Chapter 4

Dynamics of Microorganisms in the Irrigative Soils

At present the biological methods grounded on definition of the activity and microbe biomass, microbiosenoz structure durability of the soil under its natural and antropogen influences developed in evaluation of its fertility and the microorganisms quantity is a diagnostic indicator of the soil fertility (Babyeva and et. al., 1989). Some scientists were busy with the study of the biosenoza and agrosenoza effect of the natural and antropogen factors (Zvyaginsev, 1978; Kazeyev and et al., 2004; Krasilnikov, 1958). Humus, a total quantity of microorganisms, groups are received as basic elements of the biological activity, these indicators change by depending on soil type hydrothermic regime, soil fertility, applying agrotechnical measures (Mamedzade, 2004).

A definite soil-ecological condition-organic substances, air, heat, humidity easily hydrolyzing salts, pH of the soil environment and others are main terms for the normal activity of microorganisms. The eminent scientists of Azerbaijan conducted microbiological researches on a large scale and they learnt change objective laws depending on season and spreading of microorganisms (Guliyeva, 2005; Jumshidova, 1987; Gasimova, 1985; Shakuri, 2004). Some authors connect change of a quantity of microorganisms with the temperature and humidity during a season (Poson and et. al., 1960). The microorganisms quantity depends on a chemical composition of the plant residues entering the soil. Bacteria and microscopic fungi are more active in the initial stage of the splintering of the plant residues, actinomycetes and spore-forming bacteria are more active in the last stage (Mishustin, 1972).

The biochmeical process that is performed by high plants, microorganisms and zoofauna plays a great role in soil fertility formation. The destructor lessens process which is characteristic for the soil condition is fulfilled by heterotroph microorganisms (bacteria, actinomycetes, fungi). A quantity of microorganisms varies in large interval depending on the season. Non spore-forming bacteria, nitrificators, sellulozesplintering bacteria, azotobacteria and some fungi are more sensible, spore-forming bacteria and actinomycetes are less sensible for humidity (Kazeyev and et. al., 2004). Bacteria, actinomycetes, microscopic fungi quantity which perform transformation, shattering of the different organic substances changed in the trophy-boggy soils and formed straight dependence with the temperature at a vegetation period (Usacheva, et. al., 2005). The organic substances, soil environment, humidity, temperature and other ecological factors play a role in definition of the organic substances mineralization intensity and direction of soil-microbiological process (Voynova-Roynova and et. al., 1986; Merkusheva and et.al., 2004).

The complex researches conform the general objective laws between soil-ecological and antropogen factors with the direction and intensity of the biological process. The cultivation level of grey-brown soils effects positively on a quantity of micro-and macroorganisms that play a main role in increase of fertility and its physical-chemical characters. Spore-forming bacteria and actinomycetes mainly form a tillage layer of grey-brown, light-brown, brown and dark-brown soils (Kharshum, 2005). As a result of using from yellowish soils under the agricultural plants (grain) a quantity of microorganisms increased 3-4 times on surface, 2 times along the profile (Kazeyev and et al., 2002).

Study of the microorganisms dynamics shows that their activity changes in the different direction depending on soil-ecological condition. A useful condition creates for the microorganisms development in spring and autumn, an activity of the microbiological process reduces by aggravation of the hydrothermic condition in summer. A quantity of spore-forming bacteria in the brown and yellowish soils forms till 4-7% of the total quantity of microorganisms, 29% on the low layers because there is no unfit period (dryness and soil freezing) for non spore-forming bacteria in the humid subtropic zone (Kazeyev and et al., 2002). The number of actinomycetes rises in summer in comperison with the spring, this show that actinomycetes develop in the soil white there is also little humidity, but fungi number reduces (Kazeyev and et al., 2004; Shakuri, 2004). G.M.Zenova, D. G. Zvyaginchev (2002) shows an importance of actinomycetes possessing an ability to secret different ferments on an ecological side in soil.

A quantity of the different groups of microorganisms by a quality and quantity depends on soil humus state resource and distribution along the profile together with the chemical structure of the plant residue entering the soil. The microorganisms number in the natural senoz depends on hydrothermic condition and antropogen effect in the agrosenoz subjected to the mains economy activity. The microorganisms number in the soil depends on plants feeding level intensity of substance exchange ability, plants biology and development phase (Zeynalova, 1998). The soils under cotton monoculture are characterized by a little quantity of microorganisms and by a higher quantity under the lucerne (Mustafayeva, 2005). Each soil type is characterized by a special microbe structure in biotop (Kharshum, 2005). A quantity of bacteria, actinomycetes, fungi in the soil changes to an important degree depending on a temperature and humidity at a season period, depending on degree of ensuring with the water in agrocenoz (Bedlovskaya, 2005; Merkusheva and et. al., 2004). The actnomycetes quantity changes in a larger interval in summer in comparison with the spring in the alluvial-meadow soils (Zenova and et al., 2004).

The plants biology influences on microflora quantity and structure to an important degree in comparison with the soil type (Voynova-Roykova, 1986). A sort and development phase of the plants influence on rizospher microflora, a quantity of rizospher bacteria becomes maximum at period of budding and blossoming. Because of occurring active of plants development at the same time the root exsudants increase as a result a good condition is created for microorganisms development. Despite bacteria with spores are little at the strong development period and actinomycetes are little at the initial development period of the plant, at the end of the vegetation a quantity of both rises by an increase of the plant residues (Gasimova, 1985). Entering of the plant residues the soil raises a quantity of microorganisms not depending on soil type, their number and sort structure depend on a ratio of nitrogen in the structure of the plant residues to carbon. As a result of getting of the plant residues ensured with the little nitrogen into the soil, the processes that decrease a quantity of the assimilating nitrogen become intensified. Because of possessing a high selection ability against microorganisms in plants, planting one plant in the same plot for a long time area a reason for perishing of the useful microorganisms and gathering of antagonist microbes, therefore the productivity reduces, the soil falls into “tired soil” state, in this moment the crop rotation application is necessary. The plants as onion, garlic play a cleaning sanitary role in soil (Gasimova, 1985). D.G.Zvyaginsev with his co-authors (1999) explain a sharp change of the microflora quantity by an influence of the natural and antropogen suxession of soil microorganisms in different months and years, the suxession can appear from interval and external reasons (freezing, melting, becoming damp, fertilizing, polluting and etc.)

N.A Krasilnikov (1958) shows that gathering of the definite group of microorganisms in some plant roots possesses a selecting feature. The organic residues, especially, and underground part of the plants is a main substrate and energy source for soil microflora in agroecosystem.

N. A. Krasilnikov (1958) shows that a quantity and structure of the soil microflora doesn’t depend on geographical zonality, it depends on the environment-plant cover, humidity, temperature and others. An optimum temperature is 15-23^{0}C and humidity is 15-25% for microorganisms, the analogical numbers are characteristic for ferments activity (Aliyev, 1978). There are different ideas about an effect of the soil humidity increase on microorganisms quantity in the scientific references. Some authors (Alexina, 2001; Yefremov, 2000) show that microbiotan rises by an increase of hydromorphism, (at this time an activity and sort structure of the bacteria performed the fungi function change (Alexina, 2001). The other authors show that nitrogenfixing and spore-forming bacteria, actinomycetes, fungi reduce by increase of hydromorphism, this is connected with the gleying (Mamedzade, 2004). The authors express such an opinion that the microorganisms are inactive in the soils where humidity is much in both cases.

Leaching and cultivation of the soils change an availability condition of the microorganisms to an important degree. The microorganisms number raises in leaching and microbiological activity increases in the soil profile, a structure of the microbe groups is transformed (Yakutin, 2000). A relation between the soil microflora and agriculture plants is very complicated and mutual. The soil microflora is a main ecological factor and defines a direction of the soil forming process. The microorganisms participate in humus formation, in making a form of assimilation of the plant and animal residues by the plants, play an important role in increase of the agricultural plants productivity. The microorganisms activity depends on soil type, cultivation level, soil-ecological condition, agrotechnical measures system, plants alternation in crop rotation and others functionally, that’s why it is impossible to manage the processes which assume importance for growing and development of the agricultural plants not knowing the objective laws of the mutual relation with the environment and high plants. The researches that are conducted under different soil-climatic condition show that an influence of the agricultural plants on microorganisms quantity and activity is different (Abasov, 1980; Babayev et al., 2009; Hajiyev, 1997; 2000; Guliyeva, 2005; Orudzheva, 2009; 2012). The consequences of the researches show that the microflora activity changes depending on biology of growing agricultural plants, development phase, and chemical structure of the plant residues applying agrotechnique, predecessor plants as they soil biogen, sort structure and ratio possess dynamical character depending on soil type. The plant roots synthesize different exomethabolit to the environment, exsudants of the different plants are strongly distinguished from each other. A definite quantity and group of microorganisms develop in every soil that is defined by concrete physical-chemical characters, a characteristic biological balance is formed depending on the season for the same soil condition. A change of the soil water weather and food regime effects on microflora to an important degree: a quantity, dynamics and microbiological process intensity of the separate group change. The plants surface and root residues play a substrate role and are a main energy source for the soil microflora in agroecosystem. A character and intensity of the microbiological process occurring in the soil depend on quantity and quality.

So, according to the reference bases a good condition and food regime are formed, microflora quantity rises, the underground root residues enter the soil, shattering of the humus substances of soil is prevented for collection and preservation in the soil in plant alternation in comparison with the constant tillage of the crop rotation. The researches show that a ratio of the bacteria, spore-forming bacteria, actinomycetes, microscopic fungi changes as changing of the total quantity of microorganisms in a definite interval depending on growing plants biology.

4.1 Dynamics of the Microorganisms Quantity in the Irrigative Grey-Brown Soils

In order to learn an effect of the growing plants on soil microflora activity the plants of the same name are compared on the crop of the rotation and constant tillage grey-brown, grey-meadow alluvial meadow forest and gleyey-yellow soils under an irrigative condition, a change of the microorganisms quantity depending on growing plants biology, sort, soil-ecological condition in 6-field vegetable-fodder and 5-field vegetable leguminous plants crop rotations in the irrigative grey-brown soils of Absheron has been learnt. The obtained consequences show that the different agrotechnical measures applied in plants growing-fertilizer, irrigation, soil cultivation alternation of the plants on crop rotation and others effect on soil biogeniness to a significant degree, learning of the soil microbiological feature is necessary from the stand point of definition of the agrotechnical measures and growing plants effect on soil biological features. We can use of the microflora activity in definition of the different process direction occurring in the soil as a diagnostic indicator (Voyunova-Roykova and et al,, 1986, Staxurliva and et al., 2007).

A total quantity of the microorganisms on the tillage and under tillage layers under the annual lucerne+barley was 1,6-2,0 $\times 10^6$, bacteria were 1,1-1,5 $\times 10^6$, spore-forming bacteria-0,1-0,2 $\times 10^6$, actinomycetes-2,6-4,0 $\times 10^5$ and microscopic fungi were in 2,2-3,1 $\times 10^3$ CFU/g dry soil in the grey-brown soils in the spring-autumn seasons (table 11). A total number of microorganisms under the two-year lucerne was more than an annual lucerne, on the tillage and under tillage layers it was in 2,6-3,0 $\times 10^6$ CFU/g soil. A quantity of the microscopic fungi on both versions was in 2,2-4,3 $\times 10^3$ CFU/g soil by reducing on 0-50 cm of layer along the profile. Because of optimum ecological condition (soil humidity on 0-50 cm of layer was 18,3-20,8% and temperature was

23,2-26,4^{0}C) a maximum number of the microorganisms is found in June, a minimum quantity was in summer. The spore-forming bacteria were little because a good ecological condition, an ability of the root system nitrogenfixation in the soils under the lucerne forms a suitable condition for microorganisms in March-October. A maximum quantity of actinomycetes was in summer a maximum quantity of the spore-forming bacteria was in autumn.

A quantity of the bacteria entering the microflora structure changed by 1,3-1,9 $\times$ 10^6 on the tillage and under tillage layers, actinomycetes-4,5-4,6 $\times$ 10^5 and microscopic fungi 1,5-3,1 $\times$ 10^3 CFU/g dry soil under the watermelon on the 1st scheme at the vegetation period. The microflora activity was more than other vegetable plants growing in the soils under the watermelon, it can be explained by a positive effect as a predecessor. A sort structure changed together with the microorganisms quantity at the vegetation period. A quantity of actinomycetes raised in summer in comparison with the spring, its reason was to ensure the microorganisms with the food and to protect itself under unfit condition. A total number of microorganisms in the soils under the watermelon on the 2nd scheme was got 0,9 $\times$ 10^6 CFU/g soil less than the watermelon on the 1st scheme, 1,1-1,5 $\times$ 10^6 on tillage layer AI^I_a, bacteria-0,6-1,1$\times$ 10^6 CFU/g, sore-forming bacteria-0,09$\times$ 10^6 CFU/g, actinomycetes 2,7-3,5 $\times$ 10^5 and fungi – 1,8-2,2 $\times$ 10^3, on the under tillage layer was AI^{II}_a 8,7-1,1 $\times$ 10^6; 0,5-0,8 $\times$ 10^6; 0,7-1,5 $\times$ 10^5; 2,2-2,8 $\times$ 10^5 and 1,0-1,1 $\times$ 10^3 CFU/g dry soil. A total quantity of microorganisms on the watermelon constant tillage was 1,2 $\times$ 10^6 on the tillage layer and 0,6 $\times$ 10^6 CFU/g on the under tillage layer at the vegetation period. Bacteria on the tillage horizon under the constant watermelon formed 68,4% from a total number of microorganisms, actinomycetes – 22,5%, spore-forming bacteria – 9,0% and microscopic fungi – 0,1% (table 11) and a total quantity of microorganisms was 1,3 $\times$ 10^6 CFU/g dry soil less than the watermelon on the

1^{st} scheme of the crop rotation, 0,4 × 10^6 CFU/g dry soil less than the 2^{nd} scheme.

A total quantity of microorganisms under a potato on the 1^{st} scheme changed by 1,4-1,6 × 10^6 on the tillage layer and 1,0-1,3 × 10^6 CFU/g on the under tillage layer, the microflora activity was 0,3 × 10^6 CFU/g less on the scheme than the 1^{st} scheme. A total number of microorganisms in the soils under the potato on the II scheme changed by 0,8-1,6 × 10^6 CFU/g on the tillage and under tillage horizons in summer-autumn seasons. The least activity of microflora is found in August (1,1 × 10^6 CFU/g on 0-50 cm of layer). The microflora activity in the soils under the constant potato was weaker than the crop rotation and the microorganisms quantity was 0,5-1,4 × 10^6 CFU/g soil on the tillage and under tillage horizons (on 0-50 cm of layer) at a vegetation period.

The microorganisms quantity in the soils under the garlic changed by 1,2-1,3 × 10^6 CFU/g on the tillage layer AI^I_a at the vegetation period and was 0,2 × 10^6 CFU/g more than under tillage horizon (table 11). 65,1% of the microorganisms total quantity was bacteria, 25,2% was actinomycetes, a number of the microscopic fungi changed by 1,1-2,1× 10^3 CFU/g on 0-50 cm of layer descending along profile and maximum quantity was in spring. The microflora number in the constant garlic tillage was less than the crop rotation, it changed by 0,3-0,9 × 10^6 CFU/g on the tillage and under tillage layers at the vegetation period. On the constant tillage unfit soil condition was a reason for decrease of the fungus number year by year and actinomycetes (26,9%) were more from the total quantity of microorganisms.

The microorganisms quantity on the version of the white head cabbage+tomato was 2,1 × 10^6 on the tillage layer, it was 1,8 × 10^6 in summer and 2,0 × 10^6 CFU/g by increasing again in autumn. A maximum quantity of actinomycetes was noted in summer (5,3 × 10^5 CFU/g soil). A quantity of the spore-forming bacteria and total bacteria increased in autumn. The microflora activity in the soils under the tomato on the 2^{nd} scheme changed by 1,4-1,8 × 10^6 on the tillage layer and 0,9-1,1 × 10^6 CFU/g soil on the under tillage layer and 0,9-1,1 × 10^6 CFU/g soil on the under tillage layer at the vegetation period. 67,6% of bacteria, 23,4% of actinomycetes, 8,9% of spore-forming bacteria and 0,14% of microscopic fungi formed a total number of microorganisms under the tomato. The microorganisms number in the soils under the tomato on the constant tillage changed by 1,1-1,3 × 10^6 on the tillage layer and 0,4-0,8 × 10^6 on the under tillage horizon, 1,0-1,5 × 10^6 and 0,7-1,0 × 10^6 CFU/g in the whitehead cabbage and a maximum number was in spring. Despite an increase of the total quantity of microorganisms in autumn in comparison with the summer, it was some less than spring maximum. A total quantity of bacteria in the soils under the tomato and whitehead cabbage on the constant tillage was 71,2-76,7% (not forming of spore and spore-forming bacteria), actinomycetes were 23,1-28,6%, microscopic fungi – 0,1-0,2%.

The microorganisms number in the soils under the vegetable bean was 1,9-2,6 × 10^6 on the tillage layer, 1,5-1,7 × 10^6 CFU/g soil on the under tillage layer. Bacteria formed 67,9-70,4% and actinomycetes formed 23,6-26,1% of the microorganisms total number. The microorganisms total number under the constant vegetable bean was less than the crop rotation, changed by 1,1-1,9 × 10^6 CFU/g soil on the tillage and under tillage layers (0-50 cm) and bacteria formed 70,0%, actinomycetes formed 23,1% from the microorganisms total number. The biogeniness of the irrigative grey-brown soils is characterized by much special weight of bacteria, actinomycetes, but little fungus from the microorganisms total number. The higher activity of microflora under the plants entering the crop rotation was observed on the version of the two-year lucerne, white head cabbage+tomato and vegetable bean, but the least activity was observed under the garlic. The microorganisms maximum quantity under the growing plants was in the spring, but minimum one was in August. The microflora number increase was observed in the autumn, but an activity was less than spring. Bacteria formed 63,6-73,7%, actinomycetes formed 17,9-26,8% from the microorganisms total number under growing plants on the crop rotation. The bacteria number decreased and actinomycetes quantity increased in comparison with the crop rotation on the constant tillage.

4.2 Dynamics of the Microorganisms Quantity in the Irrigative Grey-Meadow Soils

The microorganisms number and physiological groups were learnt by S.M.Guliyeva (2005) in the Shirvan plain dark grey-meadow soils under the cotton by I.M.Abduyev (1987) in the meliorated irrigative grey-meadow soils, by R. A. Agabayova (1984) in the soils under the lucerne and cotton, by N.H. Orudzheva (2009) under vegetble cultures. The carried out researches show that a change of the microorganisms number on the crop rotation and constant tillage in the Shirvan plain irrigative grey-meadow soils possesses a seasonal character. The microorganisms number formed 1,6-2,0 $\times 10^6$ on 0-50 cm of layer under an annual lucerne, bacteria-0,9-1,3 $\times 10^6$, spore-forming bacteria-0,2-0,3 $\times 10^6$, actinomycetes-4,2-5,5 $\times 10^5$, microscopic fungi-2,7-5,4 $\times 10^3$ CFU/g soil. Bacteria changed by 57,5-60,6%, spore-forming bacteria-16,0-17,1%, actinomycetes-23,2-26,3% from a total number of the microorganisms in the grey-meadow soils under the Lucerne (table 12). The microorganisms quantity on 0-25 cm of layer under the cucumber changed by 2,1-2,5 $\times 10^6$ and on the under tillage layer it changed by 1,6-1,8 $\times 10^6$ CFU/g soil. Bacteria on 0-50 cm of layer formed 50,2%, spore-forming bacteria 19,3%, actinomycetes 30,3%, microscopic fungi 0,2% from the microorganisms total number. An average mark of the total quantity of microorganisms under the constant cucumber was 0,8 $\times 10^6$ on 0-50 cm of layer, bacteria were 0,4 $\times 10^6$, spore-forming bacteria – 0,2 $\times$ 10^6, actinomycetes-2,5 $\times$ 10^5 CFU/g soil and bacteria were 47,4%, sporeforming bacteria 22,7%, actinomycetes 29,8%, microscopic fungi 0,2% from the total number. The microorganisms total quantity under the cucumber was 1,2 $\times 10^6$ CFU/g soil (59,3%) more than the constant cucumber.

After finishing the rotation in the soils under the potato an average mark of the microorganisms number was 2,4 $\times 10^6$ on the tillage layer, 1,7 $\times 10^6$ CFU/g soil on the under tillage horizon, bacteria formed 51,8%, spore-forming bacteria-19,6%, actinomycetes-28,4%, microscopic fungi-0,2% from the microorganisms total quantity.

A total number of the microorganisms under the potato on the constant tillage was 1,2 $\times$ 10^6 on the tillage layer, 0,7 $\times$ 10^6 CFU/g soil on the under tillage horizon and bacteria formed 46,2%, spore-forming bacteria 21,6%, actnomycetes 32,0% and microscopic fungi 0,2% from them. Preserving of the microorganisms quantity in a higher level in the soils under the cucumber and tomato is connected with the effect of the lucerne as a predecessor. The bacteria quantity from the microorganisms total number under the cucumber and tomato was less than the lucerne, therefore a special weight of spore-forming bacteria (17,7-21,5%) and actinomycetes (27,7-30,8%) raised. This indicator under the constant cucumber and tomato got the highest mark, spore-forming bacteria vibrated 20,8-25,6% and actinomycetes 27,5-32,0%.

4.3 Dynamics of the Microorganisms Quantity in the Irrigative Alluvial Meadow-Forest Soils

The higher quantity of the microorganisms under the plants entering the crop rotation was noted under the lucerne. The change interval of the microorganisms quantity under an annual lucerne+barley and two-year lucerne was 3,9-4,7 $\times 10^6$ CFU/g soil on the tillage layer, bacteria were 3,2-4,2 $\times 10^6$ CFU/g (table 13). The microflora activity under the lucerne+barley decreased along the profile on 0-50 cm of layer the spore-forming bacteria quantity changed by 0,07-0,08 $\times 10^6$ CFU/g, actinomycetes quantity changed by 2,7-4,0 $\times 10^5$ CFU/g and it was less than two-year lucerne. It is obvious that the two-year lucerne strong root system collects enough mineral nitrogen for feeding and development of the microorganisms together with preserving of the microorganisms together with preserving of the humidity in an optimum state, therefore there is no need for increase of actinomycetes that perform shattering of difficult assimilating nitrogen combinations and turning of microorganisms into spore state. A quantity of bacteria under the lucerne was more than other plants, it was 81,2-89,7%, actinomycetes-6,4-14,6%, microscopic fungi-1,0-1,2%. The microorganisms quantity on the tillage layer under the annual lucerne+barley was 0,4 $\times 10^6$ CFU/g less than the two-year lucerne 0,5 $\times 10^6$ CFU/g less than the under tillage layer (table 13).

The micrflora activity in the soils under the onion is preserved in a higher level comparatively and the microorganisms number was 3,2-3,7 $\times 10^6$, bacteria 2,4-3,0 $\times 10^6$, spore-forming bacteria 0,09-0,1 $\times 10^6$ and actinomycetes – 3,8-6,7 $\times 10^5$ CFU/g on the tillage layer and the microorganisms quantity decreased 40,9% (1,4 $\times 10^6$ CFU/g dry soil) on the under tillage layer at the vegetation period. The microflora activity under the constant onion decreased in comparison with the crop rotation and it changed by 1,4-2,9 $\times 10^6$ CFU/g on the tillage and under tillage layers at the research period. The microorganisms quantity under the constant onion was $2,1 \times 10^6$, a total number of bacteria was $1,6 \times 10^6$, actinomycetes – $4,1 \times 10^5$ and microscopic fungi $1,6 \times 10^3$ CFU/g; bacteria formed 75,6%, actinomycetes 19,3% and microscopic fungi-0,8% from the microorganisms total number (table 13). The bacteria number under the constant onion was less than the onion version on the crop rotation, the actinomycetes number was more.

The microorganisms quantity in the soils under the cucumber changed by $2,9\text{-}3,6 \times 10^6$ CFU/g on the tillage layer of AI^{I}_{a}, $2,0\text{-}2,5 \times 10^6$, on the under tillage of AI^{II}_{a}, $2,5\text{-}3,1 \times 10^6$ and $1,7\text{-}2,1 \times 10^6$ CFU/ g soil in the research years. The microorganisms number under the constant cucumber was $0,5 \times 10^6$ CFU/g less than the crop rotation. Bacteria formed 76,2-81,7%, actinomycetes 14,3-19,6%, microscopic fungi 0,9% from the microorganisms total quantity on the constant tillage and crop rotation in the soils under the cucumber and the actinomycetes number was more than crop rotation (table 13). It is obvious that the actinomycetes perform this function because there is a need for splintering of the difficult assimilated nitrogen organic combinations as mineral nitrogen source isn't enough for feeding of the microorganisms in the soils under the cucumber.

The microorganisms number was $3,2\text{-}3,9 \times 10^6$ on the tillage layer of AI^{I}_{a} and $1,8\text{-}2,4 \times 10^6$ CFU/g on the under tillage layer of AI^{II}_{a} at the period of the research conducted under the white head cabbage. The actinomycetes quantity was $2,8\text{-}4,0 \times 10^5$ (0-50 cm) on the tillage and under tillage layers, spore-forming bacteria were less $0,07\text{-}0,09 \times 10^5$ CFU/g. The microorganisms number changed by $1,5\text{-}2,1 \times 10^6$ CFU/g on the constant tillage at the vegetation period. Bacteria formed 80,3%, spore-forming bacteria-3,4%, actinomycetes-15,3%, microscopic fungi 1,0% from the microorganisms total quantity under the white head cabbage on the crop rotation but they formed 73,4% ; 4,7%, 20,6% and 1,3% on the constant tillage (table 13). Using of the soils under the constant white head cabbage was a reason for bacterium number decrease, actinomycetes increase. The microorganisms quantity under the version of green forage +tomato was 32,0% (1,2 $\times 10^6$ CFU/g) more on the tillage layer than the under tillage horizon, it was by 2,3-4,0 $\times 10^6$ CFU/g on 0-50 cm of layer at the vegetation period. In the research years bacteria changed by 2,5-3,3 $\times 10^6$, spore-forming bacteria 0,09-0,1 $\times 10^6$, actinomycetes 5,0-6,4 $\times 10^5$ CFU/g on the tillage layer. The microflora activity on the constant tomato tillage was less than the crop rotation, the microorganisms quantity was 1,8-3,3 $\times 10^6$ CFU/g on 0-50 cm of layer at the vegetation and less activity was observed in summer. A higher activity of microflora in the irrigative alluvial meadow-forest soils under the lucerne, onion (predecessor two-year lucerne), the least one was under the cucumber. A higher quantity of microorganisms was in the spring, the least one was in summer. Despite an increase of the microorganisms quantity in autumn, it was less than spring maximum. The maximum population density of the microorganisms in the irrigated alluvial meadow-forest soils was observed under the lucerne+barley and onions (second-year lucerne was the preceding crop); the minimal population density was under the cucumbers. The microorganisms in the irrigated alluvial meadow-forest soils were dominated by bacteria and actinomycetes, and the population densities of the spore-forming bacteria and microscopic fungi were relatively lower.

4.4 Dynamics of the Microorganisms Quantity in the Irrigative Gleyey-Yellow Soils

V. T. Mamadzade (2004) shows that a main structure part of microorganisms in the soils spreaded in Lankaran consisits of the not spore-forming bacteria (65,7-82,7%) and actinomycetes (13,4-23,5%).

A scheme of the vegetable leguminous crop rotation has been tested in order to learn the microbiological changes occurring in the irrigative gleyey-yellow soils under the vegetable plants. The microorganisms number under the tomato changed by 2,4-3,7 $\times 10^6$, spore-forming bacteria – 0,2-0,3 $\times 10^6$, actinomycetes – 4,7-7,3 $\times 10^5$, microscopic fungi – 3,1-4,1 $\times 10^3$ on the tillage layer AI^{II}_a and it changed by 1,9-2,7 $\times 10^6$; 0,1-0,3 $\times 10^6$; 3,8-5,4 $\times 10^5$ and 2,4-2,9 $\times 10^3$ CFU/g on the under tillage layer (table 14). The microorganisms number was maximum relatively in the spring, it reduced in the summer and raised in the autumn again. The microflora quantity was less in autumn than spring and a quantity of spore-forming bacteria and actinomycetes was more than the microorganisms total number.

The microflora activity in the soils under the tomato was 26,8% (0,8 $\times 10^6$ CFU/g) more on the tillage layer AI^{I}_a than the under tillage layer AI^{II}_a (table 14). The microorganisms quantity on the constant tomato tillage formed 1,9-2,9 $\times 10^6$ CFU/ g on 0-50 cm of layer at the vegetation period. The microflora activity increased in autumn and was less than spring. Bacteria formed 67,2-69,7%, spore-forming bacteria 9,3-11,3%, actinomycetes 20,0-20,6%, microscopic fungi-1,0-1,2% from the microorganisms total quantity in the soils under the tomato on the crop rotation and constant tillage (table 14).

The microorganisms quantity under the version of white head cabbage+maize was 1,8-3,2 $\times$ 10^6, bacteria 1,1-2,3 $\times$ 10^6, actinomycetes 4,1-5,7 $\times$ 10^5, spore-forming bacteria 0,2-0,3 $\times 10^6$ and fungi 4,1-5,1 $\times 10^3$ CFU/g soil on 0-50 cm of layer at the research period. Bacteria formed 69,7%, spore-forming bacteria-98%, actinomycetes 18,8% and microscopic fungi-1,7% from the microorganisms total number under the version of white head cabbage+maize. A change interval of the microorganisms number under the constant white head cabbage along the profile was 1,6-2,4 $\times$ 10^6 CFU/g on the tillage and under tillage layers, on the crop rotation the microflora activity was 0,4 $\times 10^6$ CFU/g less on the tillage layer, 0,3 $\times 10^6$ CFU/g less on the under tillage layer than the version of white head cabbage+maize. The microflora activity under the constant maize vibrated by 1,4-3,2 $\times$ 10^6 on the tillage layer, 1,6-2,4 $\times$ 10^6 CFU/g on the under tillage layer at the vegetation period.

Despite the microflora activity in the soils under an onion is less in comparison with the growing plant phitoncid and sanitary feature. Limitation ability of the pathogen fungi development, improvement of the soil ecological condition shows an advisability of growing onion. The microorganisms number under the onion was 2,0-3,3 $\times$ 10^6, spore-forming bacteria – 0,2-0,3 $\times$ 10^6, actinomycetes 3,7-5,6 $\times$ 10^5 and microscopic fungi – 2,3-3,2 $\times$ 10^3 CFU/g on the tillage layer AI^I_a, but a mark of these indicators decreases and forms 1,5-2,4 $\times 10^6$; 0,2-0,3 $\times 10^6$; 2,9-4,5 $\times 10^5$ and 1,4-2,3 $\times 10^3$ CFU/g on the under tillage horizon in the research years. A maximum quantity of microflora activity under the constant onion was noted in spring by changing it by 1,3-2,7 $\times 10^6$ CFU/g soil on the tillage and under tillage layers at the vegetation period. On the crop rotation the microflora quantity under the onion was 20,7% (0,6 $\times 10^6$ CFU/g) more on the tillage layer,15,6% (0,3 $\times$ 10^6 CFU/g) more on the under tillage layer than the constant tillage. The bacteria number under the onion on the crop rotation formed 70,9%, spore-forming bacteria-10,4%, actinomycetes-17,7% and microscopic fungi 1,0% the actinomycetes number by per cent under the constant onion was more.

The microorganisms quantity in the soils under the vegetable bean was AI^{I}_{a} 2,8-4,2 $\times 10^6$ on the tillage layer, spore-forming bacteria – 0,3-0,4 $\times 10^6$, actinomycetes 4,7-7,9 $\times 10^5$, fungi 3,8-6,9 $\times 10^3$, these indicators reduced a little on the under tillage layer and formed 1,8-2,9 $\times 10^6$ CFU/g, but on the constant tillage AI^{I}_{a} the microorganisms number changed by 2,5-3,3 $\times 10^6$ CFU/g, but it changed by 1,6-2,5 $\times 10^6$ CFU/g on the under tillage of AI^{II}_{a}. A total number of microorganisms in the soils under the vegetable bean on the crop rotation consists of 69,9% of bacteria, 9,9% of spore-forming bacteria, 18,6% of actinomycetes and 1,7% of microscopic fungi. The higher activity of microflora in the irrigative gleyey-yellow soils was observed under the vegetable bean, but less one under the onion, the rest plants take an interval stand for an under an influence of spore-forming bacteria.

A quantity of not spore-forming bacteria from a total number of bacteria in the irrigative alluvial meadow-forest soils was less than the other investigative soils. The less activity of the spore-forming bacteria was in the middle of the summer. This specific group of microorganisms in the soils investigated in summer was 0,09-1,6 $\times 10^6$ CFU/g on the tillage layer and changed by 0,1-0,2 $\times 10^6$ CFU/g in the soil in spring. This group of microorganisms possessing a high ferment system assimilates durables organic combinations. An activity of spore-forming bacteria in the irrigative soils was more in autumn than summer. In the research years an average mark of this group of microorganisms on the crop rotation changed from 0,09 $\times 10^6$ CFU/g to 0,2 $\times 10^6$ CFU/g soil. The better condition on the crop rotation is created in grey-meadow and gleyey-yellow soils, an average mark of bacillus quantity in these soils changed by 0,4-0,5 $\times$

10^6 and 0,08-0,1 $\times 10^6$ CFU/g soil interval. Activity and actinomycetes quantity was more in the autumn than the summer. A reason for an increase of actinomycetes in autumn is fertility of the soil with the hard decomposing substances which are impossible to be decomposed by other microorganisms (Shakuri, 2004).

The soils of the half-humid and humid subtropic zone are distinguished from the arid subtropic zone to an important degree for a quantity and sort structure of studied microorganisms. Ammonoficators of the different group microorganisms spread widely in the research soils, the not spore-forming forms were its main part. Learning of the microflora activity in the irrigative grey-brown, grey-meadow, alluvial meadow-forest and gleyey-yellow soils shows that the microorganisms quantity was high on the tillage layer in June the ammonifixing bacteria formed a main part of microflora in an optimum temperature and humidity regime. The microorganisms number changed in a decrease direction gradually till the end of the summer and began to increase in the autumn again not reaching the spring maximum. A quantity of bacteria and actinomycetes exceeds in the research soils. In the subtropic zone soils the most quantity of aminoheterotrophs is found the organisms using of organic nitrogen as a main food source are met in the alluvial meadow-forest and gleyey-yellow soils, it is explained by a higher activity of microflora in the same soils. New organic matters enter the same soils more than grey-brown and grey-meadow soils. The soils under the growing plants changed for a microflora composition, too, because the soil-climate condition and different agrotechnical measures influence on a quantity and composition of rizospher microflora to an important degree. In grey-brown, grey-meadow, alluvial meadow-forest and gleyey-yellow soils, the dynamics of microorganisms number, change of the ratio between bacteria and actinomycetes depending on season depend on structure and quantity of the organic residues to an important degree and defined by soils condition humidity and temperature.

The more constant organic substances in the soil are mainly subjected to mineralization. Actinomycetes begin a life activity in soil as spore-forming bacteria while reducing a quantity of the easy assimilated organic combinations. At this period the very complicated organic combinations exceed in the soil, they can be assimilated by microorganisms possessing only high proteolithic ferment system. Actinomycetes are inseparable structural part of the soil microbiosenoz, they form 20-30% of the total number of bacteria, can increase under neutral and alkaline soil environment (Djanaev and et. al., 2007). This group of microorganisms exceed in comparison with spore-forming bacteria for a quantity. The actinomycetes number is defined not only by soil condition (humidity, temperature) and humus quantity, but also by biological features of the growing plants on the crop rotation. This group of the microorganisms exceeds the spore-forming bacteria for a quantity, relatively. The actinomycetes number is defined not only by soils condition (humidity, temperature) and humus quantity, but also by biological features of the growing plants on the crop rotation (Djanaev and et. al., 2007). An average mark of actinomycetes changed by 1,2-2,3 $\times 10^5$ CFU/g in the grey-brown soils on the crop rotation at vegetation period. It changed by 3,4-4,8 $\times 10^5$ CFU/g in grey-meadow soils, 1,0-1,2 $\times 10^5$ CFU/g in alluvial meadow-forest soils, 2,8-3,3 $\times 10^5$ CFU/g in gleyey-yellow soils depending on research year and growing plant. The higher quantity of actinomycetes among the investigative soils was observed in grey-meadow and gleyey-yellow soils. So, actinomycetes number increased from spring to summer, decreased in autumn again in the investigative soils.

The research soils biogenness is characterized by a high quantity of bacteria actinomicets and little number of microscopic fungi. The authors works show

(Polyakova and et al., 2007) that using of them under the agricultural plants especially, the soils cultivation were a reason for decrease of microscopic fungi to an important degree and formation of the serious changes in soil biota. A quantity of micromicets-microscopic fungi was less in grey-brown and grey-meadow soils than in alluvial meadow-forest and gleyey-yellow soils, and along the profile reduction was observed towards down. Despite minority of this group of microorganisms they determines soil fertility in many cases, forms water-stable structure of soil by participating in splintering of the plant and animal residues (Babyeva and et. al, 1989).

An average mark of the microscopic fungi quantity at the vegetation period changed by 1,7-4,8 $\times 10^3$ CFU/g in grey-brown soils, 4,2-5,9 $\times 10^3$ CFU/g in grey-meadow soils, 2,1-4,8 $\times 10^3$ CFU/g in alluvial meadow-forest soils, 2,8-6,0 $\times 10^3$ CFU/g in gleyey-yellow soils. The seasonal dynamics of the microscopic fungi got a maximum mark in spring, reduced towards the end of summer, increased towards autumn again. These objective laws were observed in all the investigated soils.

The microorganisms high quantity on the crop rotation was noted under the lucerne and vegetable bean consequently the less-under an onion and garlic.

A quantity of actinomycetes increased in summer, but bacteria number reduced. The bacteria quantity increased again in autumn. Grey-brown soils are rich in actinomycetes from microorganisms representatives in comparison with the alluvial meadow-forest soils, but grey-meadow soils are rich in bacilli.

While increasing the antropogen effect an increase of aminotrophs quantity which intensifies mineralization of the organic combinations was observed in the soils (Polyakova and et. al., 2007). We can express an idea about mineralization and immobilization coefficient for an intensity of the mineralization process (Mishustin, 1972). The mineralization coefficient (SAA/MIA) determines the intensity of the mineralization (Polyakova and et. al., 2007).The mineralization intensity of organic substances under the growing plants in the grey-brown soils changed by 0,26-0,38; 0,33-0,45 on the constant tillage; accordingly 0,41-0,57 and 0,67-0,82 in the grey-meadow soils; 0,25-0,29 and 0,28-0,32 on the gleyey-yellow soils. It is obvious form the consequences that high mineralization was observed in grey-meadow soils consequently and the same soils are rich in bacteria using from nitrogen mineral form. An average value of bacteria using form the nitrogen mineral form was $3{,}7 \times 10^6$ CFU/g on the crop rotation in the research years. Every year plaguing, fertilizing rises entering of organic substances the soil, therefore the bacteria quantity using from organic nitrogen as a food source rises, and this reduces SAA/MIA ratio, therefore weakens mineralization process. The ratio between the bacteria utilizing mineral and organic nitrogen comprised in the crop rotation 2,3:1 (1,5:1 in the leached chernozem), this value suggests the high intensity of the mineralization processes resulting in a decreases of the humus content in the soil (Djanayev and et. al., 2007). A reason of the mineralization process intensity height is little ensurement of plant residues with nitrogen. Grounding on the essential indicators we can come to such a conclusion for the microflora structure that mineralization of the plant and animal residues in the soils was enough active. So, a mineralization coefficient under the plants on the constant tillage was higher than the crop rotation, because planting of the culture in the same place for a long time, one-sided using of the nutrient intensifies the mineralization process. Because of entering little plant residue the soil on the constant tillage the mineralization intensity of organic matters was enough higher than the crop rotation.

Table 11. *Average biogeneity of irrigated grey-brown soils of dry subtropics (1992-1997).*

Field no., crop	**Depth, cm**	**Total number of microorganisms**							
		thousand CFU/g dry soil				**% of the total number**			
		spring	**sum-mer**	**au-tumn**	**average**	**bacteria**	**spore-forming bacteria**	**actino-mycetes**	**microscopic fungi**
1	2	3	4	5	6	7	8	9	10
I	0-25	2411	1947	2054	2137	73.2	07.4	19.3	0.2
Annual lucerne+	25-50	1672	1266	1456	1465	73.7	08.2	17.9	0.1
barley	0-50	2042	1607	1755	1801	73.5	07.6	18.7	0.1
II	0-25	3633	3016	3317	3322	73.3	6.1	20.4	0.1
Lucerne of the	25-50	2461	2143	2295	2300	69.4	8.3	22.2	0.1
second year	0-50	3047	2580	2806	2811	71.7	7.0	21.1	0.1
III	0-25	3499	2323	2962	2928	73.5	7.9	18.5	0.1
Watermelon	25-50	1595	1364	1508	1489	63.4	9.6	26.8	0.1
	0-50	2547	1843	2235	2208	70.1	8.5	21.3	0.1
IV	0-25	1576	1375	1506	1486	66.2	9.7	24.0	0.2
Potato	25-50	1254	1007	1195	1152	67.0	10.0	22.9	0.1
	0-50	1416	1191	1351	1319	66.5	9.8	23.5	0.1
V	0-25	1259	1185	1180	1208	65.2	9.5	25.2	0.1
Garlic	25-50	1094	948	996	1013	67.6	10.6	21.7	0.1
	0-50	1177	1067	1088	1111	66.3	10.0	23.6	0.1
VI	0-25	2086	1798	1985	1956	67.0	10.2	22.7	0.1
White head	25-50	1237	1109	1176	1174	68.3	11.7	19.9	0.1
cabbage+ tomato	0-50	1662	1454	1581	1566	67.5	10.8	21.6	0.1

Scheme 1. *The six-field vegetable-fodder crop rotation.*

Scheme 2. *The five-field vegetable-bean crop rotation.*

I	0-25	1516	1325	1447	1429	65.5	10.3	24.1	0.10
Potato	25-50	862	794	826	827	66.0	11.8	22.1	0.10
	0-50	1189	1059	1137	1128	65.7	10.8	23.4	0.10
II	0-25	2590	1922	2286	2266	70.4	5.8	23.6	0.20
Vegetable	25-50	1555	1370	1542	1489	68.3	7.8	23.7	0.20
bean	0-50	2133	1746	1914	1931	68.7	6.4	24.7	0.20
III	0-25	1846	1288	1711	1615	68.2	9.0	22.6	0.10
Watermelon	25-50	1109	873	1021	1001	64.9	10.1	24.9	0.10
	0-50	1478	1081	1366	1308	67.0	9.4	23.5	0.12
IV	0-25	1764	1402	1445	1537	67.6	8.9	23.4	0.14
Potato	25-50	1096	881	923	967	64.2	12.0	23.7	0.11
	0-50	1430	1142	1185	1252	66.2	10.1	23.5	0.13
V	0-25	2607	1897	2294	2266	67.9	5.8	26.1	0.16
Vegetable	25-50	1691	1469	1569	1576	67.8	7.5	24.6	0.14
bean	0-50	2149	1683	1932	1921	67.9	6.5	25.5	0.15

Scheme 3. *Monoculture.*

Tomato	0-25	1331	1063	1126	1173	63.5	7.7	28.6	0.13
	25-50	829	423	510	587	64.3	12.0	23.6	0.20
	0-50	1080	743	818	880	63.8	9.1	27.0	0.16
Watermelon	0-25	1417	990	1180	1196	68.4	9.0	22.5	0.11
	25-50	777	375	551	568	65.5	11.4	23.0	0.18
	0-50	1097	682	865	881	67.5	9.8	22.7	0.14
Potato	0-25	1357	1063	1235	1218	69.0	6.7	24.2	0.10
	25-50	823	475	576	625	60.0	11.3	28.5	0.10
	0-50	1090	769	906	922	66.0	8.3	25.7	0.10
Garlic	0-25	853	627	798	759	64.7	8.2	26.9	0.10
	25-50	518	345	478	447	64.2	11.6	24.0	0.10
	0-50	686	486	638	603	64.6	9.4	25.9	0.10
Whitehead	0-25	1488	996	1517	1334	61.5	15.2	23.1	0.20
cabbage	25-50	1008	687	828	841	64.0	10.9	25.1	0.20
	0-50	1248	842	1173	1088	62.4	13.5	23.9	0.20
Vegetable	0-25	1902	1381	1563	1615	70.0	6.8	23.1	0.10
bean	25-50	1449	1113	1168	1243	73.8	6.4	19.7	0.10
	0-50	1675	1248	1366	1430	71.6	6.6	21.7	0.10

Table 12. *Average biogeneity of irrigated grey-meadow soils of dry subtropics (2001-2005 г.).*

Field no., crop	Depth, cm	Total number of microorganisms							
		thousand CFU/g dry soil				% of the total number			
		spring	sum-mer	au-tumn	average	bacteria	spore-forming bacteria	actino-mycetes	microscopic fungi
Scheme 1. The four-field vegetable-fodder crop rotation.									
I	0-25	2196	1872	2213	2094	58.7	16,2	24.8	0.2
Annual lucerne	25-50	1741	1411	1816	1656	57.5	16.0	26.3	0.2
	0-50	1969	1642	2014	1875	58.2	16.1	25.5	0.2
II	0-25	2585	2304	2641	2510	58.6	17.1	24.1	0.2
Lucerne of the	25-50	1887	1697	2011	1865	60.6	16.0	23.2	0.2
second year	0-50	2236	2001	2326	2188	59.4	16.7	23.7	0.2
III	0-25	2490	2145	2416	2350	51.3	17.7	30.8	0.2
Cucumber	25-50	1840	1618	1773	1744	48.6	21.5	29.7	0.2
	0-50	2165	1881	2094	2047	50.2	19.3	30.3	0.2
IV	0-25	2298	2247	2529	2358	50.7	20.2	28.9	0.2
Tomato	25-50	1776	1602	1619	1666	53.2	18.9	27.7	0.2
	0-50	2037	1925	2074	2012	51.8	19.6	28.4	0.2
Scheme 2. Monoculture.									
Tomato	0-25	1207	1078	1260	1182	46.2	21.6	32.0	0.2
	25-50	678	657	726	687	48.2	24.0	27.5	0.2
	0-50	943	868	993	935	46.9	22.5	30.4	0.2
Cucumber	0-25	1048	974	1068	1030	48.0	20.8	31.1	0.2
	25-50	661	589	659	636	46.5	25.6	27.7	0.2
	0-50	855	782	864	834	47.4	22.7	29.8	0.2

Table 13. *Average biogeneity of irrigated alluvial meadow-forest soils of semiaid subtropics (1992-1997).*

Field no., crop	**Depth, cm**	**Total number of microorganisms**							
		thousand CFU/g dry soil				**% of the total number**			
		spring	**sum-mer**	**au-tumn**	**average**	**bacteria**	**spore-forming bacteria**	**actino-mycetes**	**microscopic fungi**
1	2	3	4	5	6	7	8	9	10
I	0-25	4057	3592	3845	3831	81.2	3.2	14.6	1.0
Annual lucerne+	25-50	2584	2294	2450	2443	82.6	3.1	13.3	1.0
barley	0-50	3320	2943	3147	3137	81.8	3.2	14.1	1.0
II	0-25	4702	3931	4188	4274	87.0	2.7	9.3	1.1
Lucerne of the	25-50	3109	2691	2963	2921	89.7	2.7	6.4	1.2
second year	0-50	3906	3311	3575	3597	88.1	2.7	8.1	1.1
III	0-25	3725	3152	3307	3395	80.5	3.2	15.8	0.6
Head onion	25-50	2199	1822	1996	2006	83.1	2.7	13.4	0.8
	0-50	2962	2487	2651	2700	81.5	3.0	14.9	0.7
IV	0-25	3577	2865	3260	3234	81.3	2.9	14.7	0.9
Cucumber	25-50	2547	2004	2300	2284	82.1	3.4	13.6	0.9
	0-50	3062	2435	2780	2759	81.7	3.1	14.3	0.9
V	0-25	3906	3228	3596	3577	80.3	3.4	15.3	1.0
Whitehead	25-50	2484	1812	2169	2155	80.0	3.7	15.1	1.2
cabbage	0-50	3195	2520	2882	2866	80.2	3.5	15.3	1.1
VI	0-25	3967	3297	3692	3652	81.2	3.0	15.0	0.8
Green fodder+	25-50	2714	2279	2456	2483	81.1	3.1	14.9	1.0
tomato	0-50	3341	2788	3074	3068	81.1	3.0	15.0	0.9

Scheme 1. *The six-field vegetable-fodder crop rotation.*

Scheme 2. *Monoculture.*

Cucumber	0-25	3304	2811	3084	3066	78.7	3.8	16.8	0.7
	25-50	2028	1786	1876	1897	76.4	3.4	19.3	0.9
	0-50	2666	2298	2480	2481	77.8	3.6	17.7	0.8
Whitehead	0-25	2899	2436	2601	2645	76.1	4.4	18.8	0.7
cabbage	25-50	1939	1402	1573	1638	74.9	4.2	20.1	0.8
	0-50	2419	1919	2087	2142	75.6	4.3	19.3	0.8
Tomato	0-25	3077	2525	2633	2745	77.1	3.2	18.9	0.8
	25-50	2074	1710	1790	1858	74.9	3.5	20.7	0.9
	0-50	2576	2117	2211	2302	76.2	3.3	19.6	0.9
Head onion	0-25	2373	1698	1966	2012	73.4	4.7	20.6	1.3
	25-50	1865	1262	1514	1547	74.0	4.0	20.9	1.2
	0-50	2119	1480	1740	1780	73.6	4.4	20.7	1.2

Table 14. *Average biogeneity of irrigated gleyey -yellow soils of moderately humid subtropics (1993-1997).*

Field no., crop	Depth, cm	Total number of microorganisms							
		thousand CFU/g dry soil				% of the total number			
		spring	sum-mer	au-tumn	average	bacteria	spore-forming bacteria	actino-mycetes	microscopic fungi
Scheme 1. *The five-field vegetable-bean crop rotation.*									
I	0-25	3742	2440	3084	3089	69.7	9.1	20.0	1.2
Tomato	25-50	2707	1886	2187	2260	69.3	9.5	20.1	1.2
	0-50	3225	2163	2636	2675	69.5	9.3	20.0	1.2
II	0-25	3680	2072	3637	3129	69.9	9.5	18.8	1.8
White head cabbage+	25-50	2736	1604	2583	2308	69.4	10.2	18.7	1.6
corn for silage	0-50	3208	1838	3110	2719	69.7	9.8	18.8	1.7
III	0-25	3259	2047	2818	2708	70.9	10.4	17.7	1.0
Head onion	25-50	2411	1497	2128	2012	68.0	11.9	19.1	1.0
	0-50	2835	1772	2473	2360	69.6	11.0	18.3	1.0
IV	0-25	4152	2830	3655	3546	70.5	9.4	18.4	1.7
Vegetable-bean	25-50	2894	1842	2741	2492	68.2	10.7	19.4	1.7
	0-50	3523	2336	3198	3019	69.6	9.9	18.8	1.7
V	0-25	4028	2773	3560	3454	70.6	9.6	18.3	1.5
Vegetable-bean	25-50	2830	1792	2652	2425	68.9	10.4	19.0	1.7
	0-50	3429	2283	3106	2939	69.9	9.9	18.6	1.6

Scheme 2. *Бессменно.*

Tomato	0-25	3335	2373	2818	2842	66.0	11.4	21.7	1.0
	25-50	2421	1517	1967	1968	69.0	11.2	18.9	0.9
	0-50	2878	1945	2393	2405	67.2	11.3	20.6	1.0
White head	0-25	3312	1775	2972	2686	68.4	9.7	20.8	1.0
cabbage	25-50	2664	1365	1879	1969	73.4	10.8	14.8	1.0
	0-50	2988	1570	2425	2328	70.5	10.2	18.3	1.0
Corn for silage	0-25	3207	2432	2899	2846	67.8	11.2	20.1	0.9
	25-50	2371	1598	2074	2014	67.9	11.9	19.2	0.9
	0-50	2789	2015	2486	2430	67.9	11.5	19.8	0.9
Head onion	0-25	2672	1701	2072	2148	67.0	10.8	21.1	1.0
	25-50	2102	1312	1680	1698	69.3	10.8	18.9	1.0
	0-50	2387	1507	1877	1924	68.0	10.8	20.2	1.0
Vegetable-bean	0-25	3327	2496	3000	2941	69.4	10.4	19.2	1.0
	25-50	2500	1575	2133	2069	66.9	11.5	20.4	1.2
	0-50	2914	2035	2568	2506	68.4	10.9	19.7	1.1