Number of Highly Educated Specialist Personnel in Agriculture, persons	Volume of Investments in Fixed Capital in Agriculture, billion soums	Number of Agricultural Enterprises of All Types, units	Share of Peasant Farms in Gross Agricultural Output, %	Total Number of Projects Implemented in Agriculture, units
	U	X_1	X_2	X_3	X_4
2011	1864	12,1	2911	65,1	8
2012	1901	14	3097	66,4	10
2013	1981	27,4	3160	68,4	11
2014	2032	37,4	3240	70,2	13
2015	2102	42,4	3502	69,9	15
2016	2172	44,0	3651	70,2	17
2017	2260	49,0	3663	67,6	19
2018	2368	65,6	3883	72,8	21
2019	2477	84,9	3892	61,6	23
2020	2574	110,8	3905	61,8	29

1. The trend equation for the volume of investments in fixed capital in agriculture is expressed as $X_1 = 48,76 + 8,33 \cdot t$ (3) where the following calculations and indicators were taken as the basis:

$$X_1 = a_0 + a_1 \cdot t; a_0 = \sum X_1 / n = 487,6 / 10 = 48,76$$

$$a_1 = \sum X_1 \cdot t / \sum t^2 = 916,5 / 110 = 8,33$$

2. Similarly, without dwelling on the explanation for the subsequent factors, the trend equation for the number of agricultural enterprises of all types is:

$$X_2 = 3490,4 + 102,8 \cdot t \quad (4) \quad \text{and}$$

$$X_2 = a_0 + a_2 \cdot t; a_0 = \sum X_2 / n = 34904 / 10 = \mathbf{3490,4};$$

$$a_2 = \sum X_2 \cdot t / \sum t^2 = 11314 / 110 = \mathbf{102,8}.$$

3. The trend equation for the share of peasant farms in gross agricultural output is: $X_3 = 67,4 - 0,24 \cdot t$ (5) and

$$X_3 = a_0 + a_3 \cdot t; a_0 = \sum X_3 / n = 674 / 10 = \mathbf{67,4};$$

$$a_3 = \sum X_3 \cdot t / \sum t^2 = -27,4 / 110 = \mathbf{-0,24}.$$

4. The trend equation for the total number of projects implemented in agriculture is:

$$X_4 = 16,6 + 1,83 \cdot t \quad (6) \quad \text{va}$$

$$X_4 = a_0 + a_4 \cdot t; a_0 = \sum X_4 / n = 166 / 10 = \mathbf{16,6};$$

$$a_4 = \sum X_4 \cdot t / \sum t^2 = 201 / 110 = \mathbf{1,83}.$$

In summary, based on the correlation-regression trend equations determined for each of the above-selected factors in the applied model and the calculations performed, the number of qualified personnel employed in agriculture in Qashqadaryo region during 2011–2020, as well as the forecasted demand indicators up to 2021–2025, are presented in the following Table 3.1.4.

Thus, the demand for qualified personnel in the agriculture sector of Qashqadaryo region, for example, is projected to reach 3,196 persons in 2025. This figure represents an increase of 1,332 persons (41.7%) compared to 2011 or 622 persons (19.5%) compared to 2020. Likewise, the volume of investments in fixed capital is expected to amount to 173.7 billion soums in 2025, reflecting an approximate 1.6-fold increase over the period between these years. This can be explained by the year-on-year growth in the level of processing of agricultural products, export potential, and the increasing share of smart technologies.

Furthermore, the continuing increase in the number of agricultural enterprises of all types is also expected to lead to the emergence of new directions and sub-sectors in the industry in the future. For instance, the expansion of volumes in the preparation, transportation, storage,

processing, and marketing of agricultural products, the wider application of marketing, the growing scale of drone usage, and a series of similar changes will, in turn, necessitate an increase in the number of qualified personnel in agriculture.

3.1.4 Table

Dynamics of the Number of Highly Educated Personnel Employed in Agriculture in Qashqadaryo Region, 2015–2024, and Projected Values for 2021–2025

Years	Change in Demand for Highly Educated Personnel in Agriculture, persons	Volume of Investments in Fixed Capital in Agriculture, billion soums	Number of Agricultural Enterprises of All Types, units ^a	Share of Peasant Farms in Gross Agricultural Output, %	Total Number of Projects Implemented in Agriculture, units
	<i>U</i>	<i>X₁</i>	<i>X₂</i>	<i>X₃</i>	<i>X₄</i>
2015	1864	12,1	2911	65,1	8
2016	1901	14	3097	66,4	10
2017	1981	27,4	3160	68,4	11
2018	2032	37,4	3240	70,2	13
2019	2102	42,4	3502	69,9	15
2020	2172	44,0	3651	70,2	17
2021	2260	49,0	3663	67,6	19
2022	2368	65,6	3883	72,8	21
2023	2477	84,9	3892	61,6	23
2024	2574	110,8	3905	61,8	29
2021*	2924	140,7	4621,2	64,8	37
2022*	2992	148,7	4724,0	64,5	39
2023*	3060	157,1	4826,8	64,3	40
2026*	3128	165,4	4929,6	64,0	42
2025*	3196	173,7	5032,4	63,8	44

*Forecasted years.

While the number of agricultural enterprises of all types in Qashqadaryo region stood at 3,905 in 2020, this indicator is expected to increase by nearly 1.3 times by 2025 compared to 2020. This may be attributed to the emergence of modern sectors and professions aligned

with the current period of rapid global development and the future digitization of the sector, such as “sector accounting,” “sector marketing,” “drone dispatching,” “online and virtual trade management,” “operator of automated agricultural machinery,” “intellectual property valuation,” and others.

In particular, the increase in the number of highly educated personnel in agriculture is, as noted above, directly related to the growth in the number of agricultural enterprises (see Figure 3.3.1).



Figure 3.8. Dynamics of Demand for Highly Educated Specialist Personnel in Agriculture and the Number of Agricultural Enterprises of All Types in the Region (2015–2025)

It should be emphasized that the upward trend in the number of agricultural enterprises, the number of investment projects implemented in the sector, and the required qualified specialist personnel in various professions necessitates an increase in the volume of investments in fixed capital. Accordingly, its volume is forecasted to reach 173.7 billion soums in 2025, representing a 157.2% increase compared to 2020 (see Figure 3.3.2). Consequently, the average volume of investments per highly educated personnel in 2025 is projected to amount to 54,349.2 thousand soums.



Figure 3.9. Dynamics and Forecast Indicators of Demand for Highly Educated Personnel in Agriculture, Investments Absorbed in Fixed Capital, and the Share of Implemented Projects in the Region’s Agriculture, 2011–2025.

In particular, during the period 2011–2020, several international and domestic projects were implemented in the agriculture of the region. For example, 8 projects were carried out in 2011, while this figure reached 29 in 2020, representing a 3.6-fold increase. By 2025, the number of projects is expected to increase by 15 units, or 151.7%, compared to 2020. It should be noted here that Qashqadaryo region occupies one of the leading positions in the republic in terms of the volume of land resources and the reserve of land areas newly brought into agricultural circulation (turnover).

Therefore, especially in the field of agriculture and water management—particularly in directions such as reconstruction of irrigation networks, hydraulic structures and equipment, assessment and ensuring the stability of reservoir dams, and implementation of water-saving technologies—the increase in public-private partnership-based

and international investment projects makes it a priority task to pay special attention to the implementation of programs and measures for training deeply specialized expert personnel required for these projects and for enhancing their knowledge and skills at leading foreign universities and scientific centers.

CONCLUSIONS AND RECOMMENDATIONS

1. Of paramount importance is the fundamental improvement of the quality of training highly qualified personnel in all specialties for diversified agriculture, as well as the preparation of a cadre class corresponding to the functions of other related enterprises and state institutions involved in the activities of this sector. This entails strengthening the material-technical base of specialized higher and secondary specialized educational institutions, integrating modern advanced pedagogical teaching methods and information-communication technologies into educational processes, and systematically enhancing the professional development and retraining of scientific-pedagogical personnel and specialists.

2. It is expedient to establish specialized outsourcing arrangements (agencies, firms, and the like) dedicated to training qualified and knowledgeable specialists in various professional-functional specialties within agriculture and to supplying organizations and enterprises with such personnel. It is also advisable to develop and implement state organizational-economic support and incentive mechanisms governing their tax, financial, and credit relations, as well as their activities, with other economic actors.

3. In our opinion, the process of preparing personnel with higher education and qualified specialists must take due account of an individual's cognitive abilities and potential—namely, their capacity, talent, and experience in perceiving surrounding objects, realities, phenomena, and information; forming preliminary conceptions thereof; analyzing them; making correct decisions on that basis; and successfully implementing those decisions in practice.

4. In accordance with the currently established traditions and culture of farming in our republic, the roles of farm manager and executor are typically performed by the same individual. In other words, relying on many years of accumulated experience, the farm leader assumes

responsibility for multiple functions simultaneously, including the organization of production, farm management, product cultivation, and marketing. This situation demands extensive knowledge, skills, experience, and time across numerous directions related to production and management functions. The persistence of this state of affairs in our republic is attributable to the shortage of specialists meeting required qualification standards, the comparatively low professional competence of existing specialists, the lack of interest in employment within a low-wage sector, and the underdeveloped state of ancillary service structures (such as marketing and sales cooperatives).

5. Analyses indicate that the diverse professional backgrounds of farm leaders generate a persistent demand for permanently employed highly qualified personnel. As of 1 January 2020, the educational profile of farm enterprise leaders was as follows: 38.1% agronomists, 19.4% economists, 9.4% engineers, 7.4% zootechnicians-veterinarians, 4.3% lawyers, and 21.4% representatives of other specialties. Notably, however, 54.5% of these individuals are specialists whose training is not directly related to agriculture. Consequently, the organization of training sessions—utilizing modern information-communication tools and drawing upon globally recognized best practices and achievements in each relevant field—plays a crucial role in upgrading their knowledge and professional competencies. Within this framework, it is advisable to conduct extensive promotional and awareness-raising activities among farm leaders under the “Mahallabay” and “Xonalarbay” programs.

6. In higher education institutions preparing personnel for agriculture, a total of 4,755 graduates with higher education were produced in 2015, comprising 3,168 in agronomy/farming, 356 in animal husbandry (accounting for graduates from all livestock-related faculties across institutions), and 1,348 in irrigation and land reclamation. By 2019 these figures had changed to 3,763, 412, and 1,741 respectively. Concurrently, as of 2019, joint educational programs and student exchange schemes with 28 higher education institutions worldwide had

been introduced across 43 bachelor's and 10 master's degree programs in the country's universities.

7. Analyses reveal that in 70–80 percent of cases in the farms of Qashqadaryo region, farm leaders holding positions as lawyers and accountants possess higher education, whereas personnel in other positions generally hold secondary specialized or secondary education credentials. Accordingly, a social survey was conducted in selected districts of the region subject to monographic study. Respondents were divided into two groups in order to investigate problems concerning the knowledge, education, qualifications, capacity to meet contemporary requirements, and motivation levels of agricultural personnel. On the basis of the survey findings, corresponding conclusions, proposals, and recommendations were formulated. Particular attention should be given to respondents' attitudes toward the level of remuneration and forms of payment for personnel—one of the principal problems associated with agriculture. It must be especially emphasized that the central question remains whether the existing payment system consistently aligns with the interests of employees. In this regard, 42 percent of respondents favored regular (monthly) cash payments, while 30 percent indicated that the form of payment—whether monetary or in-kind—was immaterial. Survey results underscore the necessity of enhancing the financial capacity and working conditions of enterprises employing highly educated specialists and qualified workers in agriculture-related fields, ensuring remuneration at competitive levels, and resolving issues related to material incentive mechanisms.

8. Notwithstanding positive developments in the agrarian education system of our country—particularly with regard to the state-order-based preparation, retraining, and placement of highly educated personnel and qualified specialists—it is our considered view that state support mechanisms for this vitally important sector must be further strengthened. This necessity can be explained by several factors, including: a) the growing imperative to more extensively adopt foreign scientific and technological achievements in order to build a cadre

potential capable of operating effectively under new forms of farm management; b) the increasing interest in attracting private investors to the education system and establishing private educational institutions with a view to preparing specialists equipped with modern knowledge and competencies; c) the intensification of science–practice integration, the growing demand for narrowly specialized experts taking into account sector-specific features, the expansion of scientific research outputs, and related developments.

9. The education, knowledge, professional qualifications, practical experience, and scientific outputs of a researcher constitute his or her intellectual capital, which yields productive results only when the individual is materially (or morally) motivated to invest that capital. Accordingly, it is expedient to introduce the following state regulatory and economic incentive mechanisms:

- devolving to the private sector the provision of scientific-practical advisory services, training, and retraining for agricultural specialist personnel at the local level, while developing corresponding funding sources and mechanisms;

- forming sectoral working groups composed of experienced and scientifically capable personnel and establishing an incentive-based financing system for their activities;

- ensuring, in the estimates and project documentation prepared for the commercialization or practical implementation of research results, dedicated funding for retraining, training in the application of scientific outcomes, dissemination activities, and related measures.

10. In order to better coordinate the agrarian labor market, it is necessary to establish outsourcing services and the entities engaged therein, and to introduce state incentive mechanisms for this activity. The rapid adoption of innovative developments and technologies, the growing challenges of ensuring employment, and similar trends render the utilization of outsourcing services—including in agriculture—one of the priority tasks on the contemporary policy agenda.

11. Forecasting personnel requirements should employ modern econometric modeling techniques, duly accounting for the strength (strong, moderate, or weak) of interrelationships among selected explanatory variables. The primary criterion in determining the number of personnel needed for essential professions in agriculture must be optimization. In the econometric model applied to Qashqadaryo region, for instance, the dependent variable (Y) was defined as the demand for highly educated qualified personnel in agriculture, while the explanatory variables comprised: the volume of investment in fixed capital in agriculture (x_1), the total number of agricultural enterprises of all types (x_2), the share of peasant farms in gross agricultural output (x_3), and the total number of projects implemented in agriculture (x_4).

12. Model results indicate that the demand for qualified personnel in agriculture in Qashqadaryo region is projected to reach 3,196 persons in 2025—an increase of 1,332 persons (41.7%) compared with 2011 or 622 persons (19.5%) compared with 2020. The volume of investment in fixed capital is expected to amount to 173.7 billion soums in 2025, representing an approximate 1.6-fold increase over the intervening period. Likewise, the total number of agricultural enterprises of all categories in the region, which stood at 3,905 in 2020, is projected to grow by nearly 1.3 times by 2025. This expansion will be driven, inter alia, by the emergence of modern professions and specializations aligned with the current phase of rapid global development and the prospective digitization of the sector, including “sectoral accounting,” “sectoral marketing,” “drone dispatching,” “online and virtual trade management,” “operator of automated agricultural machinery,” “intellectual property valuation,” and others.

13. It should be emphasized that the upward trends in the number of agricultural enterprises, investment projects implemented in the sector, and the associated demand for qualified specialists across diverse professions necessitate a corresponding increase in fixed capital investment. Accordingly, such investment is forecasted to reach 173.7 billion soums in 2025, equivalent to a 157.2 percent increase over the

2020 level. Consequently, the average volume of investment per highly educated specialist is projected to amount to 54,349.2 thousand soums in 2025.

14. During the period 2011–2020, a considerable number of international and domestic projects were implemented in the agriculture of the region. For example, whereas 8 projects were executed in 2011, this figure rose to 29 in 2020—an increase of 3.6 times. By 2025 the number of projects is expected to grow by a further 15 (or 151.7 percent) relative to 2020. Qashqadaryo region occupies one of the leading positions in the republic with respect to land resource endowment and the reserve of land areas available for incorporation into agricultural turnover. Therefore, the increasing number of public–private partnership–based and international investment projects—particularly in such directions as the reconstruction of irrigation networks, hydraulic structures and equipment, assessment and reinforcement of reservoir dam stability, and the introduction of water-saving technologies—makes it critically important to train deeply specialized expert personnel required for these initiatives and to implement systematic measures for upgrading their knowledge and professional skills at leading foreign universities and scientific centers.

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