UDC 631.42
AGRIS P35
https://doi.org/10.33619/2414-2948/103/16

CULTIVATION TECHNOLOGIES AND INORGANIC FERTILIZER NORMS WHEN GROWING POTATOES IN AZERBAIJAN

©Asgarov E., *Ph.D., Azerbaijan State Agricultural University, Ganja, Azerbaijan, eldaras469@gmail.com*
©Mirzaliyev V., *Ph.D., Azerbaijan State Agricultural University, Ganja, Azerbaijan mirze.vaqif@gmail.com*

ТЕХНОЛОГИИ ВОЗДЕЛЫВАНИЯ И НОРМЫ МИНЕРАЛЬНОГО УДОБРЕНИЯ ПРИ ВЫРАЩИВАНИИ КАРТОФЕЛЯ В АЗЕРБАЙДЖАНЕ

©Аскеров Е. И., *канд. техн. наук, Азербайджанский государственный аграрный университет, г. Гянджа, Азербайджан, eldaras469@gmail.com*
©Мирзалиев В. А., *канд. техн. наук, Азербайджанский государственный аграрный университет, г. Гянджа, Азербайджан, eldaras469@gmail.com*

Abstract. Technologies for applying granular fertilizers when growing potatoes in the farms of the Gazakh-Tuz economic region of Azerbaijan are presented. An analysis of existing technical means used to effectively prepare soil for growing potatoes was carried out. By means of a stepwise supply of inorganic fertilizers to the soil using the method of differentiated distribution, theoretical studies were carried out and analytical expressions were obtained to substantiate the parameters of the working bodies of the corresponding unit. An analysis of existing technologies and technical means for growing potatoes shows that the application of fertilizers, which provide the required amount of nutrition for the cultivated crop, prevents sufficient nutrition of the soil when carried out in a surface manner and subsequent incorporation into the soil. To avoid this, inorganic fertilizers are applied to the soil by working groups and converted into the soil by cutting off lower layers to protect the mound and optimal soil structure. By systematically filling the soil through differentiated distribution of inorganic fertilizers, analytical studies were carried out and analytical expressions were obtained to check the parameters of the unit's labor force.

Аннотация. Представлены технологии внесения гранулированных удобрений при выращивании картофеля в хозяйствах Газах-Тоузского экономического района Азербайджана. Проведен анализ существующих технических средств, используемых с целью эффективной подготовки почвы для выращивания картофеля. Путем ступенчатой подачи минеральных удобрений в почву методом дифференцированного распределения были проведены теоретические исследования и получены аналитические выражения для обоснования параметров рабочих органов соответствующего агрегата. Анализ существующих технологий и технических средств выращивания картофеля показывает, что внесение удобрений, обеспечивающих необходимое количество питания возделываемой культуры, препятствует достаточному питанию почвы при проведении поверхностным способом и последующей заделке в почву. Чтобы избежать этого, минеральные удобрения подаются в почву рабочими группами и преобразуются в почву путем срезания менее высоких слоев для защиты насыпи и оптимальной структуры почвы. Систематически засыпая почву путем дифференцированного распределения минеральных удобрений, были проведены аналитические исследования и получены аналитические выражения для проверки параметров рабочей силы агрегата.

Т. 10. №6. 2024
https://doi.org/10.33619/2414-2948/103

Keywords: fertilizers, cultivation, potatoes, Azerbaijan.

Ключевые слова: удобрение, агротехника, картофель, Азербайджан.

Among foods, potatoes are the most important and widely used crops. First of all, potatoes are widely used as a food product and can produce hundreds of different foods, resulting in a significant increase in the human body's need for carbohydrates and up to 830 kg. Eating 400 g of potatoes can meet half the need for vitamin C and prevents a number of diseases. The same amount is enough to supply the human body with the iron and some vitamins B (thiamine, nicotine acid) it needs. The importance of potatoes in the creation of world unity food security is highlighted by the UN Food and Agriculture Organization (FAO) (https://www.fao.org/home/en).

Currently, potatoes are the most important product in the world, and with no doubt the vitality of this product for human being helps to value and appreciate the importance of it. First of all, potatoes are widely used, and it is not a secret that hundreds of different dishes can be made from potatoes. Potatoes are used in various industries: alcohol, starch, cotton, textiles, foreign affairs, bread, cellulose, paper, rubber, and other fields. For a long time in our country, potatoes have always been the most popular product of agricultural production. Potatoes are used in various fields of industries such as the alcohol, starch production, cotton, textiles, pharmacy, grain-based food industry, cellulose, paper, rubber etc. For a long time in our country, potatoes have always been the most popular product of agricultural production. The average consumption of potatoes per person is 115 kg a year.

Potatoes are the second most commonly used plant product after bread products used by the people of Azerbaijan. Interest in this area has always been high in Azerbaijan. The regions specialized in potato production in Azerbaijan, small, as well as, large-scale agriculture businesses contributed immensely to abundant crop production, and even in most cases being the main industries in our country, the fame Azerbaijani potatoes was recognized by the whole world and beyond the borders of our country. In our country, potato production is also supported by the government. Farmers who plant potatoes are paid subsidy for both basic and multiple cropping. Even this year, the amount of subsidy to be paid for potato crops has increased.

Thus, based on the decision by Agricultural Union of Subsidies in 2023, farmers who planted potatoes were paid 280 manat per hectare for basic crops and 100 manat for multiple cropping. But what is the current situation in Azerbaijan right now? Let's consider the problems the people who are engaged in the process of potato growing face. First of all, let's consider the statistics reflecting the real perspectives of potato growing in our country. According to the Agriculture Ministry of Agriculture Research, by 2022, the country's potato crop yielded 10.2% compared with 2015 and 2.3% from 2021 to 548,000 hectares. Production indicators has increased recently. As a result, in 2022, potato production increased by 27.9% compared with 2015 and by 1.2% to 1.1 million tons by 2021. In the eight months of this year, our country produced 868.5 thousand tons (0.5 percent more) of potatoes. It is noteworthy that during the reporting period, the most crops were harvested in the districts of Jalilabad, Shamkir, and Tovuz.

It is noteworthy that, Jalilabad, Shamkir, and Tovuz were the districts with the highest rate of harvest during the period mentioned. Nevertheless, there is also a decrease in potato planting in the current year. According to official statistics, between January and May 2023, potato crops decreased by 10.4% or 5,000,691 hectares to 48,990 hectares.

During the reporting period, 21,738 hectares potatoes were planted in the economic district of Qazax, 10,000,123 hectares in the Lankaran-Astara economic district, 4,000,460 hectares in the Quba-Khachmaz economic district, and 3,917 hectares in the economic district of Shaki-Zagatala.

Т. 10. №6. 2024
https://doi.org/10.33619/2414-2948/103

China and India are the first in the world to produce potatoes, followed by the Russian Federation and with them, it accounts for more than 45% of the world's production. According to the level of crop productivity regardless that the USA has 4 times less crop fields compared to other areas, productivity accounts for 20 million in this country. Studying cultivation requirements is an important condition for studying its structure in potato cultivation and improving the quality of potatoes. Creating a soil environment is a complex process. Based on the biological properties of potato growth and the interaction of developing stem cells with other biological systems, as well as the impact on environmental plants, should be based on growth rates. Having a variety of influences on potato cultivation land and weather condition play important role in developing a favorable soil environment to grow analytical root fists to and increase potato productivity.

The objective of the differential distribution of mineral fertilizers in Qazakh-Tovuz economic district is to improve the efficiency of the soil for potato cultivation. For these purposes, with the aim of identifying the key aspects of soil preparation and cultivation analysis of available technologies and technical tools is conducted. Analysis of existing technologies and technical tools for growing potatoes shows that the application of fertilizers that ensure the right amount of food for a cultivated crop prevents soil from sufficient nutrition when conducted by surface method and subsequently placed in the soil. In an effort to eliminate this, mineral fertilizers are supplied to the soil by working groups, and they are transformed to the soil by cutting down layers that are less tall to protect the soil’s mound and optimal soil structure. Providing the soil systematically with it by using a differential distribution of inorganic fertilizers, analytical research was conducted, and analytical expressions were obtained to verify the parameters of the aggregate’s workforce.

Experimental research is conducted using existing experimental methods and standards. The data received is worked on PC with the support of mathematical statistics by using the Microsoft Excel 2016 and statistics 10 programs.

Sources and Methods used in the Research

In addition to creating the soil’s proper air-water regime and fertile structure, obtaining a high potato crop requires an increasing amount of food in the soil. This has to do with a relatively weakly developed root system and the biological properties of potatoes associated with the accumulation of large quantities of dry matter in a conveniently easy-to-digest state [4].

Thus, delivery of inorganic fertilizers separates from many crops and the selection of its methods of delivery play significant role. Based on the experience it should be noted that fertilizers must be systematically given to the soil to obtain a high potato product. This technology is often used without taking into account soil fertility and farming technology. Studies show that [1], when adequate fertilizer is applied to the soil during the preparation of a soil environment for potato cultivation, feeding plants is not a positive outcome. At the same time, the application of fertilizers by surface method [2], then incorporating them into the soil, does not allow them to create the nutritious soil environment needed for potatoes and is less effective than the deep placement of roots, especially in dry climates [5].

Establishing a high-quality soil cultivation environment for potato plants, expanding soil fertilizer techniques that provide better interaction with soil and plants, and ensuring optimal local placement of fertilizers relative to the potato root system, given the climate of the region [4].

The need for food in the soil is not so active throughout the growing season of potatoes (http//www.avitec.kirov.ru; https://kurl.ru/AejHN).

Unlike many other products, potatoes receive nutrition from foods placed on the mother's root fists in the early stages of development. Broken chicks are actively fed, although the use of food from agricultural roots is no exception. During the branch formation period, potatoes require

Т. 10. №6. 2024
https://doi.org/10.33619/2414-2948/103

nitrogen absorption. Thus, at the optimal distance from the root fists that determine the quality of the potato crop and the root system of plants that later develop inside the soil will be fertilized as during the pre-crop or crop period [3].

Currently, soil cultivation, the formation of series, the application of mineral fertilizers to the processed soil, and the presence of inorganic fertilizers are among the main means of cultivation activities. In modern times, a variety of important experimental studies have been undertaken aimed at developing basic technological techniques to develop a soil environment for potato cultivation. Most of this has to do with the improvement of fertilizer-producing parts of machines that cultivate plants in the soil [5].

To provide a general view of the size of the development of crop regimes in the Tovuz-Qazakh economic district, it is crucial to manifest classification of machines made on the basis of analyzing general information on fertilizer technologies and the devices and mechanisms that work on the basis of these technologies. One of the existing devices is the Volga Institute for Ecological Research in Russia, which proposes the use of a combined soil recycling tool to distribute mineral fertilizers equally across the entire depth of the agricultural surface.

In Figure 1, 2 — describes the device, the second one equipped with a high-pressure ventilator, 3 — pressure air channels, 4 and 5 — ventilation pipes, and 6 — touching devices. To the bottom of frame 1 the plowing trunks with 7 and 8 supporting bases are added. Disk 9's output pipe is hermetically connected to 10-8 windows. The output gap of 10 windows is directed to 7 throughout the mailbox, and 9 pipelines are combined with 10 windows along the back of the circle. Cutting trunks are attached to the frame of the device using razors.

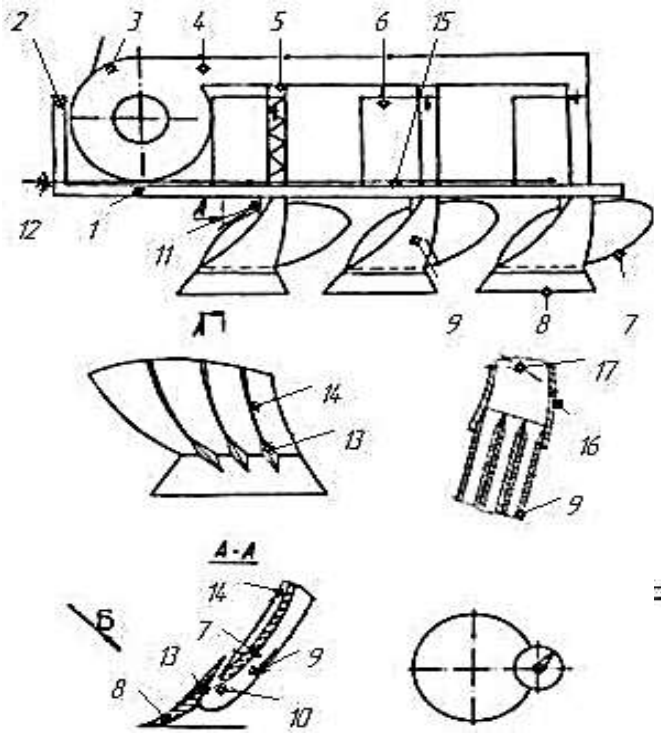

Figure 1. Combined land recycling tools

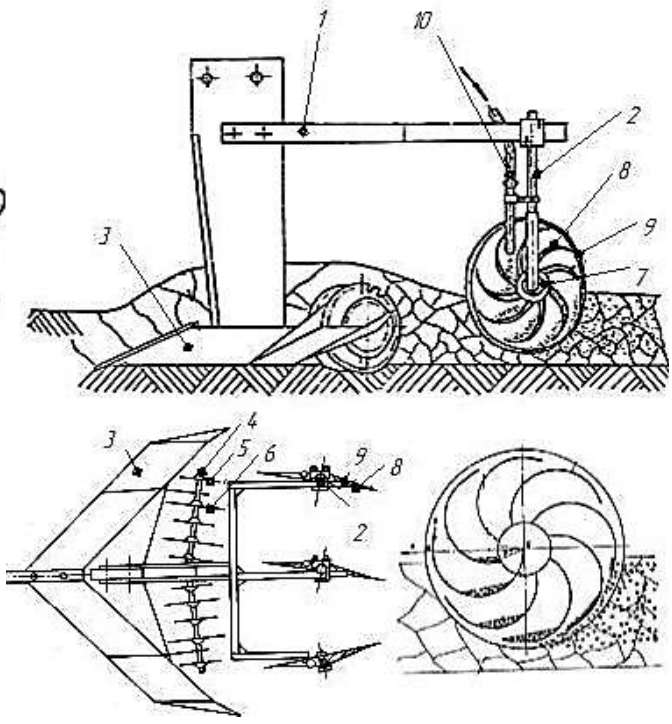

Figure 2. The combined machine to sprinkle fertilizer

The working principle of a combined soil recycling tool is as follows. While the part of machine device moves under soil, the cutting plane cuts off the soil layer in 8 horizontal planes and directs it to 7. Empty extensions cross the 13 layers into a vertical plane. At the same time, under

Т. 10. №6. 2024
https://doi.org/10.33619/2414-2948/103

pressure created by the 10 ventilators, air mixture in 9 pipelines is transferred to a gap with 3 layers. As directive extensions have one cutting edge along the moving trajectory of the layer it triggers the motion of layer by expanding its width. Partly spinning layer with 7 fertilizers affects 14 directories whose function is to elevate the soil weathering process. Fertilizer penetrates the layer of sand containing air mixture and provides the whole surface with fertilizer. Thus, despite structural installations designed to elevate the breakdown of the soil this device, thus, the tool does not provide small-scale particles of the soil layer throughout the entire volume. Equal distribution of fertilizers can be optimized to equally equal to zero. Additionally, the use of the upper surface for soil cultivation does not allow the bubble residue needed to create a protective layer in the wind erosion zone to be kept on the upper surface. Device is used to distribute fertilizer grains equally and deeply. The prepared device combines 1 frame, 2 stabilizing columns, 3 horizontal cutting surfaces, 4 medium, small 5 and large 6 arrows and disk propellers, with 2 columns, 7 arrows, 8 discs, and 9 propellers behind it.

The process of forming soil stacks during the exploitation of the field is essential for subsequent differential fertilization [4]. If the resulting piles are smaller, granules distribution along the width and height, as well as their mixture with soil will be easier. Therefore, the soil layer should be grinded as much as possible. The motion of soil layer with the help of a group of devices are provided below to review it carefully. After the mentioned process completed the layer is placed over the surface of the soil in the form of airplane. Therefore, the layer collapses mainly after it has disappeared from the work surface. Only one collapsed effect is performed for each part of the land being cut off. In this situation, the layer works for a break. It creates a tearful force.

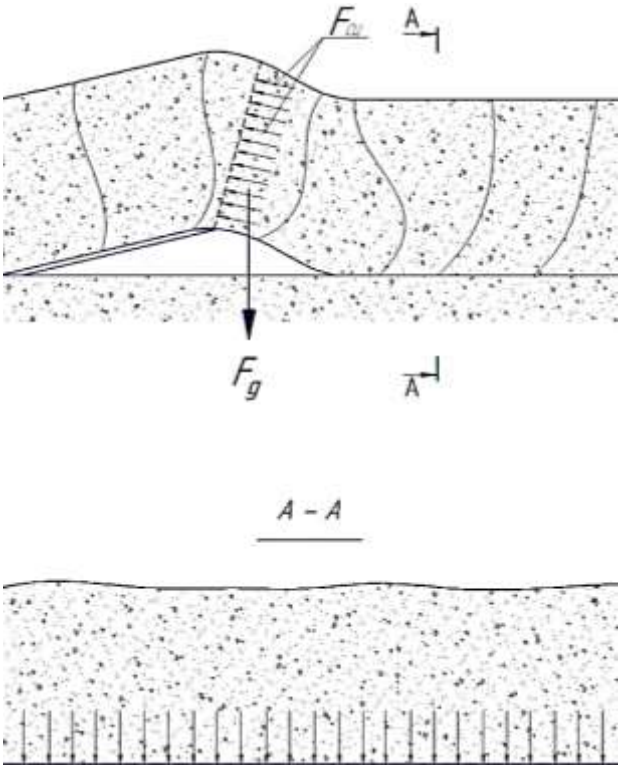

Figure 3. Describes destruction of soil layers during exploitation of a group of the workforce

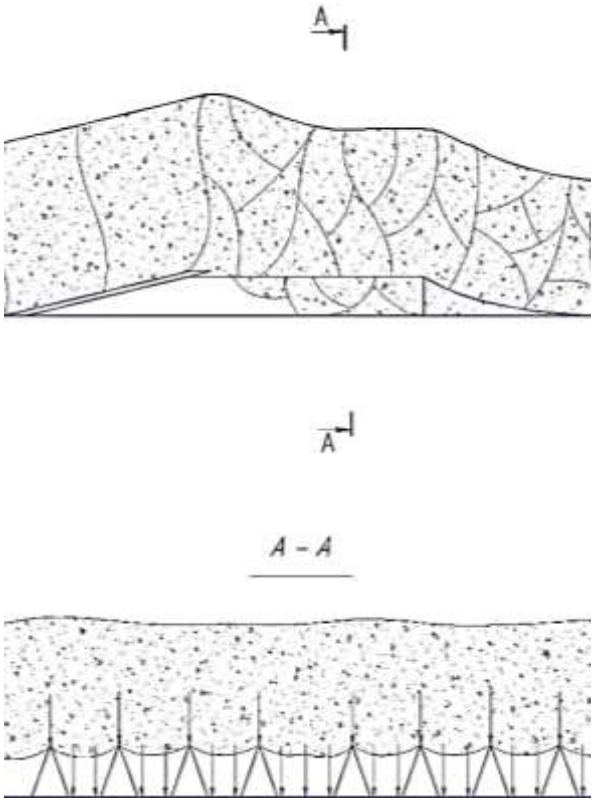

Figure 4. Image of the destruction of soil layers offered during the work of a group of devices with triangular extensions

Т. 10. №6. 2024
https://doi.org/10.33619/2414-2948/103

The destruction of the soil and the formation of soil piles by the group of workforces are determined by $F_g > F_{сц}$, Here F_g is a gravity force of a part of layer not supported after having been missed in soil warehouses n - $F_{сц}$ — n is a sticking force of soil that actually determines the power of stretching $F_{сц} = \sigma_p lh$, here, σ_p — determines the tension in pulling $h - l$ — determines the height of soil layer, м; l — determines its wdth. As forces move in different directions and different angles, they will create moments of rotation, and balance will be conditional. $F_g a = \sigma_p lh^2/2$, here a is an applicable part of gravity, mm $h^2/2$ — distance from the instant rotation center of the intersection of the separated soil layer, mm.

Because of instability factor of the properties of the soil and constant changing features of tear resistance layer division into the stacks is unequal. Space occurs when $mga > \sigma_p lh^2/2$, In this case, there is a fault inside the reservoir. If there is little sticking between soil particles, several defects and several soil stacks form. The number of faults depends on the size of the pieces and the quantity of defects (https://kurl.ru/anYvf).

Given that the power of the soil also varies widely in a short length, the cracks can form very unevenly, so different sizes of stacks are formed. Therefore, after having been disappeared from the surface of solder the soil falls into the triangular extensions of the plates (Figure 3, 4).

In this case, each part of the layer is on the two sharp edges of the triangular plates for a time (Figure 5). Under the influence of the gravity of the reservoir, its sharp edges enter it and cause the destruction of previously formed divisions. Additionally, under the influence of gravity, the layer is bent between the tiles. The folding causes cracks and the layer is destroyed by the formation of smaller stacks.

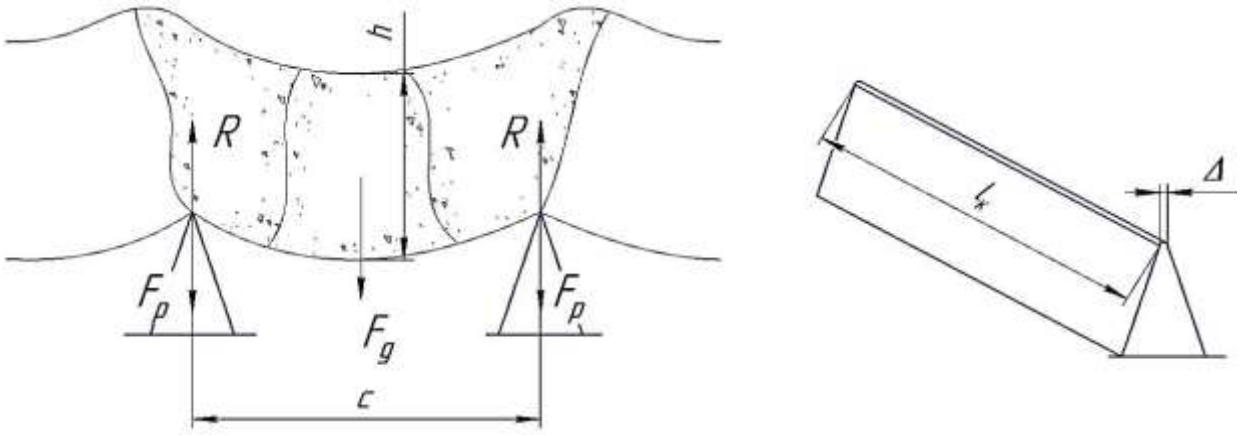

Figure 5. The scheme of the process when soil layer is taken during the work of device with extensions

As the section moves along the field, vibrations occur, and piles of soil experience alternative accelerations, resulting in additional collapse [3].

The soil's power characteristics can also change significantly in a small length. This change is random, causing the formation of stacks of soil of variety sizes. Therefore, the formula above can be clarified through experiments. The analyze of existing technological techniques and modern technologies that improve the development of soil environments for potato cultivation allows us to come to the following conclusions:

Only the technology enabling soil layers that provide optimal soil in terms of layer structure and air-feeding for potato cultivation during the growing season might be impressive.

Soil preparation in tarping method that require in-layer fertilization will create an optimal condition for crop growth during growing season. In arid regions with low altitudes in order to

Т. 10. №6. 2024
https://doi.org/10.33619/2414-2948/103

provide soil with sufficient water before cultivation the trees are exposed to fall trimming which allows using the wet period of spring earlier.

In order to save the dampness of the soil and create a thin structure, the soil preparation by using vertical freeze cutters in the almost equal depth level of wet lower layers is suggested which reduces the speed at which the damp from the soil evaporates, unlike the horizontal frame cutters that lift the lower wet layers to the surface.

With a different distribution of mineral fertilizers, the formation of a sowed soil will increase the efficiency of soil cultivation, create an optimal soil condition for potato development, and maintain a favorable environment for the structure of the soil layer for potato plantation during subsequent land recycling operations.

Classical methods and methods of producing potatoes in Qazakh economic district do not provide high productivity and profitability, resulting in the development of technological processes and technical tools for the cultivation of potatoes.

Overgeneralization of scientific materials and practical research, as well as, the development of soil horizons for potato cultivation by the writer, based on the classification reflecting technological and constructive features of modern soil recycling tools a promising field for potatoes has been identified for improving the workforce of land recycling and mineral fertilizer machines that allow them to produce optimal air-conditioned soil environments for potato cultivation in drought-prone regions.

References:

1. Shardina, G. E., Karpov, M. V., Semenov, D. O., & Nesterov, E. S. (2016). Issledovanie faktorov, vliyayushchikh na urozhainost' kartofelya. In *Materialy mezhdunarodnoi nauchno-prakticheskoi konferentsii,* 88-90. (in Russian).

2. Imamov, I. S. (1992). Mekhaniko-tekhnologicheskie osnovy teorii deformatsii pochvy rabochimi organami pochvoobrabatyvayushchikh i posevnykh mashin (modelirovanie metodom konechnykh elementov, optimizatsiya i avtomatizirovannoe proektirovanie): avtoref. diss. ... d-r tekhn. nauk. Moscow. (in Russian).

3. Zakharchenko, A. A. (2004). Effektivnost' ispol'zovaniya traktorov so shchadyashchim vozdeistviem na pochvu v razlichnykh tekhnologiyakh vozdelyvaniya kartofelya: avtoref. diss. ... kand. tekhn. nauk. Moscow. (in Russian).

4 Demen'tev, A. I., & Yudaev, N. V. (2012). Sovershenstvovanie tekhniki vneseniya udobrenii v zasushlivykh usloviyakh Povolzh'ya. Moscow. (in Russian).

5. Labukh, V. M., & Gorbachev, I. V. (2011). Kartofel' trebuet osobennoi podgotovki pochvy. *Sel'skii mekhanizator,* (10), 14-15. (in Russian).

Список литературы:

1. Шардина Г. Е., Карпов М. В., Семенов Д. О., Нестеров Е. С. Исследование факторов, влияющих на урожайность картофеля // Материалы международной научно-практической конференции. 2016. С. 88-90.

2. Имамов И. С. Механико-технологические основы теории деформации почвы рабочими органами почвообрабатывающих и посевных машин (моделирование методом конечных элементов, оптимизация и автоматизированное проектирование): автореф. дисс. ... д-р техн. наук. М., 1992. 56 с.

3. Захарченко А. А. Эффективность использования тракторов со щадящим воздействием на почву в различных технологиях возделывания картофеля: автореф. дисс. ... канд. техн. наук. М., 2004. 20 с.

4 Деменьтев А. И., Юдаев Н. В. Совершенствование техники внесения удобрений в засушливых условиях Поволжья. М.: Наука образования, 2012.

5. Лабух В. М., Горбачев И. В. Картофель требует особенной подготовки почвы // Сельский механизатор. 2011. №10. С. 14-15.

Работа поступила
в редакцию 02.05.2024 г.

Принята к публикации
14.05.2024 г.

Ссылка для цитирования:

Asgarov E., Mirzaliyev V. Cultivation Technologies and Inorganic Fertilizer Norms when Growing Potatoes in Azerbaijan // Бюллетень науки и практики. 2024. Т. 10. №6. С. 110-117. https://doi.org/10.33619/2414-2948/103/16

Cite as (APA):

Asgarov, E., & Mirzaliyev, V. (2024). Cultivation Technologies and Inorganic Fertilizer Norms when Growing Potatoes in Azerbaijan. *Bulletin of Science and Practice, 10*(6), 110-117. https://doi.org/10.33619/2414-2948/103/16