

**AZERBAIJAN REPUBLIC**

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**OPTIMIZATION OF FERTILIZER NORMS IN COTTON  
PLANTS**

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**SYNOPSIS**

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## GENERAL CHARACTERISTICS OF THE WORK

Relevance and development of the topic. “Strategic Way for Production and Processing of Agricultural Products in the Republic of Azerbaijan”<sup>[1]</sup> approved by the Decree of the President of the Republic of Azerbaijan dated December 6, 2016 The “Map” [1] sets a number of goals for the development of the agricultural sector, production and processing, which are to be implemented by 2020. The main target indicators for the measures envisaged in the agricultural production and processing sector until 2020 (compared to 2015) have been identified, including those related to cotton growing. It is planned to increase the production of cotton, as well as the volume of processing by at least 4 times [1]. [17, p.156]. At the same time, “Cotton growing in the Republic of Azerbaijan”<sup>[2]</sup> approved by the decree of our President IH Aliyev dated July 13, 2017. State Program for the Development of Agriculture for 2017-2022 ”[2] Strengthens state support for cotton growing It is aimed at solving problems in this area. As a result of the implementation of the State Program, the production of raw cotton in 2022 will reach 500,000 tons [2]. [18]. According to the State Statistics Committee of the Republic, in 2019, cotton was planted on 100,112 hectares, 295,279 tons of raw cotton was produced and the average yield of cotton was 29.5 s / ha. In Ganja-Gazakh economic region, 7277 tons of raw cotton was produced from 3102 hectares and the average productivity was 23.5 s / ha [175, www.stat.gov.az]. Cotton played a major role in the economy of the republic and was the main source of income for the population in the lowlands. Cotton is a technical plant of strategic importance. Its main product There is a constant demand for fiber in the world market. More than 250 different products are made from raw cotton.

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[1] “Strategic Road Map for the production and processing of agricultural products in the Republic of Azerbaijan” December 6, 2016, 947 p.

[2] “State Program on Development of Cotton Growing in the Republic of Azerbaijan for 2017-2022” July 13, 2017 il.

Thus, the calculations show that 20 s / ha of 4840 m of raw cotton, 172 kg of oil, 452 kg of cottonseed, 30 kg of soap, 160 kg of seed cotton, 70 kg of linter, etc. is obtained [64, p.111]. Cotton is one of the most widely grown crops in the world. In the last 10 years, the area under cotton has exceeded 30 million hectares, which is more than in previous years. The world produces 7 kg of cotton per capita every year. Cotton accounts for 40% of the world's arable land and 1/3 of all industrial crops. There is no sector of the economy that does not use cotton products. The most valuable product of cotton is mahlich. It is made up of fibrous fibers. The fibers of the cotton plant differ from other fibrous plants by being located on the stalk. Cotton plays an important role in the economy of our country, along with bread, iron, coal and oil. [5, p.29-32] Due to the fact that our lands have been used for a long time under various agricultural crops, the productivity and fertility of the soil decreases from year to year. The main reason for this is the non-return of nutrients extracted by plants from the soil to the soil, ie the lack of organic and mineral fertilizers. Increasing the productivity of the cotton crop and improving the quality of the crop in the modern conditions of the republic with a shortage of arable land is very relevant. Therefore, in order to ensure the dynamic development of cotton growing in our country, we need to use land resources, varieties created in recent years, fertilizers, irrigation, etc. It is very important to carry out new scientifically substantiated agro-technical measures using Cotton is more demanding of nutrients than other plants. From this point of view, it is important to determine the effective fertilizer norms that ensure high quality and high yields of cotton, and it is one of the problems of great scientific and practical importance [84, p. .165-167].

**Object and subject of research.** The subject of the study is to determine the optimal fertilizer options with the application of cotton, organic and mineral fertilizers on the gray-brown (chestnut) soils of the Ganja-Gazakh region.

**Objectives and tasks of the research.** The main purpose of the study is to ensure optimal production of high-quality products

from cotton plants on irrigated gray-brown (brown) soils in Ganja-Gazakh region. is to determine fertilizer norms.

In order to achieve the goal of the study, the following tasks are envisaged:

- \* study of agrochemical and physicochemical properties of experimental soils;

- \* study of the effect of fertilizers on changes in soil nutrition during the development phases of cotton plants;

- \* Study of the effect of fertilizers on the changes in total nitrogen, phosphorus and potassium in the vegetative mass of cotton plants on the developmental phases;

- \* to study the effect of fertilizers on the growth and development of cotton plants in the developmental stages;

- \* to study the effect of fertilizers on the productivity and quality of cotton;

- \* calculation of food balance;

- \* economic efficiency and recommendations to farms.

**Research methods.** The object of research was "Ganja-110" variety of cotton plant. Field experiments to determine the optimal norms of mineral fertilizers in the cultivation of cotton plants on the basis of manure in the past 2012-2014 Azerbaijan Scientific Research Cotton Growing It was carried out on gray-brown (chestnut) soils irrigated on the basis of the Central Experimental Base of the Institute.

Field experiments were carried out in 4 repetitions with the "Ganja-110" variety of cotton plant, with a total area of 120.0 m<sup>2</sup> (40x3.0 m) in each variant, using a 60x15 row method. 1 plant) cm sowing scheme was carried out in the 2nd decade of April (50 kg of seeds per hectare). In the case of semi-decomposed manure, 100% (annually) is applied to plowing in autumn, nitrogen-ammonium nitrate (34.7%) from mineral fertilizers, phosphorus-simple superphosphate (18.7). %) and potassium-potassium sulphate (46%), phosphorus and potassium 80% under plowing in autumn, the remaining 20% in feed, Nitrogen was given twice as feed.

**Scientific novelty of the research.** For the first time in the study, in the irrigated gray-brown (chestnut) soils of the Ganja-Gazakh region, mineral fertilizers were applied under manure under cotton plants. norms have been set, productivity, product quality indicators have increased, soil fertility, plant use of soil and fertilizers The economic balance of nutrients has been calculated.

**Theoretical and practical significance of the research.** It was found that the application of mineral fertilizers on the basis of manure has a significant impact on productivity and product quality. edits. Thus, the highest net income from the combined effect of fertilizers was obtained in the variant of manure 10 t / ha + -N90P120K90 1402.5 man / ha, and the level of profitability was 95.0%. has done.

**Approbation and application.** The results of the research were presented at the Scientific and Technical Council of the Department of Agrochemistry and Soil Fertility of the former Azerbaijan Scientific-Research Cotton Institute and by the Scientific Council of the Institute. Council (2013-2015), Agrarian Science Center of the Ministry of Agriculture of the Republic of Azerbaijan on the 91st anniversary of the birth of HA Aliyev and at the International Scientific Conference "The Role of Young Scientists in Agriculture: Problems and Opportunities" dedicated to the National Salvation Day (Baku, June 17-18, 2014), Azerbaijan The State Agrarian University hosted an international conference on "Innovative development of agrarian science and education: world experience and modern priorities." at the practical conference (Ganja, October 23-24, 2015), at the XXIII International Scientific-Practical Conference "EurasiaScience" in the Russian Federation (August 15, 2019, Moscow), ANAS Presented at the scientific-methodical seminar of the Institute of Soil Science and Agrochemistry (2021).

The results of field experiments were applied in 2 hectares in Fakhrali, Samadabad, Borsunlu and Gizil Hajili villages of Goranboy region in 2015-2018. As a result of application of fertilizers under the influence of fertilizers (manure 10 t / ha + N90P120K90) the load

of raw cotton is 40.0-42.5 s / ha The net income was between 1150.5-1370.5 man / ha.

**Name of the organization where the dissertation work is performed.** The dissertation work was carried out at the former Azerbaijan Scientific-Research Cotton Institute of the Ministry of Agriculture of the Republic of Azerbaijan (now the Scientific Research Institute of Plant Protection and Technical Plants).

**The total volume of the dissertation with a sign, indicating the volume of the structural units of the dissertation separately.** The dissertation consists of an introduction, six chapters, results, recommendations for production, 176 references and appendices. There are 5 figures, 20 tables and 47 additional tables. The introduction to the content of the dissertation is 5 pages with 9843 characters, the first chapter is 12 pages with 26701 characters, the second chapter is 41 pages with 90420 characters, the third chapter is 21 pages with 45885 characters, the fourth chapter is 21 pages with 45340 The fifth chapter is 15 pages, 30418 characters, the sixth chapter is 17 pages, 34671 characters, the results are 2 pages, 3098 characters, the recommendations for production are 1 page, 669 characters and the list of 176 used literature is 18 pages. It consists of 32812 characters. The volume of the dissertation consists of 213 pages of computer writing, the total volume is 337794 characters (266218 characters excluding the list of used literature, tables, figures and appendices).

**Personal participation of the author:** The author set the problem in the dissertation, conducted experimental experiments, analyzed and summarized the obtained results.

**Publication:** 9 articles and 3 theses reflecting the results of the research work were published. Of these, 2 articles and 1 thesis were published abroad.

### **The main content of the work**

The introductory part of the dissertation gives a brief description of the relevance of the work, its importance for science and practice.

**The first chapter** is a review of the literature, which provides a brief overview of the literature collected on research in this field in many foreign countries and in our country.

**The second chapter** is entitled "Botanical description of the cotton plant, biological features and development of cotton growing in Azerbaijan", where cotton (*Gossypium hirsutum* L.) The various products obtained, their strategic importance and other biological features were analyzed.

**The third chapter** provides information on the agro-ecological characteristics of the soils of the study area.

**In the fourth chapter**, the effect of fertilizers on changes in soil nutrient regime and total nitrogen, phosphorus and potassium in the soil mass was studied.

**The fifth chapter** provides information on the impact of fertilizers on the development, productivity and quality of cotton plants.

**In the sixth chapter**, the nutrient balance under the cotton plant is calculated and the economic efficiency is determined.

At the end of the dissertation, the results, suggestions, list of used literature, appendices reflecting the essence of the research work are given.

## CHAPTER I. LITERATURE REVIEW

Studies have shown that organic, mineral fertilizers, irrigation and other agro-technical measures affect soil fertility and the quality of cotton. Influence on productivity, economic indicators, quality, nutrient balance, assimilation is different It has been studied by many authors over the years. Improving the productivity and quality of cotton, which is a strategically important and labor-intensive plant for our country, is one of the most important issues. Therefore, there is a need to study the effectiveness of the application of organic and mineral fertilizers under cotton and to optimize fertilizer standards. has been washed.



## **CHAPTER II. IMPORTANCE OF COTTON PLANT, BOTANICAL DESCRIPTION, BIOLOGICAL FEATURES, AGROTECHNICS, DISEASE, PEST.**

Botanical description and biological properties of cotton plants, root system, structure of cotton buds, stems, shoots Branches, twigs, petals, flowers, flower buds, cups, crowns, walnuts, fiber development, fiber length, fiber elegance, strength, fiber maturity, raw material, heat, light, soil, water The demand for cotton and nutrients, as well as the history of the development of cotton growing in Azerbaijan and the current situation in this chapter. Extensive information is given about his life. At the same time, this chapter deals with the development of cotton growing in the Republic in recent years, certain quotes from the speeches of President IH Aliyev at the meetings on cotton growing, the upcoming tasks and state support. The information is reflected in the report.

## **CHAPTER III. AGRO-ECOLOGICAL CHARACTERISTICS OF THE LAND OF THE STUDY AREA**

The Ganja-Kazakh region is located in the western part of the Kura-Araz lowland, starting from the area of the Khram River where the Kura flows into the Kura and forming the southern part of the Greater Caucasus Mountains of the Kura. It is located in a large area up to the city of Mingachevir. The region is bounded on the south by the Lesser Caucasus Mountains, on the north by the Kura River and the Jeyranchol lowland. Natural drainage of lands, intensive irrigation, groundwater in the mountainous, central and western part of the region. mineralization, and gradually increases from the mountainous areas to the Kura [108].

The lands of the region [156], [19], [22] in different years Salayev M.E., Mammadov Q.Sh., Babayev MP, Mammadov R.H., Hasanov V.H. etc., and climatic conditions [140] were studied in different years by AM Madatza, AM Shikhlinisky and others. It was

determined that in the Ganja-Gazakh plain mainly dark gray-brown, gray-brown, light gray-brown, primitive gray-brown, ancient irrigated gray-brown and so on. soil types are widespread.

Agrochemical and physicochemical properties of the soils of the region in different years were studied by many researchers FHakhundov [16, p.18-20], NAAgaev [4, p.20-33], H .A.Aslanov [15, p.70], M.I.Mammadov [72, p.9] and others. studied by

Analysis of soil samples shows that gray-brown (chestnut) soils are not highly supplied with the assimilated forms of nitrogen, phosphorus and potassium. The pH was 7.8 in the 0-30 cm layer in the aqueous solution, and 8.4 in the 60-100 cm layer in the lower layers. Total humus, nitrogen, phosphorus and potassium in a layer of 0-30 cm, respectively 2.15; 0.15; 0.13; Is 2.39%. However, it gradually decreased to the lower layers, 0.85 in the 60-100 cm layer, respectively; 0.06; 0.07; 1.51%. Absorbed ammonia nitrogen 18.0-6.5; nitrate nitrogen 9.7-2.6, mobile phosphorus 15.8-4.5; exchangeable potassium fluctuates between 263.5-105.3 mg / kg [52, p.124-127]. Due to the amount of humus, these lands are considered to be less humus due to the gradation accepted in our republic (SA Aliyev, RHMammadov, FHakhundov (1981)) [ 40, p.11].

At the same time, along with agrochemical indicators, the main physical and chemical indicators of the experimental soils were studied. The total absorbed base was 28.6 mg / eq in the 0-30 cm layer and 20.5 mg / eq in the 60-100 cm layer. The amount of physical clay along the profile is 53.8-51.6%, and the amount of sludge is 24.3-22.5%. According to R.H.Mammadov, these soils are considered to be light clay with granulometric composition [142, p.32].

Our agrochemical analysis shows that due to the gradation accepted in our republic (Gulmadov AN, Akhundov FH, Ibragimov SZ, 1980) [119] these soils are poorly supplied with nutrients. Therefore, the application of mineral fertilizers on manure is very important for the growth, development, high yields and maintenance of soil fertility of cotton in these lands. is important and necessary.

## **CHAPTER IV. EFFECTS OF FERTILIZERS ON CHANGE OF NUTRITIONAL NUTRITION AND GENERAL NITROGEN, PHOSPHORUS, POTASSIUM IN SOIL**

The effect of application of mineral fertilizer norms on cotton on the basis of manure on the change of soil nutrient regime in the soil was studied in layers of 0-30 and 30-60 cm during the budding, flowering and full ripening phases of cotton. . Depending on the norms of mineral fertilizers in the manure, the amount of nutrients in the soil and in the subsoil is changed regularly. The maximum amount of milk was observed during budding, and the minimum amount was observed during harvesting. Thus, in the control (fertilizer-free) variant, the ammonia nitrogen and nitrate nitrogen absorbed during the budding stage are 16.5-17.5 in layers 0-30 and 30-60 cm, and 13.1-13.5 mg / kg, 8.8-9.3 and 5.8-6.1 mg / kg, motor phosphorus and metabolic potassium 14.3-15 , 5 and 12.3-12.8; 240.3-250.5 and 180.5-190.3 mg / kg, decreased due to plant assimilation of nutrients at the stage of full maturity, 11.8-12, respectively. 5 and 9.5-10.3; 5.8-6.5 and 4.1-4.5; 12.3-13.1 and 10.8-11.5; 192.5-201.5 and 145.3-150.5 mg / kg. The highest amount of nutrients in the development phases was obtained in the variant of manure 10 t / ha + N120P150K120 However, no significant difference was observed compared to the 10 t / ha + N90P120K90 variant. The application of mineral fertilizer norms on manure on gray-brown soils under cotton plants has a significant impact on the change of nutritional regime, as well as the absorption of nutrients in the plowed and subsoil layers of the soil. significantly increased the amount of manganese and nitrate nitrogen, mobile phosphorus and exchangeable potassium compared to the control (fertilizer-free) option, resulting in increased soil fertility. The agrochemical properties have improved, which in turn has had a significant impact on productivity.

Mathematical-statistical calculations of the application of mineral fertilizer norms on the basis of manure under the cotton plant show that the amount of nutrients in the soil at the stage of full

maturity with the cotton crop (s / ha) ( mg / kg) and there is a correlation between years  $r = + 0.863 \pm -0.114$ ;  $r = 0.910 \pm 0.077$ .

The highest total NPK was observed at the beginning of the growing season and at the end of the growing season. Total nitrogen in the growing phase According to the control (fertilizer-free) variant, total nitrogen is 2.85-2.91%, total phosphorus is 0.67-0.70% and total potassium is 2.27-2.38%. 2.17-2.21% as of today; 0.52-0.55%, 1.95-2.05% and 0.61-0.68% during the harvest period; 0.33-0.35% and 0.91-0.95%, in the case of 10 t / ha of manure, these indicators are 2.95-3.01% of total nitrogen in buds , total phosphorus 0.70-0.72% and total potassium 2.41-2.55%, respectively 2.28-2.33% at the stage of flowering; 0.56-0.58%, 2.01-2.15% and 0.73-0.76% during the harvest period; 0.35-0.38% and 0.98-1.01% [13, p.50-54].

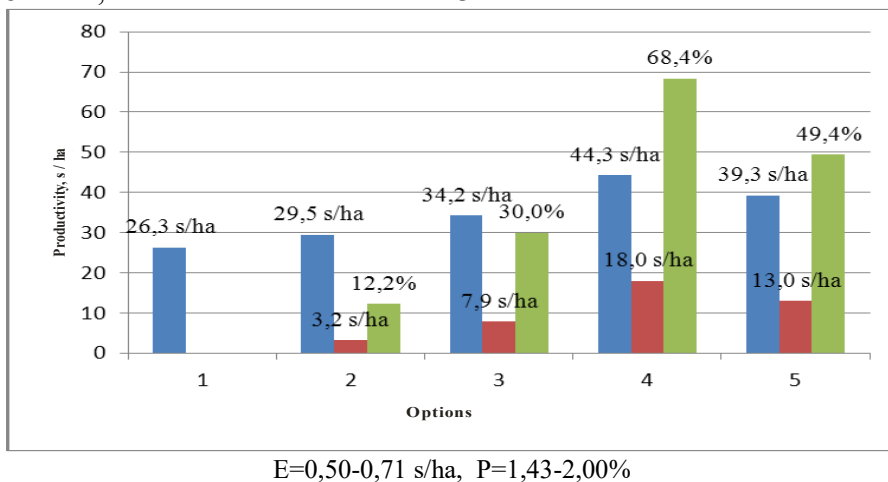
As a result of the application of different norms of mineral fertilizers together with the soil, the amount of total NPK increased significantly compared to the 10 t / ha (soil) variants of manure. Thus, in the ground variant +  $-N60P90K60$ , these indicators increase by 3.13-3.18%, 0.82-0.85%, 2.73-2.88%, respectively, in the budding stage. , at full maturity was 0.82-0.85%, 0.42-0.45%, 1.05-1.08%. The highest amount of total NPK was observed in the ground variant +  $N90P120K90$  and was 3.41-3.45%, 1.02-1.05%, 3, respectively, in the budding phase, respectively. 28-3.45% and at full maturity it was 0.98-1.03%, 0.53-0.61%, 1.31-1.38%. As the mineral fertilizer rate increases with the soil (soil +  $N120P150K120$ ), the amount of total NPK decreases relative to the soil +  $N90P120K90$  variant.

As a result of the application of mineral fertilizers together with manure under the cotton plant, it was found that in the full ripening phase According to the oaths, there is a correlation between the amount (%) of the total NPK in the surface mass and the raw cotton product (s / ha). Over the years, this relationship has varied between  $r = + 0.953 \pm 0.041$  and  $r = + 0.987 \pm 0.012$ .

## CHAPTER V. EFFECTS OF FERTILIZERS ON THE DEVELOPMENT, PRODUCTIVITY AND QUALITY OF THE COTTON PLANT

When a small amount of nitrogen, phosphorus and potassium is provided in the early stages of a cotton plant's development, normal conditions for the development of the root system are created and it develops rapidly. As a result, well-developed roots spread to the lower layers of the soil, providing the plant with nutrients and creating conditions for the growth of the trunk. In addition, a well-developed root system leads to the lower layers of the soil and uses the water more efficiently, which makes the plant resistant to drought. Under the influence of fertilizers given in different norms and proportions, the height of cotton increases, the root system develops strongly, the dry matter mass of the plant increases, and finally productivity increases [31, XIX. c., p.471-475]. On the basis of manure (manure 10 t / ha) the effect of mineral fertilizer norms on the height and development of cotton plants in phases is controlled (without fertilizers). In the budding phase of the plant, the height of one plant is 23.2-24.5 cm, sympodial branches are 4.0-4.2, buds are 3.8. -4.3 pieces, height 35.3-36.8 cm in bloom, sympodial branches 6.8-7.2, buds 7.7-8.1, cones 2.5-3 , 3 pieces, height 80.5-85.3 cm at full maturity, sympodial branches 9.7-10.2 pieces, cones 6.5-7.0 pieces, open cones 4.5-5.2 pieces The surface and root mass of a plant (dry mass in air) was 78.0-84.0 and 21.2-17.7 grams. In the budding phase in the 10 t / ha (ground) variant of the manure, the plant height is 26.5-27.8 cm, the sympodial branches are 4.4-4.7, the buds are 4.2. 4.8 pcs., Height 39.7-40.3 cm in inflorescence, sympodial branches 7.5-8.1 pcs., Buds 8.4-9.0 pcs. halls 2.8-3.8, full-grown 86.3-90.6 cm, sympodial branches 10.7-11.6, cones 7.2-7.8 , open cones 5,1-6,0 pieces, surface and root mass of one plant (dry mass in air) is 80,7-87,4 and 19,0-23,5 grams [83, p.134-137]. As a result of the application of different norms of mineral fertilizers along with the soil, the indicators studied have significantly increased compared to the control and manure options of 10 t / ha.

Thus, in the budding phase of the ground variant + N60P90K60, the height of the plant is 30.7-31.8 cm, sympodial branches 5.1-5.5, buds 4.8-5 , 7 pieces, height 45.1-46.6 cm in inflorescence, sympodial branches 8.6-9.5, buds 9.8-10.7, cones 3.2-4.6 pieces, full-grown height 93.5-97.4 cm, sympodial branches 12.2-13.5 pieces, cones 8.3-9.2 pieces, open cones 6.0-7.1 pieces, surface of one plant and root mass (dry mass in air) was 83.5-88.1 and 23.5-25.6 grams. The highest number of height and development indicators was observed in the variant of ground + N90P120K90 and 37.3-38.7 cm, respectively, according to the stages of development. , 6.5-6.8 units, 6.4-6.9 units; 57.2-56.5 cm, 10.8-11.5 pieces, 13.0-13.5 pieces, 4.3-5.4 pieces and 105.3-108.3 cm, 15.2-16 , 3 units, 11.0-11.8 units, 7.8-8.3 units, 88.0-92.1 and 23.0-28.3 grams. The average yield of raw cotton for 3 years (Fig. 1) is 26.3 s / ha in the control (without fertilizer) variant, while in the variant of 10 t / ha of manure it is 29 , 5 s / ha, an increase over control is 3.2 s / ha or 12.2%.



**Figure 1. Effect of fertilizers on cotton crop productivity (average of 3 years).**  
**1. Control (without fertilizer); 2. Manure 10 t / ha (ground);**  
**3. Ground + N60P90K60; 4. Ground + N90P120K90; 5. Ground +**  
**N120P150K120.**

The application of increasing norms of mineral fertilizers on the basis of manure has significantly increased the yield of raw cotton compared to uncontrolled fertilizers and 10 t / ha (ground) variants of manure. Thus, in the ground + N60P90K60 variant, the productivity was 34.2 s / ha, the increase compared to the control was 7.9 s / ha or 30.0%. The highest raw cotton yield was observed in the ground + N90P120K90 variant and 44.3, respectively; It was 18.0 s / ha or 68.4%. As mineral fertilizer norms increase with soil (N120P150K120), productivity decreases to 39.3; It was 13.0 s / ha or 49.4%. Compared to the 10 t / ha (land) variant of manure, the raw cotton yield per kilogram of NPK is 2.24, respectively; 4.93 and 2.51 kg [109, p.2-4].

Mathematical calculation of the effectiveness of the application of mineral fertilizers on the basis of manure under the cotton plant proves the accuracy of the experiment. Thus, the increase in variants was more than three times higher than E, s / ha,  $E = 0.50-0.71$  s / ha, and the accuracy of the experiment was  $P = 1.43-2.00\%$ .  $R = +0.997 \pm -0.003$  between raw cotton product (s / ha) and root mass (grams);  $r = +0.982 \pm 0.016$ , between raw cotton product (s / ha) and surface mass (grams),  $r = +0.855 \pm 0.120$ ; There is a correlation of  $r = +0.970 \pm 0.026$ .

The effect of mineral fertilizers on manure on the economic performance of cotton plants is given in Table 1. As can be seen, in the control (without fertilizer) variant, the weight of 1000 seeds is 100.5-105.3 grams, and the weight of raw cotton in one cocoon is 4.8-5.1 grams. The length of the fiber is 34.0-34.3, the fiber yield is 34.3-34.6%, the fiber yield is 9.1-9.5 s / ha. The weight of 1000 seeds in 10 t / ha variant of manure is 107.3-110.4 grams, the weight of raw cotton in one cocoon is 5.0-5.3 grams, fiber length 34.3-34.7 mm, fiber yield 34.6-35.0%, fiber yield 10.3-10.5 s / ha, fiber yield increase 1.0-1, Was 2 s / ha or 10.5-13.2% [148, p.227-233].

The application of various norms of mineral fertilizers on the basis of manure has significantly increased the control over the economic value of cotton and compared to the 10 t / ha (ground) variants of manure. Thus, in the ground + N60P90K60 variant, the

weight of 1000 seeds is 110.5-115.8 grams, the weight of raw cotton in one cone is 5.2-5.5 grams, the length of the fiber is 34.5-35.0 mm, the fiber yield was 35.0-35.6%, fiber yield was 12.2-12.3 s / ha, fiber yield increase was 2.7-3.2 s / ha or 28.4-35.2%. The highest values were observed in the ground + N90P120K90 variant and were 119.5-122.5 grams, 5.8-6.4 grams, 35.6-36.0 mm, 36.3-, respectively. 36.6%, 15.5-16.8 s / ha, 6.4-7.3 s / ha or 70.3-76.8%. As the mineral fertilizer rate increased along with the soil (N120P150K120), the studied values decreased.

**Table 1.**

**The effect of fertilizers on the economic value of cotton**

s/s	Practice	Options 1000 pieces seed weight, gr	Mass of raw cotton in a cocoon, gr	Fiber length, mm	Fiber yield,%	Fiber product, s / ha	Growth	
							S/ha	%
<b>2012</b>								
1	Control (without fertilizer)	105,3	5,1	34,3	34,6	9,5	-	-
2	Manure 10 t / ha (Ground)	110,4	5,3	34,7	35,0	10,5	1,0	10,5
3	Ground + N60P90K60	115,6	5,5	35,0	35,6	12,2	2,7	28,4
4	Ground + N90P120K90	122,5	6,2	35,6	36,3	16,8	7,3	76,8
5	Ground + N120P150K120	118,6	5,8	35,3	35,6	14,4	4,9	51,6
<b>2013</b>								
1	Control (without fertilizer)	100,5	4,8	34,0	34,3	9,1	-	-
2	Manure 10 t / ha (Ground)	107,3	5,0	34,3	34,6	10,3	1,2	13,2
3	Ground + N60P90K60	110,5	5,2	34,5	35,0	12,3	3,2	35,2
4	Ground + N90P120K90	118,4	5,8	36,0	36,6	15,5	6,4	70,3
5	Ground + N120P150K120	116,2	5,5	35,0	36,0	14,0	4,9	54,0

In the control (fertilizer-free) variant, the breaking load of raw cotton is 3.9-4.2 g, linear density is 5400-5350 m.tex, relative breaking length is 20.8-22.7 g While the length of tex and staples is 28 / 29-29 / 30 mm, at 10 t / ha of manure, these figures have increased significantly and are 4.2-4, respectively. , 4 gg, 5420-5500 m.tex, 22.8-24.2 gg / tex and 29 / 30-30 / 31 mm were present [149, p.6-9].



The application of mineral fertilizers on the basis of manure has significantly increased the control over the technological parameters of cotton fiber and compared to the 10 t / ha options of manure. Thus, in the ground + N60P90K60 variant, the breaking load of raw cotton is 4.4-4.6 g, the linear density is 5700-5750 m.tex, the relative breaking length is 25.1-26, 5 gg / tex and staple length 30 / 31-31 / 32 mm, the highest values were observed in the ground + N90P120K90 variant and the breaking load of cotton fiber was 4.7-4, 9 gg, linear density was 5920-6000 m.tex, relative fracture length was 28.2-29.0 gg / tex and staple length was 33 / 34-34 / 35 mm. With the increase of mineral fertilizer norms along with the soil (soil + N120P150K120), the technological quality indicators of cotton fiber decreased. Along with manure, the application of mineral fertilizers under the cotton plant has a significant impact not only on productivity, but also on the technological qualities of raw cotton fiber. The breaking load of cotton fiber due to the combined action of fertilizers is 0.6-0.7 g, linear density 520-650 m.tex, relative breaking length 6.3-7.4 g / tex and staple length 4 / 5 mm higher than the control (fertilizer-free) variant. The highest indicators of technological qualities of raw cotton fiber were observed in the variant of manure 10 t / ha + N90P120K90. As a result of application of fertilizers under cotton, it was found that the relative breaking length (kg / tex) of cotton fiber with raw cotton product (s / ha)  $R = + 0.968 \pm 0.030$ ,  $r = + 0.992 \pm 0.004$ ,  $r = + 0.946 \pm 0.047$  between the raw cotton product (s / ha) and the breaking load (kg) of cotton fiber,  $r = + 0,968 \pm 0,030$  and  $r = + 0,948 \pm -0,045$ ,  $r = + 0,993 \pm$  between linear density (m.tex) of raw cotton and (s / ha) cotton fiber It was determined that there was a correlation of 0.006, which confirms the accuracy of the results obtained.

## **CHAPTER VI. NUTRITION BALANCE AND ECONOMIC EFFICIENCY UNDER THE COTTON PLANT**

This includes the extraction of nutrients from the soil with raw cotton and vegetative mass, irrigation water, atmospheric sediments

and nitrogen, phosphorus, potassium content and amount of seeds entering the field, etc. The effect of the application of fertilizers under the cotton crop is reflected in the balance of nitrogen, phosphorus and potassium, nutrient uptake, and economic efficiency.

The amount of nutrients extracted from the soil by fiber products due to the effect of fertilizers varies depending on the productivity and its chemical composition. Thus, in the control variant, nitrogen extracted from the soil by fiber products is 2.1-2.4 kg / ha, phosphorus 0.6-0.7 kg / ha, potassium 3.2-4. , 1 kg / ha, and the highest amount was observed in the variant of ground + N90P120K90 and accordingly 4,8-6,0; 1.7-2.2 and 9.8-11.4 kg / ha [80, p.50-54].

In the control variant, 24.5-26.8 kg / ha of nitrogen, 17.8-18.7 kg / ha of phosphorus, 18.0-18.3 kg / ha of potassium from the soil with seed products, load the amount of sediment was observed in the variant of ground + N90P120K90 and correspondingly 49.4-54.2; 31.4-35.0 and 35.8-41.0 kg / ha.

In the control variant, nitrogen transported from the soil by vegetative mass was 48.3-48.8 kg / ha, phosphorus 25.1-26.1 kg / ha, potassium 68.2-72, 0 kg / ha, and the highest amount was observed in the variant of ground + N90P120K90 and correspondingly 82,1-933,0; 48.0-48.6 and 115.6-118.3 kg / ha.  $R = + 0,998 \pm -0,002$  between raw cotton product (s / ha) and fiber product;  $r = + 0,991 \pm 0,008$ , between raw cotton product (s / ha) and seed product (s / ha)  $r = + 0,996 \pm 0,004$ ;  $r = + 0.995 \pm 0.005$ .

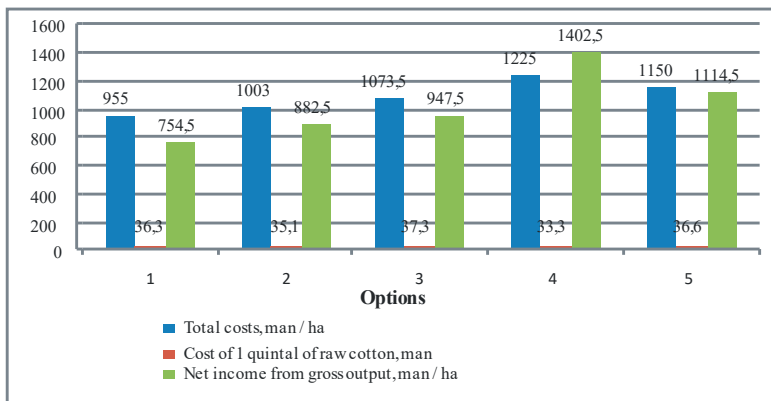
Annually, 4.15-4.62 kg / ha of nitrogen enters the experimental field with atmospheric sediments. Nitrogen is mainly in the form of ammonia 3.39-3.94 kg / ha, nitrate nitrogen 0.68-0.76 kg / ha, phosphorus 0.63-0.86 kg / ha, potassium 2.35-2, 38 kg / ha. Irrigation water and ammonia and nitrate nitrogen were only 2.42-2.77 kg / ha, phosphorus 0.78-0.84 kg / ha, and potassium 22.7-23.0 kg / ha [ 85, p.65-68].

One of the income elements of the balance is the nutrients that enter the soil through the seed material. According to our analysis, 0.72-0.80 kg / ha of nitrogen, 0.53-0.56 kg / ha of phosphorus, 0.54-0

/ kg of 50 kg of cotton seeds per hectare of cotton field per year , 60 kg / ha of potassium.

Balanced nutrient transfer to the soil is cost-effective, high in maintaining soil fertility and ecological balance, and higher than in agricultural crops. and is of great importance in obtaining a quality product. The application of fertilizers creates a positive balance of nutrients and restores soil fertility. The highest amount of nutrient uptake by plants is in the variant + -N90P120K90 with nitrogen 64.3-72.4 kg / ha, phosphorus 36.6-41.3 kg / ha and potassium. -um was 70.5-77.7 kg / ha or 46.0-52.0% of nitrogen, 25.2-28.5% of phosphorus and 50.4-52.0% of potassium [79, p.74 -79].

The economic efficiency of the application of mineral fertilizers under irrigated manure on irrigated gray-brown (chestnut) soils has been studied (Figure 2). Expenditures on application of manure and mineral fertilizers under cotton 32.0-290.0 man / ha, depending on the options, agro-technical The total cost of the event is 560.5 manat per hectare, depending on productivity - 955.0-1225.0 manat per hectare, manure, mineral fertilizers. Expenditures on crops and agro-technical measures varied between 955.0-1477.0 man / ha [82, p.485-488].



**Figure 2. Effect of optimization of fertilizer norms on economic efficiency of cotton plant: 1. Control (without fertilizer), 2. Manure 10 t / ha (Ground), 3. Ground + N60P90K60, 4. Ground + N90P120K90, 5. Ground + N120P150K120**

The cost of 1 quintal of raw cotton is 33.3-37.3 manat, depending on manure, mineral fertilizer norms and agro-technical measures, one hectare of cotton area. Net income from it ranged from 754.5 to 1402.5 manat.

## Results

1. Application of mineral fertilizer norms under manure on the basis of manure, having a significant effect on the change of diet, plant growth in the 0-60 cm layer of soil. At the end of the growing season, the amount of nutrients consumed in excess of 6.8-16.8, ammonium nitrogen, nitrate nitrogen 2.2-7.0 , mobile phosphorus increases between 7.9-14.2 and metabolic potassium between 9.1-28.3 mg / kg compared to the control (fertilizer-free) variant, resulting in soil fertility. Effective fertility increases, agrochemical properties improve, which in turn ultimately affects productivity. .
2. Application of mineral fertilizers together with manure under cotton plant has a significant effect on the accumulation of total nitrogen, phosphorus and potassium in the vegetative mass by growth phases. Due to the combined effect of manure and mineral fertilizers, by the end of the growing season, total nitrogen is 0.30-0.42%, phosphorus 0.20-0.26% and potassium 0.40-0.43%. increases compared to the control (fertilizer-free) option. The highest amounts of total nitrogen, phosphorus and potassium were observed in each of the development phases at 10 t / ha + N90P120K90.
3. Due to the combined effect of manure and mineral fertilizers, at the end of the vegetation, the length of cotton is 24.8-30.0 cm, sympodial branches are 5.5-6.1, 4.5-4.8 units, buds 3.1-3.3 units, surface and root mass of a plant (dry mass in air) 8.1-10.0 and 5.3-7, Control increases by 1 gram relative to the (fertilizer-free) option.
4. The highest yield of raw cotton was obtained in the variant + N90P120K90, 44.3 s / ha, an increase of 18.0 s / ha or 68.4%

- compared to the fertilizer-free variant. miş-dir. Along with productivity, there is a significant increase in the technological quality of cotton fiber.
5. Fertilizers have a significant effect on the economic value of raw cotton. At the end of the growing season, the weight of 1000 seeds is 17.2-19.0 g per cocoon. The weight of raw cotton is 1.0-1.4 g, fiber length is 1.3-2.0 mm, fiber yield is 1.7-2.3%, fiber yield is 6.4 7.3 s / ha more than the control (fertilizer-free) option. The highest indicators of economic value of raw cotton were observed in the variant of manure 10 t / ha + -N90P120K90.
  6. The total amount of nutrients extracted from the soil, depending on the yield, chemical composition and fertilizer norms, is 13.4 times higher than the control (without fertilizer). 72.2, phosphorus 5.6-41.3 and potassium 12.4-77.7 kg / ha.
  7. Annually 4.15-4.62 kg / ha of nitrogen with atmospheric sediments, 0.63-0.86 kg / ha of phosphorus, 2.35-2.38 kg / ha of potassium, nitrogen with irrigation water 2 , 42-2.77 kg / ha, phosphorus 0.78-0.84 kg / ha, and potassium 22.7-23.0 kg / ha.
  8. In the "soil-plant" system, all elements of the balance in the fertilizer-free variant are negative. As a result of the application of fertilizers, the negative balance of nutrients has completely disappeared. The positive balance of nutrients was obtained in the variant of manure 10 t / ha + -N90P120K90 and nitrogen positive 0.10-5.9 kg / ha, phosphorus positive 61.7-66.1 kg / ha, potassium positive 8.0-11, 7 kg / ha.
  9. The highest net income from gross output was 1402.5 manat / ha in the form of 10 t / ha + N90P120K90 manure, and the level of profitability was 95.0%.

### **Production recommendations**

1. In order to get high and high-quality raw cotton from cotton, it is recommended to sow in the region in the 2nd decade of

April, in the sowing scheme of 60x15 (1 plant) cm with a seed rate of 50 kg per hectare.

2. In irrigated gray-brown (chestnut) soils, manure is used to obtain high-quality products from cotton plants and to maintain soil fertility. t / ha + N90P120K90 option is recommended.
3. In order to enrich the soil with organic matter, after harvesting raw cotton from non-disease and pest-free areas, it is advisable to chop the surface mass with a chopper and plow to a depth of 22-27 cm.

**The main content of the dissertation is reflected in the following articles olunmuşdur:**

1. The main agrochemical properties of subsoil // Azerbaijan Agrarian Science, - 2013, №2. - pp.124-127 (jointly with NV Huseynov and others).
2. Cotton is a valuable technical plant // On the 91st anniversary of the National Leader of the Azerbaijani people H.Aliyev and the National "The role of young scientists in agriculture: problems and opportunities, International Scientific Conference (June 17-18, 2014)" dedicated to the Day of Salvation. Baku: Muallim Publishing House, - 2014. - pp.165-167.
3. The effect of application of fertilizers under cotton plants on gray-brown soils to change nitrogen, phosphorus and potassium in the soil // ADAU Innovative development of agrarian science and education: world experience and modern priorities. Proceedings of the International Scientific-Practical Conference, III c. (October 23-24, 2015). Ganja: ADAU Publishing House, - 2015, pp.165-169
4. The effect of fertilizers on the absorption of nutrients by cotton plants in gray-brown soils // Ganja branch of ANAS News Bulletin. - Ganja: Science, 2016, №4 (66). - pp.74-79.

5. Influence of optimization of fertilizer norms on height and development of cotton plant // Azerbaijan agrarian science, - 2016, №5.- p.134-137.
6. The effect of optimalization of fertilizer norms on the accumulation of total nitrogen, phosphorus and potassium in the vegetative mass of cotton plants // Scientific Works of ADAU, - Ganja: ADAU Publishing House, - 2016, №4. - pp.50-54 (together with HA Aslanov)
7. Influence of fertilizers on the harvest of cotton // M .: Agrarian science, - 2017, №3. - p.2-4 (locally Aslanov GA)
8. The effect of fertilizers on the transport of nutrients from the soil with raw cotton products in gray-brown soils // Scientific Works of ADAU, Ganja: ADAU Publishing House, - 2017, №2. - pp.50-54
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10. Economic efficiency of optimization of fertilizer norms under cotton plant // Collection of Works of Azerbaijan Society of Soil Scientists, - Baku: Science, - 2019, XV p. - pp.485-488
11. Influence of fertilizers on the harvest of cotton fiber // Bulletin of Science and Practice, Vol.5. - 2019, №9. - pp.227-233
12. Influence of fertilizers on technological properties of cotton fiber. // "Eurasia Science" XXIII International Scientific-Practical Conference (August 15, 2019). - Moscow: "Scientific Publishing Center" Actuality. RF », 2019. - p.6-9.

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Electronic versions of the dissertation and abstract  
posted on the official website of [defterxana@tai.science.az](mailto:defterxana@tai.science.az).

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