Chapter 8

Correlative Relation between of the Biological Parameters and Fertility Parameters of the Irrigative Soils in the Subtropic Zone

Humus, microflora general quantity, different groups, biochemical process intensity are received, as the main elements of biological activity in the soil, these parameters change depending on soil type, hydrothermic regime, soil environment, applied dynamical character (Mamedzade, 2004). Because of dynamic character of the soil biological parameters some authors' dispersion and correlative analyses show difference of the correlative relation among the soil parameters. Some authors have learned dependence between physical, chemical and biological characters of the soil and soil process. It was defined as a result of the statistic calculations that there is a reliable correlative relation between humus quantity and nitrogen mobile forms, ferments activity parameters and its biogenity (Popova and et al., 2005).

A straight dependence between ferments activity and humus quantity in the soil shows connection of the soil organic substance with its ferment potential directly. The correlative analyses show a close relation between ferments activity, microbiological indicators and soil fertility. The soil biological activity is a diagnostic indicator of the soil fertility (Popova and et al., 2005). Dependence of the catalase activity and humus quantity isn't defined according to the seasonal dynamics of the ferments activity, there is a close relation between invertase and humus (n=0,850) (Dadenko, 2005). The catalase activity of the soil is mainly defined by the humus quantity, a thick correlative relation among the same parameters and humus distribution along soil profile approve it (Kazeyev and et al., 2002).

8.1 Correlative Relation between Humus and Microorganisms Quantity and Ferments Activity in the Irrigative Soils

The plants and microorganisms form a base of the soil ferment potential. Some authors show that there isn't dependence between microorganisms quantity and ferments activity. There are opposite ideas here. The different researches' consequences explain disconnection between ferments activity and microorganisms quantity and quality by unsolving of the latter reception wholly as diagnostic indicator of the soil biological activity. For this purpose a correlative relation between a quantity of humus and microflora and an activity of invertase, urease, phosphatase catalase and dehydregenase ferments in the grey-brown, grey-meadow, alluvial meadow-forest and gleyey-yellow soils has been studied. The soil biological activity varieties to a high degree, that's why statistic-variation works have been carried out, the variation indicators have been defined by V. A. Dospekhov for exactness of the got figures and a correlation coefficient has been calculated on Excel 2007 of program in computer.

The invertase ferment activity is in a positive correlative relation with the carbon, humus and nitrogen quantity in the soil. The urease ferment activity reduces along the soil profile and it is in straight relation of organic carbon, absorption capacity, clay and humus quantity (Singh and et al., 1991), in a negative correlative relation with the pH quantity (Baligar and et al., 1978; Singh and et al., 1991).

The authors show a correlative relation between dehyrogenase ferment activity and soil biogenity and we can give an idea about total microbe respiration according to activity (Abbasov, 1980). The consequences of the

correlative analyses show being of the correlation coefficient 0,90 between the bacteria quantity and catalase activity and 0,80 between invertase activity and bacteria quantity (Kazeyev and et al., 2004). As obvious from Table 32 the correlative relation between ferments activity and biological indicators changes in a large interval. A correlative relation is in soil close between invertase ferment activity and humus quantity and changes by 0,68-0,79, a thick dependence approve being of diagnostic indicator of invertase ferment in soil fertility definition. Some authors approve a high correlative relation between ferment activity and humus quantity (Dadenko, 2005; Mamedzade, 2004).

The correlative relation between invertase ferment activity and microorganisms quantity was 0,53-0,78 in the irrigative soils, that's why we can give an idea about an integral indicator of the microorganisms quantity of the invertase ferment activity in the irrigative soils.

Study of the ferment system in connection with the nitrogen circulation in soil assumes importance in an explanation of nitrogen mobile, in organization of management of the plants feeding with nitrogen. An evolution of high molecular combinations of nitrogen till nitrate or on the contrary has been fulfilled by interval cell and external call ferments. The soil organic nitrogen turns into little molecular combinations under an influence of hydrolytic ferments which participate in nitrogen metabolism, the latter is mineralized by unspecific ferments and by a biotic method and nitrogen in their composition turns into assimilating form (Khaziyev, 2005). The higher correlative dependence between urease ferment activity and humus is defined in the irrigative gleyey-yellow soils (r=0,93) and between it and microflora is defined in grey-brown (r=0,81) soils. A level of phosphatase ferment activity that fulfills phosphorus biogeochemical mobilization directly in the soil determines a potential ability of phosphorus mobilization process and intensity and

direction of this process. A correlative relation between phosphase ferment activity and humus was by r=0,58-0,84 in the investigative soils, the closer dependence between phosphatase ferment activity and microorganisms is observed in grey-brown soils (r=0,77).

The catalase ferment activity is defined by humus quantity, that's why there is a close relation between them (r=0,80) and distribution of the activity along the profile is as in humus (Kazeyev and et l., 2004). According to the seasonal dynamics of the ferments activity dependence between catalase activity and humus quantity hasn't been determined (r). The close relation between humus quantity and catalase ferment activity was determined in irrigative grey-meadow (r=0,71), and irrigative gleyey-yellow soils (r=0,79), therefore we can give an idea about the soils fertility according to the catalase ferment activity. A correlative relation between catalase ferment activity and total quantity of microorganisms was r=0,60 in the irrigative grey-brown soils, r=0,88 in the grey-meadow soils, r =0,33 in the alluvial meadow-forest soils and r=0,44 in the gleyey-yellow soils, the weaker dependence is determined in the gleyey-yellow soils. Dependence between dehydrogenase ferment activity and humus quantity in the research soil types vibrates in an interval of r=0,69-0,89, between microorganisms quantity and it is r=0,70-0,88 and a relation is close. We should come to such conclusion that the dehydrogenase ferment activity can be used as a diagnostic indicator in definition of the soils microbiological activity.

Dependence between humus quantity and microorganisms' quantity is not determined on soil surface (Kazeyev and et l., 2004). The soils which in the humus quantity are much are characterized by the microorganisms quantity with high biogenity, maximum phosphatmobilizing. A correlative relation between microorganisms and humus quantity was r=0,58-0,75, between cellulose shattering intensity was in the interval of r=0,44-0,86.

8.2 Correlative Relation between Biological Activity and Biochemical and Agrochemical Indicators of the Irrigative Soils

A correlation coefficient between urease ferment activity and nitrification ability is r=0,76, between it and ammonification is r=0,48 in irrigative grey-brown soils, it is 0,69 and 0,37 in grey-meadow soils, r=0,81 and r=0,54 in alluvial meadow-forest soils, r=0,68 and 0,66 in gleyey-yellow soils. The higher dependence between urease ferment activity and nitrifixing bacteria activity was determined in the irrigative grey-brown soils (r=0,76), in the alluvial meadow forest soils (r=0,76), in the alluvial meadow-forest soils (r=0,81) and between it and ammonifixing bacteria in the gleyey-yellow soils (r=0,66).

A negative correlative relation between cellulose shattering intensity and microroganisms quantity (r=0,58) and biomass (r=0,54) has been defined in Excel program (Krishenko and et al., 2005). A quantity of cellulose shattering microorganisms is in a positive correlative relation (r=0,69) with the sakharase ferment activity (Khaziev, 2005). A cellulose activity of the soils is in a positive correlative relation with some microelements quantity (Kozlov, 1970; Naplekova, 1974). A composition of the plant residues changes depending on carbon quantity, relief, geographical condition. A free amino acids quantity and an ability of cellulose shattering show an intensity of the biochemical processes (Jumshudova, 1987).

A correlative relation between cellulose shattering intensity and microorganisms quantity of the research object in the irrigative grey-brown soils were r=0,44; r=0,67 in the grey-meadow soils r=0,79 in the alluvial meadow-forest soils and r=0,86 in gleyey-yellow soils.

The closer dependence between the total quantity of microorganisms and cellulose shattering intensity was determined in the irrigative alluvial meadow-forest (r=0,79) and gleyey-yellow soils (r=0,86) (Table 32) The close relation is a main criterion of the microbiological processes of the cellulose shattering intensity in the irrigative alluvial meadow-forest and gleyey-yellow soils.

The research consequences show that the soil respiration is connected with the soils fertility potential and forms a correlation with the soil fertility indicators. The hydrothermic condition (humidity, temperature) exerts a great influence on a quantity of CO_2 decomposed from soil. The correlative relation between the CO_2 intensity decomposing from soil and humus quantity was weaker in the irrigative alluvial meadow-forest (r=0,81) and gleyey-yellow soils (r=0,79) dense grey-brown and grey-meadow soils. It is obvious that an intensity of CO_2 decomposing from irrigative alluvial meadow-forest and gleyey-yellow soils is criterion of the soils fertility parameter. A correlative relation between CO_2 intensity decomposing from irrigative grey-brown grey-meadow alluvial meadow-forest and gleyey-yellow soils and a total quantity of microflora was in r=0,53-0,97 interval. A quantity of CO_2 decomposing from irrigative grey-brown, grey-meadow, and alluvial meadow-forest soils is an indicator parameter of the microbiological process.

A role of soil agrochemical characters is looked out in ferment potential formation from different point of view: the first, the soil agrochemical features define the tropic condition which is necessary for an activity of microorganisms and plants fulfilling ferments secretion; the second, the separate parameters of the soil agrochemical character play a special role in biosynthesis of out of cell ferments; the third, the soil agrochemical parameters, especially absorbing complex, pH and humus character determine the ferment immobilization in soil (Khaziev, 2005). Some authors' notions and the consequences show that a

correlative relation between the ferments activity and dynamical agrochemical parameters is different. The urease activity is in a positive correlative relation with the humus quantity that is hydrolyzed easily and nitrogen mineral, ammoniac (Khaziev, 2005). A reason for increase of nitrogen phosphorus and potassium mobile form in long cultivating soils is explained with the aeration of the soils upper part to a high degree and therefore with the intensive mineralization of humus, their transformation to organic-mineral complex. A main indicator of phosphor organic combinations mobilization which forms a main source of assimilating phosphorus in soil is the phosphatase ferment activity. The phosphatase ferment activity depends on phosphorus different form (Baligar and et al, 1988) and organic combinations. Organic phosphorus forms a main part of the soil phosphorus resource plays an important role in phosphorus regime, ensurement of the plants with phosphorus and after mineralization it becomes an assimilating form for plants. A relation between the nutrient (nitrogen nitrate, ammoniac forms, phosphorus), a quantity of easy hydrolyzing nitrogen and plants depends on its biology (Larionova and et al., 2003), the nutrient quantity and quality, an intensity of microbiological process as amonification and nitrification, cellulose shattering microorganisms and ferments activity (Voynova-Roykova and et al., 1986). The soils under the plants predecessor for the leguminous crops possess a high fermentative activity, but the mobile forms of nitrogen and phosphorus don't collect as a result of organic combinations mineralization, that's why dense correlation between their quantity and ferments activity isn't observed. This independence is connected with an assimilation of nitrogen phosphorus and other mobile elements by plants.

The close relation between nitrogen nitrate and ammoniac forms and urease ferment activity wasn't defined. Nitrate and ammoniac of the last crop of mineral nitrogen combinations are used easily not depending on ureolithic processes. The

reason is to be assimilated by plants and microorganisms collecting in soil, moving away from soil profile, leaching or losing in a gas form. There is no always close dependence between their quantity and ferments activity depending on the complex balance of the nitrogen mineral combinations. Learning of ferments activity and total objective laws of nitrogen fund in light grey soils shows that urease ferment activity rises by an increase of humus quantity and resource, total nitrogen and its different forms. The nutrient in dynamics was learnt in irrigative grey-brown, grey-meadow, alluvial meadow- forest and gleyey-yellow soils in order to determine the dependence between biological indicators and the nutrient assimilated easily by plants. The information about correlation between the biological activity and nutrient in the irrigative soils of the subtropic zone was shown in N.H. Orudzheva's work (2009).

The nutrient quantity was determined with the biological indicators in the soil samples. An average value of the nitrate quantity under the growing plants on the crop rotation in the irrigative grey-brown soils vibrated by 4,3-8,4 and 2,3-4,8 mg $N0_3$/kg on the constant tillage. The nitrate quantity under the lucerne was less than growing other plants on the six-field crop rotation, a reason is assimilation of the nutrient intensively for formation of underground and surface organs of the lucerne. Such situation was noted for a quantity of ammoniac and mobile phosphorus. The nitrogen nitrate form on 0-50 cm of layer on the crop rotation was 1,8-3,7 and 0,7-2,5 mg/NO_3 on the constant tillage in the irrigative grey-meadow soils at research period. The nitrate quantity under growing plants on the crop rotation in the irrigative alluvial meadow-forest soils was in comparison with the constant tillage. An average value of nitrate quantity under the plants growing on the crop rotation changed by 6,2-8,2; 3,3-6,7 mg/NO_3 kg on the constant tillage. A change dynamics of nitrate quantity on the crop rotation in the irrigative gleyey-yellow soils under

the vegetable plants at the vegetation period changed by 2,2-8,7; 1,4-5,1 mg/$N0_3$ on the constant tillage. The consequences show that the nitrate quantity is dynamically characterized depending on plants development phase, applying agrotechnics.

The ammoniac change interval on 0-50 cm of layer changed by 5,2-16,3 in the irrigative grey-brown soils at vegetation period and 3,1-7,3 on the constant tillage; 9,5-33,6 and 8,3-17,8 in grey-meadow soils; 6,1-25,3 and 5,3-16,2 in the alluvial meadow-forest soils and 51,2-98,7 and 27,0-71,6 mg/$N0_3$ in the gleyey-yellow soils.

The soils types comparison shows that the irrigative gleyey-yellow soils are characterized by a higher quantity of ammoniac. The dependent between the biological parameters and agrochemical indicators of the irrigative grey-brown, grey-meadow alluvial meadow-forest and gleyey-yellow soils was given on Table 32. An attitude of the plants ecological features to the soil condition was different and depended on soil environment reaction, physical characters, granulometric structure, a quantity of organic substances and nutrient (Beres-teskiy and et al., 1978). A correlative relation between urease ferment activity and nitrogen nitrate form in the irrigative grey-brown soils r=0,46 and between ammoniac r=0,42; r=0,22 and r=0,24 in the grey-meadow soils; r=0,33 and r=0,36 in the alluvial meadow-forest soils; r=0,62 and r= 0,53 in the gleyey-yellow soils (Table 33).

Weakness of the dependence by urease ferment activity and nitrogen nitrate and ammoniac forms in the research soils is with the assimilation of nitrogen by plants intensively, expense of microorganisms for cell formation. Presence of the plants in soil raises an increase probability of microorganisms, therefore it accelerates immobilization of the nitrogen mobile forms in microorganisms.

One of the nutrient that assumes great importance in plants feeding, development is phosphorus. An unique means is a relation by phosphatase ferment activity and mobile mineral phosphorus for soil phosphor hydralase activity. Some researches show a negative correlative relation by phosphatase ferment activity and mineral phosphorus quantity. Phosphatase ferment activity and organic phosphorus mineralization in soils is a complex process, that's why there are opposite ideas by phosphatase ferment activity and mobile phosphorus quantity in the reference. There are alternative ideas by different researches, they show a positive relation on one hand, a negative relation on the other hand (Kozlov, 1970). A quantity of mobile phosphorus was learnt in dynamics in the research soils. An average value of mobile phosphorus in the irrigative grey-brown soils under the growing plants on the crop rotation at vegetation period over the years was 5,6-13,5; 4,4-6,1 on the constant tillage, 7,2-10,5 and 7,2-7,7 in the grey-meadow soils; 15,7-40,5 and 9,6-21,3 in the alluvial meadow-forest soils; 121,3-165,8 and 113,1-135,4 mg/kg P_2O_5 in the gleyey-yellow soils. A resource and quantity of mobile phosphorus in soil are determined by phosphatase ferment activity. Dependence by phosphatase ferment activity and mobile phosphorus quantity is characterized negatively in the research works. This dependent was r=0,17 in the irrigative grey-brown soils; r=0,22 in the grey-meadow soils, r=0,30 in the alluvial meadow-forest soils and r=-0,10 in the irrigative gleyey-yellow soils. Weakness of the dependence of phosphatase ferment activity and mobile phosphorus is determined by high dynamicity of the second, soil type with the intensively assimilation by plants.

8.3 Correlative Relation between Ferments Activity and Temperature, Humidity in the Irrigative Soils

Hydrothermic regime defines an activity of soil microorganisms, an intensity of the biochemical processes. S. A. Aliyev, J. A. Hajiyev (1979) show a change of the correlative relation between an activity of invertase, phosphatase, protease, catalase and polyphenoloxidase ferments and humidity, temperature in a large interval depending on depth in the soils of the south zone. An increase of dehydrogenase from oxydizer-reductor ferments, invertase, phosphatase, urease and adenozintriphosphatase from hydrolothic ferments by an increase of productive humidity and a decrease of the temperature is observed (Kazeyev and et al., 2004). The positive correlative relation was determined between the temperature of soil and air and respiration intensity of soils (r=0,60-0,90).

The correlative relation between the ferments activity and soil temperature wasn't determined. The humidity level in the soils of different types is in a correlative relation with the soil microbial complex quantity. There is high dependence between the all groups of microorganisms and temperature and humidity and a correlation coefficient is 0,81 (Aliyev and et al.,1979). Correlative change objective laws were learnt by V. T. Mammadzade (2004) depending on soil-ecological condition of the ferments activity in Lankaran. A correlation coefficient between invertase ferment activity and humidity was r=0,52 and temperature was r=0,70, and phosphotase was 0,67 and 0,66, and catalase was 0,69 and 0,62, and dehydrogenase was 0,80 and 0,80 in the soils of the humid subtropic zone.

A correlation coefficient between humidity and invertase ferment was r=0,75; urease was r=0,63; phosphatase was r=0,61; catalase was r=0,60; dehydrogenase was r=0,59; temperature was 0,61; 0,34; 0,35; 0,43 and 0,69, a closer

relation was determined between invertase, phosphatase, drhydrogenase and humidity in the irrigative grey-brown soils. A correlation coefficient between ferments activity and humidity was r=0,39-0,68, and temperature was r=0,49-0,75 in the irrigative grey-meadow soils; a correlation coefficient between humidity and invertase ferment activity was r=0,66; urease was 0,63; phosphatase r=0,.66; catalase r=0,68; dehydrogenase r=0,59 in the alluvial meadow-forest soils. A relation between the temperature and ferments activity was weaker; the closer relation was noted between invertase (r=0,62) and catalase (r=0,67). A relation between invertase (r=0,71), phosphatase (r=0,64) ferments was very close. The closer relation between a temperature and ferments activity between invertase (r=0,61) and dehydrogenase (r=0,64).

8.4 Correlative Relation between Ferments Activity and Humus Quantity and Productivity in the Irrigative Soils

Humus performs its function as both biological and agrochemical parameter (Kazeyev and et al., 2004). A correlation relation between humus and productivity was close and r=0,82 in the irrigative grey-brown soils; r=0,79 in the grey-meadow soils; r=0,91 in the alluvial meadow-forest soils and r=0,89 in the gleyey-yellow soils. A close relation between productivity and humus approves that humus quantity is its fertility indicator.

The organic residues transformations don't give a chance for collecting of the plant residues on soil because of a great potential opportunity of ferments in overturn into an assimilating form by plants. The relation was close between dehydrogenase (r=0,63) ferments activity and productivity in the gleyey-yellow soils, catalase (r=0,67) in the irrigative grey-brown soils, catalase (r=0,73) in grey-meadow soils, urease (r=0,71) in the alluvial meadow-forest soils and

dehydrogenase (r=0,63) ferments in the gleyey-yellow soils. The relation between phosphatase ferment activity and productivity was weak in the irrigative soils of the subtropic zone. It is obvious that a reason for this is a change of the phosphatase ferment activity in a large interval for a time limit depending on plants development phase. There was a very close relation between invertase ferment activity and productivity and correlative relation was r=0,79-0,86 in the irrigative soils of the subtropic zone. Close correlative relation approves that invertase ferment activity is a main indicator of the soil fertility.

Table 32. *Correlative relation between humus and microorganisms quantity and ferments activity in the irrigative soils.*

parameters	**invertase**	**urease**	**phos-phatase**	**catalase**	**dehydro-genase**
irrigative grey-brown soils					
humus	0,76	0,68	0,76	0,68	0,90
microflora	0,53	0,81	0,77	0,60	0,88
irrigative grey-meadow soils					
humus	0,79	0,89	0,84	0,71	0,69
microflora	0,78	0,41	0,36	0,88	0,84
irrigative alluvial meadow-forest soils					
humus	0,68	0,79	0,58	0,48	0,71
microflora	0,69	0,76	0,69	0,33	0,70
irrigative gleyey-yellow soils					
humus	0,72	0,93	0,79	0,79	0,77
microflora	0,66	0,76	0,55	0,44	0,75

Table 32. *Continued.*

parameters	nitrifi-cation	ammoni-fication	CO_2	cellulose	microflora
irrigative grey-brown soils					
humus	0,84	0,81	0,51	0,64	0,75
microflora	0,86	0,56	0,73	0,44	
irrigative grey-meadow soils					
humus	0,83	0,75	0,51	0,52	0,64
microflora	0,55	0,72	0,97	0,67	
irrigative alluvial meadow-forest soils					
humus	0,66	0,85	0,81	0,57	0,58
microflora	0,78	0,58	0,68	0,79	
irrigative gleyey-yellow soils					
humus	0,69	0,75	0,79	0,65	0,59
microflora	0,72	0,64	0,53	0,86	

Table 33. *Correlative relation between biological activity and biochemical and agrochemical indicators of the irrigative soils.*

parameters	irrigative grey-brown			irrigative grey-meadow		
	urease	nitrifi-cation	ammoni-fication	urease	nitrifi-cation	ammoni-fication
Nitrate	0,46	0,41	0,49	0,22	0,44	0,14
Ammoniac	0,42	0,21	0,61	0,24	0,06	0,62

Table 33. *Continued.*

parameters	irrigative alluvial meadow-forest			irrigative gleyey-yellow		
	urease	nitrifi-cation	ammoni-fication	urease	nitrifi-cation	ammoni-fication
Nitrate	0,33	0,27	0,35	0,62	0,61	0,67
Ammoniac	0,36	0,03	0,51	0,53	0,41	0,56

Conclusions

1. A comparison of the irrigative soils shows that an activity of invertase ferment from hydrolithic ferments was higher in gleyey-yellow soils (13,82 mg glucose), urease ferment activity was higher in the alluvial meadow-forest soils (5,51 mg NH_3) and phosphatase ferment activity was lower in the alluvial meadow-forest soils (1,31 mg P_2O_5). Under the versions of the lucerne, vegetable bean the ferments activity was higher, it was little under the onion, garlic, the rest plants took an interval position for an activity. The ferments activity was lower than the plants of the same name under growing plants on the constant tillage.
2. Catalase (15,9 cm^3 O_2) from oxidizer-reductor ferments was higher in the irrigative grey-brown soils and dehydrogenase (15,50 mg TFF) was higher in the irrigative gleyey-yellow soils than irrigative grey-meadow and alluvial meadow-forest soils and constant tillage on the crop rotation.
3. Not-sporforming forms of bacteria were a main part of microorganisms in the irrigative soils of the subtropic zone. Biogenity of the irrigative alluvial meadow-forest (2,8-3,6 $\times 10^6$ CFU/g dry soils on a cultivated layer) and gleyey-yellow soils (2,4-3,5 $\times 10^6$ CFU/g dry soils on a cultivated layer) was higher than grey-brown (1,1-2,8 $\times 10^6$ CFU/g dry soils on a cultivated layer) and grey-meadow soils (2,0-2,2 $\times 10^6$ CFU/g dry soils on a cultivated layer). Biogenity of the irrigative soils in the subtropic zone was higher than other plants growing under leguminous plants and constant tillage on the crop rotation. Actinomycetes take the second place for a quantity by percentage and a higher quantity of actinomycetes was observed in grey-brown, grey-meadow and gleyey-yellow soils. A quantity of the microscopic fungus is

little in the grey-brown and grey-meadow soils, and was less than alluvial meadow-forest and gley-yellow soils.

An intensity mineralization of organic substances under growing plants in the grey-brown soils was 0,26-0,38 and 0,33-0,45 on the constant tillage; 0,41-0,57 and 0,67-0,82 in the grey-meadow soils; 0,11-0,20 and 0,21-0,28 in the alluvial meadow-forest soils; 0,25-0,29 and 0,28-0,32 in the gleyey-yellow soils, the higher mineralization was observed in the grey-meadow soils. A mineralization coefficient was higher than crop rotation under the plants on the constant tillage.

4. The humus quantity which is a main index of the soil effective fertility stability changing by 1,23-1,88% in the irrigative grey-brown soils on crop rotation; 1,50-1,80% in the grey-meadow soils; 2,56-3,26% in the alluvial meadow-forest soils and 3,45-4,03% in the gleyey-yellow soils and 0,81-1,32%; 1,12-1,31%; 1,92-2,31 və 2,58-3,46% on the constant tillage the decrease was observed till the end of vegetation under all the versions.

5. An intensity of nitrification process which performs an overturn of ammonia salts into nitrate acid salts was higher in the irrigative grey-brown soils (85,2 mg/kg $N\text{-}NO_3$) and ammonifixing bacteria activity that performs nitrogenorganic combinations ammonifixation was higher in the irrigative gleyey-yellow soils (129,1 mg/kg $N\text{-}NH_3$) than grey-meadow and alluvial meadow-forest soils. Dynamically changing law objectives of the intensity of nitrixation and ammonifixation process were determined in the grey-brown, grey-meadow, alluvial meadow-forest and gleyey-yellow soils on the crop rotation and constant tillage under irrigative condition depending on plants development phase, applying agrotechnical measures, plants biology, hydrothermic condition and an activity was weaker on the constant tillage than crop rotation.

6. CO_2 quantity decomposing from soil and shattering intensity of cellulose settling in the soil profile on crop rotation and constant tillage were higher in the irrigative gleyey-yellow soils of the humid subtropic zone (CO_2 quantity is 6,07 CO_2 kg/h hour and shattering intensity of cellulose is 23,9%) than grey-brown (3,36 CO_2 kg/h hour and 10,3%), grey-meadow (2,28 CO_2 kg/h hour and 28,0%) and alluvial meadow-forest (3,39 CO_2 kg/h hour and 19,5%) soils, on the crop rotation than constant tillage.
7. The mathematic-statistic calculations were conducted in order to define exactness of the factical materials got on the basis of the biochemical process and biological activity, biogenity of the gleyey-yellow soils of the humid subtropic zone and alluvial meadow-forest soils of the moderate subtropic zone, grey-brown, grey-meadow soils of the arid subtropic zone for prognosis and definition of the direction of the biological changes occurring in the soils under antropogenic effect.
8. An integral index biological state of soils (IIBS) was determined on the basis of the complex biological parameters under virgin versions and grey-brown, grey-meadow, alluvial meadow-forest and gleyey-yellow soils under irrigative condition and biological evaluation was conducted. IIBS in the irrigative grey-brown soils was 18% higher on six-field vegetable-fodder crop rotation than virgin versions; on five-field vegetable-leguminous 12% more than crop rotation; 34% higher than constant tillage; 15% more in the irrigative grey-meadow soils on the crop rotation than virgin versions; 35% more than constant tillage. IIBS under virgin versions in the alluvial meadow-forest soils was 12% more than the crop rotation; 40% more than the constant tillage; 8% və 30% more in gleyey-yellow soils. The biological activity of IIBS was very high because of chancing by 80-100% under virgin versions and crop rotation in the soils investigated on the basis

of the biological estimation scale; but because of being of 60-70% on the constant tillage the biological activity was concerned to the medium and high soils. Biological activity increase in the irrigative grey-brown and grey-meadow soils and stabilization of the alluvial meadow-forest and gleyey-yellow soils were observed.

9. The correlative relation among the soil parameters in the subtropic zone was calculated. A correlative relation between ferments activity and microorganisms quantity and humus was r=0,33-0,88 and r=0,58-0,89, a closer relation in the irrigative gleyey-yellow soils was between dehydrogenase ferment activity and humus and microflora quantity.

Dependence r=0,44-0,85 between a quantity of humus and microflora and an intensity of the biochemical process chanced. A closer relation between nitrate and ammoniac forms of nitrogen and urease ferment activity, soils nitrification and ammonification ability was in the irrigative gleyey-yellow soils. A negative relation was between phosphatase ferment activity and chanced r=-0,17-0,30. A correlative between the soil humidity and an activity of ferments mobile phosphorus quantity and microflora was closer than a relation of soil temperature. A relation between humus and productivity was very close, and was r=0,72-0,91 in the irrigative grey-brown, grey-meadow, alluvial meadow-forest and gleyey-yellow soils. The higher correlative relation between ferments activity and productivity was noted between invertase ferment activity and productivity (r=0,78-0,86).

The complex agromeliorative measures system (the crop rotation scheme which in the legumenious plants and intermediate plants are included, agrotechnological schemes for vegetable plants growing and etc) was offered by paying attention to soil-ecological condition for management of soil processes

by scientific bases, holding of biological activity, restoration of irrigative grey-brown, grey-meadow, alluvial meadow-forest and gleyey-yellow soils.