Chapter 7

Quantity of Humus and Nutrient in the Irrigative Soils

7.1 Humus Quantity in the Irrigative Soils

Hydrolytic shattering of the high molecular unspecific organic combinations is connected with some processes and humus formation is formed by a participation of oxidation-reduction ferments. Humus is one of the main indicators of the soils effective fertility. All the part of nitrogen in humus, 70-80% of the total supply of sulphuric are summed up, half of phosphorus combinations is in organic form on the tillage layer.

An influence of humus on ferments activity in the soil is many-sided. It is connected with the effect of ferments which are excreted as a result of soil microorganisms and plants activity directly and indirectly. On the one hand main nutrient resource and biogen ash elements are collected in humus, on the other hand the physical-chemical and water features, structure, buffering, absorbing capacity, water-capacity, water-conductivity ability, and others are defined for humus (Khaziev, 2005).

An investigation of the labile and inert fractions ratio of humus by a quantity under a different bioclimatic condition gives a chance to evaluate the durability of the humus quantity against the negative factors; it depends on granulometric, mineralogical structure of soil, natrium salts, soil environment and exchangeable forms.

A situation of the soil cover humus is distinguished over the zones and landscapes, changes in a large integral by a quality and quantity. A mass of the unspecific organic combinations by a quantity possesses a high dynamically and these substances variety in a large interval. A analyses of humus structure shows that unspecific organic substances form 10%, they are the organisms which lost their morphological structure completely (Kazeyev and et al., 2004).

One of the main indicators of the soil cover degradation is a study of humus state of the soil. A role of the organic fertilizers, a surface and root residue of the plants is great in increase of the humus quantity. A quantity of the different group microorganisms by a quantity and quality depends on soil humus state, resource and distribution along the profile with the chemical structure of the plant residue entering the soil. Along the profile the microorganisms quantity reduces together with the increase of humus quantity (Mustafayeva, 2005).

Humus quantity in the irrigative grey-brown soils. The most usefulness of the agrotechnical measures directed to increase of the agricultural plants productivity and fertility is an application of the crop rotation based on plants alternation.

At theoretical and practical importance of the investigation of the influence of the agricultural plants differing from each other for the biology, soil chemical composition and growing technology on soils features, fertility and humus quantity, resource is great. The soil defines the plants productivity as an ecological factor, the plant is a reason for change of the humus state in a directed form as abiotic factor. The changes occurring as a result of use of the soils under the agricultural plants take place in a different direction and the authors have different ideas about it. At present an intensification of the antropogen effect is connected with the monoculture, crop rotation possessing a short rotation, minimum growing of soils, shortage of the qualitative sorts. This reduces regulation of soils by themselves, aggravates phytosanitar ability of agrocenoz as a result accelerates pathogen biotype formation (Paxnenko and et al., 2005).

A role of the surface and root residues of the plants, organic fertilizers is great in increase of the humus quantity.

The humus quantity and resource was learnt at the beginning (in March) and at the end (in October) of the vegetation on the crop rotation six field vegetable-fodder and five-field vegetable-leguminous plants in comparison with the constant tillage in the grey-brown soils under irrigative condition. The researches show that the humus quantity changes in a different direction under an influence of the growing plants biology, predecessor plants and depending on applying agrotechnics. The fodder plants formed 33,3% and vegetable plants formed 66,7% on the crop rotation applying on the 1st scheme in the irrigative grey-brown soils. The perennial grass plants growing gives a chance to solve the following problems: growing the fodder plants rich in vitamins; reducing of the antropogen intensification for the environment; decrease of the use of the natural resources and energy source to a striking degree; holding and of restoring of the soil fertility (Zelenskiy and et al., 2005). A source of ensurement of the soil with the organic matters in a natural method is surface and underground residues. 15-28% of humus loss can be compensated at the expense of the plant residues on the crop rotation (Mamedov, 1989).

The organic substances in plant residues are a main energy source for microorganisms and a main source for soil structure improvement, richness in nitrogen, phosphorus and potassium. The soils fertility according to the total rule are evaluated for humus state, organic matter quantity in t/h of the soil. The humus quantity under the growing plants on the 1st scheme in the irrigative grey-brown soils changed by 1,23-1,88% on the tillage layer (AI^{I}_{a}) and humus resource 38,4-58,8 t/h; 1,09-1,73% and 38,2-60,6 t/h on the under tillage layer (Table 28).

The humus quantity under the annual lucerne+barley changed by 1,48-1,72% (on 0-25 cm of layer) on the tillage layer; 1,35-1,64% (25-50 cm of layer) on the under tillage layer at the vegetation period and the humus quantity increase was 0,24% and resource was 7,5 t/h; 0,29% and 10, 1 t/h on under tillage layer at the vegetation period. The humus number under the two year lucerne was 1,50-1,88% (0-25 cm of layer) on the tillage layer and changed by 1,35-1,73% (25-50 cm of layer) on the tillage layer. The humus resource increased 11,9 and 13,3 t/h on the tillage and under tillage layers. The statistic calculations show that the humus quantity was 1,43-1,78% on the tillage and under tillage layers, a variation coefficient was 8,21-2,53%. The researches show that growing of the annual and perennial grass plants enrich the soil with the organic substances and rise 1,5-2,0 times of biological activity and fertility, nutrient. The substances being got from organic matters in the root residues of the soil form a food source of the plants. After the lucerne was ploughed, the humus quantity raised, its main source formed by the plant residues. If humus was 1,60%, nitrogen was 0,110% on 0-20 cm of layer at the beginning of the experiment, the lucerne was 1,77%; 0,127% under a version of the annual+barley; it increases 2,14% and 0,133% in the two-year lucerne (Huseynov, 1974).

Phytomeliorants influence on agrohemical and agrophysical features of soils 2,8-5,1 t/h of organic matter, 35-87 kg of nitrogen, 8-15 kg of P_2O_5 and 26-45 kg of K_2O are accumulated in the lucerne tillage in the soil (Sazanov and et al., 2005).

More loss of humus under the plants growing in the irrigative grey-brown soils was observed under a garlic, a quantity reduced 0,08% and a resource decreased 2,5 t/h.

The humus quantity under a watermelon increased 0,05% at the vegetation period. It is obvious that, the two-year, the lucerne kept its positive effect in the next years as a predecessor. Entering the interval plants the crop rotation was a reason for increase of the humus quantity. The mathematic analyses show that the humus quantity under a watermelon changed by 1,49-1,53% on the tillage layer, 1,32-1,42% on the under tillage layer; 1,23-1,29% and 1,09-1,11%, a variation coefficient changed by 2,59-7,29% on 0-50 cm of layer under the both version. Being the soil cover under the plant constantly was a reason for entering of the plant residues the soil ecosystem continuously, getting crop two times a year, enriching the soil with the organic substances in a form of the plant residues.

An increase of humus was observed under the white head cabbage version at the vegetation period. The humus quantity was 1,42% and resource was 44,4 t/h on 0-25 cm of layer at the beginning of the vegetation. The humus quantity was 0,19% on the tillage layer and 0,25% on the under tillage layer, the resource increased 5,9 and 8,8 t/h at the end of the vegetation. We can come to such a conclusion from the mathematic analyses conducted in the soils under the white head cabbage+tomato that the humus quantity was 1,28-1,57%, a variation coefficient was by 6,48-9,54% on 0-50 cm of layer.

The vegetable plants were 60% and leguminous plants were 40% on the five-field vegetable leguminous crop rotation in the irrigative grey-brown soils. An increase of humus quantity and resource was observed under the vegetable bean, an increase was 1,41-1,68% on the tillage layer; 1,29-1,56% on the under tillage layers. The humus resource changed by 44,1-52,5 on the tillage layer and 42,7-54,6 t/h on the under tillage layer and increased 5,6 t/h on the tillage layer.

The stabilization process of the humus quantity and resource under the tomato was observed, and its quantity was 1,31% and resource was 43,3 t/h on 0-50 cm of layer. The humus quantity under the watermelon was 1,37% on 0-25 cm of layer, the resource was 42,8 t/h, an increase was 0,09% and 2,80 t/h at the beginning of the vegetation. An increase for the humus quantity and resource in the soils under the watermelon was observed, it is obvious that it is connected with the vegetable bean as a predecessor. The humus quantity was 1,29% and resource was 40,3 t/h under the potato, the decrease was 1,50 t/h for the humus resource on 0-50 cm of layer. The humus quantity and resource under the tomato, watermelon, potato, garlic, white head cabbage and vegetable bean on the constant tillage decreased in comparison with the plants of the same name on the crop rotation. This reduction occurs slowly under the vegetable bean, but is occurs more intensively under the garlic. The humus quantity under the plants growing on the constant tillage was 0,81-1,32% and the resource was changed by 25,3-41,3 t/h on 0-25 cm of layer. The consequences of the statistic calculations show that the humus quantity under the plants entering of the five-field the crop rotation changed by 1,12-1,58%, a variation coefficient changed by 1,93-10,96%, 0,69-1,28 and 6,58-22,09% on the constant tillage.

So, the humus quantity and resource changed in a different direction depending on biology, predecessor plants in the irrigative grey-brown soils. An increase of the humus quantity and resource was observed under a version of the annual lucerne+barley, two-year lucerne, white head cabbage+tomato and vegetable bean, its decrease was observed under the garlic. Entering of the lucerne and vegetable bean the crop rotations influenced on an increase of the humus quantity and resource positively under the plants growing after itself as predecessor. The humus quantity and resource changed in decreasing direction under all the plants growing on the constant tillage.

Humus quantity in the irrigative grey-meadow soils. The 4-field vegetable-fodder crop rotation has been tested in the irrigative grey-meadow soils of the Shirvan plain. The forage plants formed the crop rotation and vegetable plants formed 50% of the crop rotation. The soil samples were taken from the layers of 0-25 and 25-50 cm and were analyzed at the beginning (in

March) and at the end (in October) of the research for learning of the humus quantity and resource every year. The researches show that the humus quantity under the annual lucerne was 1,52% in March and 1,79% in October; the resource was 46,4 and 54,6 t/h, 1,63 and 1,97%, 49,7 and 60,1 t/h under the two-year Lucerne (Table 29). The humus quantity was 0,29%, the resource was 9,4 t/h under the annual lucerne on 0-50 cm of layer; increased 0,34% and 10,4 t/h under the two-year lucerne. An increase of the humus resource under the two-year lucerne was 4,8 t/h more than the annual lucerne.

The humus quantity on the tillage layer in the soils under the cucumber at the vegetation period vibrated by 1,60-1,63% its resource vibrated by 48,8-49,7 t/h, an increase was 0,9 t/h for a resource. Changing of the humus quantity in an increase direction little in the soils under the cucumber is explained by an effect of the lucerne as a predecessor. The humus quantity under constant cucumber changed by 1,12-1,27% on the tillage layer at the vegetation period, the decrease for its quantity was 0,15% and 4,50 t/h for the resource. An average value of humus under the cucumber on the crop rotation was 0,45% more, the resource was 14,4 t/h than the constant tillage.

The humus quantity was 1,49-1,52%, the resource was 47,1-48,0 t/h on the layer of 0-50 cm under the tomato at the vegetation period, because of some decrease, the lucerne effected on humus stability in the soils under the tomato with the cucumber as a predecessor. The humus quantity under the constant tomato changed by 1,17-1,31% the resource was 35,7-40,0 t/h on 0-25 cm of layer, its quantity changed by 0,98-1,31% the resource was 35,7-40,0 t/h on 0-25 cm of layer; its quantity changed by 0,98-1,18% and 32,3-38,9 t/h on 25-50 cm of layer. An average of the humus quantity under the constant tomato decreased 0,17% and the resource was 5,4 t/h. The mathematic analyses show that the humus quantity changed by 1,66±0,80 under the annual lucerne on 0-25 cm of layer; 1,79±0,100 under the two-year lucerne; 1,62±0,021 under the cucumber; 1,56±0,016 under the tomato; 1,24±0,128 under the tomato and 1,20±0,164 under the cucumber on the constant tillage.

So, an increase of the humus quantity occurs under the lucerne, cucumber on the crop rotation (predecessor two-year lucerne), its stabilization occurs under the tomato. Change of the humus quantity and resource in diminishing direction in the soils under the cucumber and tomato on the constant tillage gives an opportunity to understand a positive effect of the lucerne on direction of the humification process very clearly.

Humus quantity in the irrigative alluvial meadow-forest soils. The six-field vegetable-fodder crop rotation was tested in the irrigative alluvial meadow-forest soils at the research period, 33,3% of the scheme formed fodder plants, 66,7% of it formed vegetable plants. Inter-row growing plants were in three of the four field, an onion was in one field. The inter-row growing plants intensified mineralization of organic substances and accelerated the humus quantity. From this point of view a special weight of the inter-row plants must be paid attention to when the schemes of the crop rotation are applied. The humus quantity in the soil samples taken from the plants changed to an important degree depending on plants biology on the six-field vegetable-fodder crop rotation which is applied in the irrigative alluvial meadow-forestry soils at the vegetation period.

The humus quantity under the lucerne, tomato, white head cabbage, onion and cucumber plants entering the crop rotation changed (AI^{I}_{a}) 2,53-3,47% on the tillage layer and (AI^{II}_{a}) 2,02-3,01% on the under tillage layer, 1,92-2,31% and 1,63-2,01% on the constant tillage, the resource changed by 70,8-100,9 on

0-50 cm of layer on the crop rotation and 55,3-67,3 t/h on the constant tillage (Table 30).

The higher quantity of humus was noted under the lucerne in the irrigative alluvial meadow-forestry soils under the growing plants at the end of vegetation. An average of the humus quantity under the annual lucerne+barley was 2,79% and resource was 87,1 t/h on 0-50 cm of layer under the annual lucerne +barley and 3,07% and 95.6 t/h under the two-year lucerne.

The consequences got from the statistic calculations show that the humus quantity changed by 2,82-3,36% on 0-25 cm of layer of the irrigative alluvial meadow-forest soils; 2,63-2,94% on 25-50 cm of layer, a variation coefficient changed by 4,05-6,79% on 0-50 cm of layer.

The humus quantity in the irrigative alluvial meadow-forest soils under the cucumber occurred in the decreasing direction at the vegetation period, it is quantity changed by 2,28-2,36% on 0-50 cm of layer and the resource changed by 70,8-73,3 t/h . The humus quantity under the onion was 2,92-3,00% and the resource was 90,8-93,4 t/h at the vegetation period. Despite the onion holds few quantities of plant residues after itself, holding of the humus quantity and resource in a high level under it is explained by an influence of the two-year lucerne as a predecessor. It was (AI^{I}_{a}) 83,0-87,2 t/h on the tillage layer and (AI^{II}_{a}) 78,0-85,5 t/h and increase was 5,5 t/h.

So, the consequences show that the plants are distinguished for the humus quantity despite the plants are grown the same soil type. Planting of the same culture in one area was a reason for increase of the dehumification process and the plants feeding at the expense of decomposition of the humus substances. The humus quantity under the growing plants on the constant tillage changed by 1,92-2,31% on the tillage layer ($AI^{I}a$), the humus resource changed by 57,1-68,7 t/h, and changed by 1,63-2,01% and in an interval of 53,4-65,8 t/h. The humus quantity under the growing plants on the constant tillage goes towards decrease till the vegetation end. The mathematic-statistic analyses show that the humus quantity on 0-50 cm of layer changed by 2,61-3,29% under the onion, 2,05-2,57 under the cucumber, 2,39-28,4% under white head cabbage, 2,42-2,82% under a version of green fodder+tomato, 1,63-2,31% on the crop rotation, under the growing plants on the constant tillage, a variation coefficient changed by 1,11-6,79 % and 9,07-13,06%.

The humus quantity in the irrigative gleyey-yellow soils. 60% of the vegetable plants and 40% of the annual leguminous plants were on the five-field crop rotation in the irrigative gleyey-yellow soils. The humus quantity under the plants grown on the crop rotation in the irrigative gleyey-yellow soils was 2,91-4,17% and its resource varied by 97,5-127,2 t/h on the tillage and under tillage layers and it changed by 2,39-3,46% and 80,1-105,5 t/h (Table 31).

The humus increase was comparatively observed under the versions of the vegetable bean and white head cabbage+maize. The humus quantity under the vegetable bean was 3,89% and the resource was 118,7 t/h on 0-50 cm of layer at the beginning of vegetation, it was accordingly 4,17% and 172,2 t/h at the end of the vegetation and on increase for the humus resource was 8,6 t/h. The humus quantity under the constant vegetable bean was in the decrease direction by changing by 3,24-3,46% on the tillage layer during the season, the resource on 0-50 cm of layer was 6,7 t/h less than the vegetable bean version on the crop rotation.

As a result of entering of grain-interrow growing plants especially 80% of the interrow growing plants the tillage and absence of the perennial grass plants the humus quantity decreased 0,08-0,37%, entering of the perennial grass plants the crop rotation and as a result of surface cultivation of the soils the humus quantity, fertility and therefore the agricultural plants productivity increased to an important degree.

The humus quantity under the tomato on the crop rotation changed by 3,38-3,52% on the tillage layer and 3,04-3,22% on the under tillage layer. The humus quantity on 0-50 cm layer was 0,6% less and the resource was 18,3 t/h less than the tomato on the crop rotation under the constant tomato.

The humus number on 0-50 cm of layer increased 3,41% and the recourse increased 108,6 t/h under a version of the white head cabbage+maize till the end of vegetation and accordingly 3,64% and 116,2 t/h in March. An increase of the humus resource on the tillage layer under the white head cabbage+maize version was 5,5 at the vegetation period and 9,7 t/h on the under tillage layer and the humus resource was 27,1 t/h than the constant white head cabbage and 26,2 t/h more than the constant maize.

The humus quantity under the tomato, onion, maize, white head cabbage and vegetable bean on the constant tillage was 2,58-3,46 and 2,39-3.25% on the under tillage layer, the recourse changed by 78,7-105,7 and 80,1-108,9 t/h.

The mathematic analyses conducted for the humus quantity in the gleyey-yellow soils show that a less quantity of humus number and resource was found in the irrigative grey-brown soils, but a more quantity was found in the irrigative gleyey-yellow soils. The humus quantity was more in the grey-brown, grey-meadow, alluvial meadow-forest and gleyey-yellow soils and the resource was more on the crop rotation than the constant tillage, on the tillage layer than the under tillage under irrigation condition. Humification process dominates under the leguminous plants as lucerne, vegetable bean and dehumification process dominates on the constant tillage. On the constant tillage one-sided use of the nutrient by plants intensifies mineralization of humus substances.

7.2 A Quantity of the Nutrient in the Irrigative Soils

The nutrient-nitrogen, phosphorus and potassium which play an important role in plant development is in the assimilating and non-assimilating form depending on soils fertility. A need of the plants for the nutrient changes depending on soils fertility. A need of the plants for the nutrient changes depending on their development phase. This is a base for getting high crop by ensuring the plants with the nutrient at the vegetation period. Alternation of the plants entering the crop rotation conditioned entering of the plant remnants (rich in food) the soil. From this point of view the nutrient in the soil samples taken under plants entering the crop rotation in the research zones has been studied in dynamics. Studying the nitrogen nitrate form in dynamics shows that its quantity under the plants growing in the crop rotation changes both over years and at the vegetation period in a frame of time and space to an important degree.

The nitrogen nitrate form changed 3,5-6,8 mg/kg under plants growing vegetable-fodder crop rotation in the irrigative grey-brown soils, 4,3-4,9 mg/kg in vegetable leguminous plants tillage rotation and 2,3-3,5 mg/kg of NO_3 in constant tillage. The higher quantity of nitrate on tillage rotation of vegetable fodder at the vegetation period was under watermelon and vibrated by 5,5-10,3 mg/kg of NO_3, it is explained by an influence of two year lucerne last years. There is no strong difference according to the nitrate nitrogen quantity from the influence of planting of the vegetable bean in two fields on plants after itself as a predecessor. The nitrogen nitrate form in the constant tillage changed by

2,3-4,8 mg/kg of NO_3 on 0-50 cm of the layer under the separate plants and the indicators continued to reduce over the years.

The nitrogen nitrate form on the vegetable-fodder crop rotation in the irrigative grey-meadow soils changed by 1,1-4,5 mg/kg on tillage (0-25 cm) and 1,1-3,1 mg/kg of NO_3 on under tillage layers (25-50 cm) and 0,4-2,8 mg/kg of NO_3 (0-50 cm) in the constant tillage. The nitrate quantity was less in comparison with the plants of the same name on the crop rotation under tomato and cucumber in the constant tillage. The nitrate quantity in the irrigative grey-meadow soils was 2,4-3,9 NO_3 under cucumber on 0-50 cm of the layer at the vegetation period, 1,8-3,5 NO_3 under tomato, 1,5-3,4 mg/kg of NO_3 under lucerne. In comparison the nitrate quantity under the cucumber on the crop rotation was 27% more than tomato, 65% more than tomato and cucumber on the constant tillage.

The nitrate quantity was 5,0-15,3 on the tillage layer (0-25 cm) under the plants growing on the crop rotation and 4,1-9,3 mg/kg of $N0_3$ on under tillage layer (25-50 cm) in the irrigative alluvial-meadow-forest soils. The higher quantity of nitrate was 12,4 mg/kg of NO_3 under lucerne and 10,2 mg/kg of NO_3 under onion in September, under cucumber in August (11,3 mg/kg of NO_3), under white-head cabbage in June (10,2 mg/kg of NO_3) in the version of green fodder + tomato in July (11,8 mg/kg of NO_3) depending on soil-climate condition, plants development phase. The same objective law was observed on the constant tillage, but the nitrate quantity continued to reduce over the years.

The nitrate quantity under tomato on 0-50 cm of layer in crop rotation in the irrigative gleyey-yellow soils at the vegetation period was 3,3-5,8, in the version of the white head cabbage+maize it was 3,8-4,9; 2,2-3,8 under onion and 2,8-8,7 under vegetable bean, 1,4-5,1 mg/kg of NO_3 under plants being grown on the constant tillage (tomato, white head cabbage, maize, onion, vegetable bean). The higher quantity of nitrate on the crop rotation was observed under vegetable bean and at the end of vegetation-in October. The nitrate quantity under vegetable bean 19% more than tomato, 17% more than the version of white head cabbage + maize, and 45% more than onion. The nitrate quantity on the crop rotation in the version of the white-head cabbage on the constant tillage, 33% more than maize, 32% more than tomato on the constant tillage under tomato, 34% more than onion on the constant tillage under onion, 48% more than vegetable-bean under vegetable-bean.

The difference was observed according to the nitrate quantity at the vegetation period during plants growing on the crop rotation, but this difference was to an important degree on the constant tillage in comparison with the plant of the same name. We should note that the nitrate collection intensity was less in comparison with the plant of the same name on the constant tillage. The nitrate quantity was higher than under tillage layer on the tillage horizon in all the soil types. Sometimes majority of the nitrate quantity on under tillage layer can be explained by washing towards low layers from an influence of rainfall and irrigation.

So, the consequences of the conducted research show that nitrate nitrogen collects under plants being grown on the crop rotation to an important degree and this quantity changes to an important degree depending on plants development phase.

The ammoniac quantity in the irrigative grey-brown soils of the research object was 7,8-12,1 mg/kg of NH_4 on 0-50 cm of layer under plants being grown on the crop rotation, 4,9-6,9 on the constant tillage; 18,6-23,2 and 11,5-11,7 in the grey-meadow soils; 12,2-17,3 and 10,9-12,7 in alluvial meadow-forest soils and 60,1-85,9 and 36,9-56,8 mg/kg of NH_4 in gleyey-yellow soils. The soil types difference shows that the higher quantity of ammoniac was in gleyey-yellow soils. The ammoniac quantity on the crop rotation in the irrigative grey-brown soils changed depending on development phase of the plants being grown at the vegetation period. The higher quantity of ammoniac was noted under lucerne in July, under watermelon in June and October, in the version of garlic, potato and white head cabbage+tomato in March, July and October; this indicator was comparatively low on the constant tillage. The ammoniac collection intensity was the highest under watermelon plant being planted after two-year lucerne. The ammoniac quantity on the crop rotation was 13,7 mg/kg of NH4 on the tillage layer under watermelon, it was 38% more than lucerne, 23% more than potato, 32% more than garlic and 6% more than the version of white head cabbage+tomato. This indicator 41-61% more than the constant tillage.

The ammoniac quantity in the irrigative grey-meadow soils was 23,2 mg/kg of NH_4 under cucumber on the crop rotation, 14% more than lucerne, 5% more than tomato. This indicator was less on the constant tillage. The relative higher quantity of ammoniac on crop rotation in the irrigative alluvial meadow-forest soils was in the version of green fodder+tomato (17,3 mg/kg of NH_4). This indicator was more than 29% of the lucerne, 13% of the onion, 18% of the cucumber, 8% more than the cabbage. The ammoniac quantity on the constant tillage changed by 10,9-12,7 mg/kg of NH_4 decreasing over the years.

The comparison of the soil types show that the higher quantity of ammoniac was in the gleyey-yellow soils. The plants comparison shows that this indicator is noted in the version of white-head cabbage+maize relatively (85,9 mg/kg of NH_4). In the version of white head cabbage+maize the ammoniac quantity was 37% more than the tomato being grown on the constant tillage, 36% more than white-head cabbage, 51% more than maize, 57% more than onion, 34% more than vegetable bean.

We should note that a relative little quantity of the nitrogen ammoniac form at the period of the research is observed in August. It can be explained by soil regime aggravation, temperature increase and humidity decrease, as a result of weakening of the microorganisms life activity at the same period, the plant growing shows reduction of ammoniac on the constant tillage on both tillage and under tillage layers.

Studying of mobile phosphorus quantity in the soils under growing plants on crop rotation and constant tillage in dynamics shows that this indicator changes in a large interval depending on plants development phase.

The higher quantity of mobile phosphorus in the irrigative grey-brown soils was under watermelon (0-50 cm layer, 10,1 mg/kg P_2O_5) being planted after lucerne on crop rotation. The phosphorus quantity under watermelon on the vegetable-fodder tillage rotation was 12% more than watermelon on crop rotation, 60% more than watermelon on constant tillage, 10% and 38% under potato, 8% more than tomato on vegetable-leguminous crop rotation in the version of white head cabbage+ tomato,42% more than tomato on the constant tillage, 32% more than vegetable bean on the constant tillage under vegetable bean.

The mobile phosphorus quantity under plants being grown on crop rotation in the irrigative grey-meadow soils was higher, the higher quantity of the mobile phosphorus in the irrigative grey-meadow soils under the lucerne was observed in July, under cucumber and tomato in July and October, this indicator is 10,5 mg/kg of P_2O_5 under cucumber, it is 26% more than tomato and 31% more than cucumber on the constant tillage. A quantity of the mobile phosphorus vibrated by 11,7-48,6 on the tillage and under tillage layers and 9,1-24,9 mg/kg of P_2O_5

on the constant tillage. The higher quantity of this indicator was under lucerne in March and August, under onion in March, July, under cucumber in March, July and October, in the version of green forage+tomato in March and July. This indicator was higher in comparison with the plants of the same name on the constant tillage on crop rotation.

A quantity of the mobile phosphorus was higher inn the version of (141,3 mg/kg of P_2O_5) the white head cabbage+maize on crop rotation in the irrigative gleyey-yellow soils. The phosphorus quantity of the plants on constant tillage was less than the plants of the same name being grown on crop rotation.

So, a need for the plants nutrient is high at the vegetation period, their quantity changed in the large interval depending on plants assimilation intensity in March-October.

Table 28. *Humus content in irrigated grey-brown soils and statistical processing of parameters (average).*

Variants Number of the field	Depth, cm	n	During the growing season the experiment	
			in the beginning	in the end
I Annual lucerne+	0-25	36	1.48	1.72
barley	25-50	36	1.35	1.64
II Lucerne of	0-25	36	1.5	1.88
the second year	25-50	36	1.35	1.7
III	0-25	36	1.48	1.53
Watermelon	25-50	36	1.27	1.46
IV	0-25	36	1.38	1.34
Potatoes	25-50	36	1.18	1.22
V	0-25	36	1.31	1.23
Garlic	25-50	36	1.12	1.09
VI White head	0-25	36	1.42	1.61
cabbage+tomato	25-50	36	1.22	1.47

Table 28. *Continued.*

Variants Number of the field	**x aver.**	**V, %**	**S_x**	**S_x%**	**$x \pm t_{05Sx}$**
I Annual lucerne+	1.60	8.32	0.038	2.403	1.60 ±0.085
barley	1.50	10.32	0.045	2.979	1.50 ±0.098
II Lucerne of	1.69	11.78	0.058	3.401	1.69 ±0.127
the second year	1.54	12.85	0.057	3.709	1.54 ±0.126
III	1.51	2.84	0.012	0.822	1.51 ±0.027
Watermelon	1.37	7.42	0.029	2.141	1.37 ±0.064
IV	1.40	1.81	0.007	0.522	1.40 ±0.016
Potatoes	1.20	2.21	0.008	0.64	1.20 ±0.017
V	1.30	3.37	0.013	0.973	1.30 ±0.028
Garlic	1.11	1.65	0.005	0.474	1.11 ±0.012
VI White head	1.52	6.54	0.029	1.889	1.52 ±0.063
cabbage+tomato	1.35	9.65	0.038	2.787	1.35 ±0.083

Scheme 1. *The five-field vegetable-beans crop rotation.*

I	0-25	30	1.29	1.15	1.22	6.11	0.024	1.931	1.22 ±0.053
Potatoes	25-50	30	1.12	1.16	1.14	2.60	0.009	0.821	1.14 ±0.021
II	0-25	30	1.41	1.68	1.55	9.35	0.046	2.957	1.55 ±0.103
Vegetable bean	25-50	30	1.22	1.51	1.37	11.29	0.049	3.570	1.37 ±0.110
III	0-25	30	1.37	1.46	1.41	3.63	0.016	1.149	1.41 ±0.037
Watermelon	25-50	30	1.22	1.31	1.27	4.05	0.016	1.281	1.27 ±0.037
IV	0-25	30	1.39	1.37	1.40	5.41	0.024	1.711	1.40 ±0.054
Tomatoes	25-50	30	1.24	1.25	1.25	1.51	0.006	0.481	1.25 ±0.014
V	0-25	30	1.45	1.63	1.54	6.24	0.030	1.974	1.54 ±0.069
Vegetable bean	25-50	30	1.29	1.56	1.43	10.05	0.045	3.179	1.43 ±0.102

Scheme 2. *Constant.*

Tomatoes	0-25	36	1.24	1.01	1.13	14.79	0.048	4.270	1.13 ±0.106
	25-50	36	1.02	0.83	0.93	17.22	0.046	4.969	0.93 ±0.101
Watermelon	0-25	36	1.15	0.92	1.00	16.48	0.048	4.757	1.00 ±0.105
	25-50	36	1.01	0.81	0.91	17.91	0.047	5.169	0.91 ±0.104
Potatoes	0-25	36	1.06	0.87	0.97	16.33	0.046	4.713	0.97 ±0.100
	25-50	36	0.96	0.74	0.85	19.79	0.049	5.715	0.85 ±0.107
Garlic	0-25	36	1.05	0.81	0.93	21.51	0.051	5.460	0.93 ±0.112
	25-50	36	0.91	0.64	0.78	23.04	0.052	6.651	0.78 ±0.114
White head	0-25	36	1.26	1.07	1.17	10.38	0.035	2.995	1.17 ±0.077
cabbage	25-50	36	1.06	0.82	0.94	19.35	0.053	5.586	0.94 ±0.116
Vegetable bean	0-25	30	1.32	1.15	1.24	8.33	0.033	2.634	1.24 ±0.074
	25-50	30	1.12	1.03	1.08	6.46	0.022	2.045	1.08 ±0.050

Note: n – Quantity of frequency; x – Average; V-Coefficient of variation; Sx-the average absolute error; Sx%-relative error.

Table 29. *Humus content in irrigated grey-meadow soils and statistical processing of parameters (average).*

Variants Number of the field	**Depth, cm**	**n**	**During the growing season the experiment**		**x aver.**	**V, %**	**S_x**	**S_x%**	**x ±t_{05Sx}**
			in the beginning	**in the end**					
Scheme 1. *Four-field vegetable fodder crop rotation.*									
I Annual	0-25	24	1.52	1.79	1,66	8,780	0,510	3,104	1,66 ±0,122
lucerne	25-50	24	1.39	1.71	1,55	11,062	0,060	3,91	1,55 ±0,143
II Lucerne of	0-25	24	1.63	1.97	1,80	10,123	0,064	3,579	1,80 ±0,153
the second year	25-50	24	1.55	1.86	1,71	9,769	0,059	3,454	1,71 ±0,140
III	0-25	24	1.60	1.63	1,62	1,610	0,009	0,569	1,62 ±0,022
Cucumber	25-50	24	1.45	1.57	1,51	4,339	0,023	1,534	1,51 ±0,055
IV	0-25	24	1.57	1.55	1,56	0,907	0,005	0,321	1,56 ±0,012
Tomatoes	25-50	24	1.46	1.42	1,44	1,741	0,009	0,616	1,44 ±0,021

Scheme 2. *Constant.*

Tomatoes	0-25	24	1.31	1.17	1,24	18,714	0,082	6,616	1,24 ±0,195
	25-50	24	1.18	0.98	1,08	20,896	0,080	7,388	1,08 ±0,190
Cucumber	0-25	24	1.27	1.12	1,20	16,985	0,072	6,005	1,20 ±0,170
	25-50	24	1.12	0.93	1,12	21,980	0,087	7,771	1,12 ±0,206

Table 30. *Humus content in irrigated alluvial meadow-forest soils and statistical processing of parameters average).*

Variants Number of the field	**Depth, cm**		**During the growing season the experiment**		**x aver.**	**V,%**	**S_x**	**S_x%**	**$x \pm t_{05Sx}$**
			in the beginning	**in the end**					
Scheme 1. *The six-field vegetable-fodder crop rotation.*									
I Annual lucerne+	0-25	36	2.75	3.05	2,90	5,465	0,046	1,577	2,90 ±0,101
barley	25-50	36	2.58	2.78	2,68	4,037	0,031	1,165	2,68 ±0,069
II Lucerne of	0-25	36	3.04	3.47	3,26	6,936	0,065	2,002	3,26 ±0,143
the second year	25-50	36	2.75	3.01	2,88	4,798	0,040	1,385	2,88 ±0,088
III	0-25	36	3.25	3.29	3,27	0,933	0,009	0,269	3,27 ±0,019
Onion	25-50	36	2.59	2.71	2,65	2,417	0,018	0,698	2,65 ±0,041
IV	0-25	36	2.58	2.53	2,55	1,101	0,008	0,318	2,55 ±0,018
Cucumber	25-50	36	2.13	2.02	2,08	2,742	0,016	0,792	2,08 ±0,036
V White head	0-25	36	2.85	2.79	2,82	1,326	0,011	0,383	2,82 ±0,024
cabbage	25-50	36	2.47	2.36	2,42	2,366	0,016	0,683	2,42 ±0,036
VI Green	0-25	36	2.79	2.93	2,86	2,686	0,022	0,775	2,86 ±0,049
fodder+tomatoes	25-50	36	2.38	2.61	2,49	4,882	0,035	1,409	2,49 ±0,077
Scheme 2. *Constant.*									
Cucumber	0-25	36	2.19	2.05	2,12	8,688	0,053	2,508	2,12 ±0,117
	25-50	36	1.87	1.66	1,77	11,439	0,058	3,302	1,77 ±0,128
White head	0-25	36	2.24	2.06	2,15	8,812	0,055	2,544	2,15 ±0,121
cabbage	25-50	36	1.95	1.75	1,85	10,976	0,059	3,168	1,85 ±0,129
Tomatoes	0-25	36	2.31	2.13	2,22	8,532	0,055	2,463	2,22 ±0,120
	25-50	36	2.01	1.81	1,91	10,274	0,057	2,966	1,91 ±0,125
Onion	0-25	36	2.18	1.92	2,05	10,543	0,062	3,043	2,05 ±0,137
	25-50	36	1.84	1.63	1,74	11,748	0,059	3,391	1,74 ±0,130

Table 31. *Humus content in irrigated gleyey-yellow soils and statistical processing of parameters (average).*

Variants Number of the field	Depth, cm	n	During the growing season the experiment		x aver.	V, %	S_x	S_x%	$x \pm t_{05Sx}$
			in the beginning	in the end					
Scheme 1. *The five-field vegetable-beans crop rotation.*									
I	0-25	30	3.52	3.38	3,45	2,239	0,024	0,708	3,45 ±0,055
Tomatoes	25-50	30	3.22	3.04	3,13	3,124	0,031	0,988	3,13 ±0,070
II White head	0-25	30	3.65	3.83	3,74	2,609	0,031	0,825	3,74 ±0,070
cabbage + maize	25-50	30	3.47	3.79	3,63	4,685	0,054	1,481	3,63 ±0,122
III	0-25	30	3.52	3.45	3,49	1,232	0,014	0,390	3,49 ±0,031
Onion	25-50	30	3.05	2.91	2,98	2,594	0,024	0,820	2,98 ±0,055
IV	0-25	30	3.75	4.06	3,91	4,230	0,052	1,338	3,91 ±0,118
Vegetable bean	25-50	30	3.56	3.97	3,77	5,799	0,069	1,834	3,77 ±0,156
V	0-25	30	3.89	4.17	4,03	3,715	0,047	1,175	4,03 ±0,107
Vegetable bean	25-50	30	3.69	3.94	3,82	3,527	0,043	1,115	3,82 ±0,096
Scheme 2. *Constant.*									
Tomatoes	0-25	30	2.89	2.69	2,79	6,019	0,053	1,903	2,79 ±0,120
	25-50	30	2.75	2.53	2,64	6,620	0,055	2,093	2,64 ±0,125
White head	0-25	30	2.81	2.67	2,74	5,460	0,047	1,727	2,74 ±0,107
cabbage	25-50	30	2.69	2.51	2,60	6,189	0,051	1,957	2,60 ±0,115
Maize for silage	0-25	30	2.82	2.76	2,79	4,770	0,042	1,508	2,79 ±0,095
	25-50	30	2.63	2.59	2,61	5,057	0,042	1,599	2,61 ±0,094
Onion	0-25	30	2.71	2.58	2,65	5,648	0,047	1,786	2,65 ±0,107
	25-50	30	2.45	2.39	2,42	5,828	0,045	1,843	2,42 ±0,101
Vegetable bean	0-25	30	3.46	3.24	3,35	5,271	0,056	1,667	3,35 ±0,126
	25-50	30	3.25	3.06	3,16	5,268	0,053	1,666	3,16 ±0,119