Chapter 6

Diagnostics of the Irrigative Soils and an Integral Parameter of the Biological State

6.1 Biodiagnostics of the Subtropic Zone Soils

The soils biomonitoring, biodiagnostics and bioindication assume a great importance from the stand point of the conduction of the research works and performation of the perimental industry measures. The methods of the soil microbiology, biochemistry and zoology are applied for the characterization of the soil biological state and definition of its change under a various antropogen influence. These methods are used in ecology, soil science, preservation of the environment.

The biochemical methods are used in soil cover diagnostics and monitoring in last ten years. The all biological parameters of soil possess dynamics, a definition of the ferments activity is very important in conduction of the ecological researches analyzing of the analyses, determination of the methodic mistake (Dadenko and et al., 2006).

The biological indication, bioindicators and the soil biological activity indicators are considered a main means in estimation of soils by quantity. An activity of invertase and dehydrogenase ferments is sensitive for an antropogen effect and it is a diagnostic indicator in definition of the influence of the soils fertility and agricultural plants on soils (Dadenko and et al., 2006).

It is necessary to have a look at the biological activity in soils formation as a sum of the main character of soil, a biotic, biotic and antropogen factors. The life products of phito-, zoo-and microbiocenoz (at first ferments and humus) and abiotic components of the soil environment (granulometric structure and structural elements, physical and water characters, the environment reaction, absorption ability and etc) turn into the complete system. Using of the organisms which are more sensitive than the environment changes in ecological monitoring form a basis of bioindication and biotest (Domracheva and et al., 2006). Using of the biological indicators is advisable in soil fertility diagnostics (Popova, 2006). The chemical analyses that are conducted by a contemporary method can't show soil toxicity sometimes, using of biotest gives a chance to define a presence of them in the environment. The biotest plays main role in controlling for the state of the natural system and ecosystem.

On the basis of the zoological-microbiological researches the soils biodiagnostics is a main means in control for the environment protection and its change. Some researchers advise to define ferments activity, humus quantity and qualitative structure from the indicator which are very sensitive and are varied little (Kazeyev and et al., 2004).

The ferments activity application as a diagnostic indicator is explained by high sensitiveness against the external effects, easiness of definition, little experience error (Dadenko and et al., 2006; Kazeyev and et al., 2004). Some biochemical processes-mineralization, humusformation, nitrification, nitrogenfixation and other diagnostics can be given according to the ferments activity, using of the ferments activity in biodiagnostics gives very objective information in comparison with the microbiological activity about processes occurring in the soil. The indicators selected in monitoring, diagnostics and indication of the soils biological state are conducted depending on the research purpose and duty, antropogen effect kind, an available laboratory-analytical source and other criteria (Kazeyev and et al., 2003; 2004).

It is necessary to learn a relation between the diagnostic parameters and them for a definition of the direction of some or other soil processes, reflection of the changes occurring in the soil characters in the irrigation along the profile. The biological methods assume a great urgency in definition and evaluation of the characters soils state especially the soils subjected to the antropogen effect (Staxurlova and et al., 2007). There are different ideas depending on using of the soils under the agricultural plants. Some authors show that using of the soils under the agricultural plants can be changed in a negative and positive direction as a result of its main characters transformation (Zenova and et al., 2002), the biological activity reduces according to others' idea (Kuprevich, 1974). The biological characters of the soil types are equalized on the tillage layer of the different natural zones and get the characters which are necessary for the same agricultural plant (Kazeyev and et al., 2004), therefore study of the soils biology along the profile is an actual problem, gives a chance to reveal new objective laws of the formation of soil genesis and soils fertility.

The comparative-geographical analysis gives a chance to define a formation of the geographical environment in the space depending on the factors and to compare a biological activity among the different soils. At present biodiagnostics and bioindication assume an actuality; they are main indicators in soil fertility increase and in protection of the environment from destruction and pollution (Staxurlova and et al., 2007). The researches consequences show that a direction of the ferments activity in the antropogen landscape changes in a different direction depending on use level of soils, soil type, kind of the growing plants and biological indicators in comparison with the natural landscape. The biomorphodiagnostics of the irrigative soils reflects in some works in the subtropic zone (Babayev and et al., 2000; Orudzheva, 2009).

The potential (ferments activity, ammonification and nitrification ability, biogenness) and actual activity (shattering intensity of the linen located in the soil profile and CO_2 decomposed from soil) have been learnt in dynamics. The statistic-variation calculations have been conducted for definition of the got figures exactness. The biological indicators were defined and biodiagnostics was given under the growing plants on the crop rotations and constant tillage in the irrigative grey-brown soils in the dry subtropic zone for definition of the biological indicators change in what direction inside the same soil type. The soils biological activity under the separate plants was higher on the 1st scheme than the 2nd scheme; it was higher on the crop rotations than constant tillage (Table 15, 19, 23). An activity for the biological parameters in the soils under the growing plants on the crop rotation and constant tillage was determined the same parameters were reflected for giving of the biodiagnostics in the irrigative grey-meadow soils (Table 16, 20, 24). The biological activity was higher on the tillage layer than under tillage layer, than under tillage layer, it was higher on the crop rotation than the constant tillage.

The biodiagnostics of the irrigative alluvial meadow-forest soils under the growing plants six field vegetable fodder on the crop rotation and constant tillage was given on the basis of the collected factual Tables (Table 17, 21, 25) for the complex biological parameters. The figures show that the biological parameters are higher on the crop rotation than the constant tillage. The soils biodiagnostics was reflected on the basis of the soil biological parameters under the growing plants on the five-field vegetable-leguminous crop rotation and constant tillage in the irrigative gleyey-yellow soils (Table 18, 22, 26). The biological parameters were higher under the vegetable bean.

So, Tables 15-26 visually show changing of the biological parameters intensity in which direction under the growing plants on the crop rotations and constant tillage in the grey-brown, grey-meadow, alluvial meadow-forest and gleyey-yellow soils under the irrigative condition. Using of the virgin land, sowing fertilizing, applying of the agrotechnical measures under the agricultural plants were a reason for appearance of the biological activity change in a different form. With that end in view changing of the cultural level of the grey-brown soils in comparison with the virgin versions in which direction can be clearly seen on Table 27. An table 27 the biological activity was higher in comparison with the virgin versions as a result of use of grey-brown and grey-meadow soils on the crop rotation. This process in grey-brown soils was observed on both schemes. A biological activity of the grey-brown and grey-meadow soils under the plants on the constant tillage was lower than crop rotation and virgin versions. In order to define the changes occurring in the soils being subjected to the antropogen effect, the biodiagnostics of the virgin soils possessing analogues irrigative alluvial meadow-forest and irrigative gleyey-yellow soils on the crop rotation and constant tillage was given on Table 27. Biodiagnostics of the alluvial meadow-forest and gleyey-yellow soils shows a change of the biological parameters under the plants in a different direction. The catalaza ferment activity, nitrification process intensity and microflora quantity were higher in both soil type, the rest indicators changed depending on soil type character. Changing of the soil biological activity differs in the different type of soils depending on the ferments activity, hydrothermic regime and other factors (Aliyev, 1978).

Table 15. *Biodiagnostic of irrigated grey-brown soils (ferments, average 5-6 y).*

Variants	**Depth, cm**	**n**	**Invertaza**		**Ureaza**	
			V,%	**$x \pm t_{0.05}s_x$**	**V,%**	**$x \pm t_{0.05}s_x$**
1	**2**	**3**	**4**	**5**	**6**	**7**

Table 15. *Continued.*

Variants	**Fosfataza**		**Catalaza**		**Dehidrogenaza**	
	V,%	**$x \pm t_{0.05}s_x$**	**V,%**	**$x \pm t_{0.05}s_x$**	**V,%**	**$x \pm t_{0.05}s_x$**
1	8	9	10	11	12	13

Scheme 1. *Six-field vegetable-fodder crop rotation.*

I Annual lucerne+	0-25	108	11,26	12,30±0,469	10,87	3,12±0,112
barley	25-50	108	14,45	10,75±0,510	11,57	2,76±0,112
II Lucerne of	0-25	108	8,74	14,19±0,422	12,54	3,62±0,157
the second year	25-50	108	10,40	12,21±0,432	14,60	3,30±0,157
III	0-25	108	13,18	12,48±0,559	13,01	3,42±0,157
Watermelon	25-50	108	11,51	10,62±0,418	16,92	2,89±0,171
IV	0-25	108	16,84	10,78±0,618	14,08	2,98±0,145
Potatoes	25-50	108	13,31	9,25±0,418	12,74	2,38±0,112
V	0-25	108	16,87	8,59±0,510	13,60	2,61±0,120
Garlic	25-50	108	15,05	7,74±0,398	12,88	2,21±0,096
VI White head	0-25	108	10,85	12,27±0,451	11,40	3,10±0,120
cabbage+ tomato	25-50	108	12,09	10,68±0,437	11,27	2,76±0,106

Scheme 1. *Continued.*

I Annual lucerne+	10,70	2,91±0.106	16,97	13.8±0.789	10,21	6,69±0,233
barley	14,91	1,71±0.086	19,96	11.5±0.783	14,97	5,11±0,259
II Lucerne of	13,52	3,35±0.153	15,18	15.1±0.781	15,42	8,26±0,432
the second year	19,35	2,27±0.149	17,70	13.6±0.820	19,16	6,57±0,428
III	13,12	2,77±0.124	15,41	13.7±0.716	12,09	6,84±0,286
Watermelon	15,04	2,05±0.104	15,35	11.7±0.610	11,92	4,65±0,188
IV	16,98	2,40±0.139	13,84	12.2±0.575	17,65	4,86±0,292
Potatoes	22,74	1,77±0.137	14,75	10.0±0.501	13,72	2,97±0,139
V	22,42	1,75±0.133	14,26	11.2±0.542	13,81	4,55±0,214
Garlic	21,18	1,36±0.098	16,95	8.7±0.412	12,86	3,91±0,171
VI White head	7,94	2,72±0.073	13,60	13.3±0.616	13,56	5,26±0,288
cabbage+ tomato	11,77	2,20±0.088	12,29	10.9±0.469	19,99	4,33±0,294

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

I	0-25	90	16,12	9,86±0,595	14,00	2,71±0,141
Potatoes	25-50	90	17,34	8,32±0,539	13,07	2,23±0,109
II	0-25	90	14,14	12,44±0,658	13,26	3,43±0,170
Vegetable bean	25-50	90	12,45	11,01±0,515	14,80	3,19±0,176
III	0-25	90	14,08	10,99±0.580	15,29	3,17±0,182
Watermelon	25-50	90	11,60	9,65±0,420	16,19	2,55±0,154
IV	0-25	90	11,81	10,39±0,459	13,41	2,83±0,141
Tomatoes	25-50	90	13,72	9,11±0,486	13,54	2,46±0,127
V	0-25	90	12,83	12,53±0,601	12,82	3,31±0,144
Vegetable bean	25-50	90	11,12	10,96±0,527	12,35	3,04±0,141

Scheme 2. *Continued.*

I	17,91	2,17±0.135	14,17	11.1±0.605	14,48	4,40±0,238
Potatoes	9,73	1,30±0.047	11,90	8.8±0.392	17,63	2,69±0,178
II	9,12	3,10±0.107	15,11	13.4±0.758	12,38	6,36±0,295
Vegetable bean	15,19	2,22±0.117	18,75	11.4±0.799	14,36	4,87±0,262
III	15,34	2,43±0.139	16,33	11.4±0.697	11,61	5,95±0,258
Watermelon	15,30	1,86±0.107	15,10	8.9±0.502	14,67	4,22±0,232
IV	9,13	2,66±0.090	13,54	11.3±0.571	10,50	5,24±0,205
Tomatoes	14,80	2,19±0.121	15,21	9.8±0.0.558	13,44	4,57±0,230
V	13,55	3,14±0.160	15,34	14.2±0.816	12,16	6,62±0,301
Vegetable bean	12,30	2,27±0.105	20,24	11.9±0.902	12,85	4,59±0,221

Scheme 3. *Constant.*

1	2	3	4	5	6	7
Tomatoes	0-25	108	22,49	8.83±0.677	24,16	1,95±0,161
	25-50	108	22,33	7.73±0.588	26,37	1,67±0,124
Watermelon	0-25	108	20,56	8.23±0.577	18,14	2,01±0,124
	25-50	108	23,95	6.96±0.565	21,68	1,53±0,133
Potatoes	0-25	108	17,89	8.43±0.512	21,50	2,10±0,153
	25-50	108	19,68	7.14±0.479	21,78	1,61±0,118
Garlic	0-25	108	18,53	7.81±0.492	24,99	1,73±0,147
	25-50	108	18,26	5.99±0.208	13,36	1,40±0,063
Whitehead	0-25	108	14,50	10.18±0.504	14,70	2,72±0,137
cabbage	25-50	108	13,25	9.24±0.418	16,84	2,30±0,133
Vegetable bean	0-25	90	18,89	10.34±0.730	16,08	2,71±0,164
	25-50	90	18,32	9.30±6.380	19,68	2,43±0,115

Scheme 3. *Continued.*

1	8	9	10	11	12	13
Tomatoes	23,89	1,69±0.033	21,11	9.1±0.653	16,13	3,55±0,194
	28,02	0,79±0.018	23,21	7.7±0.608	19,32	3,00±0,198
Watermelon	38,20	1,34±0.042	21,51	7.5±0.548	24,97	3,10±0,263
	27,90	0,68±0.157	24,09	6.7±0.548	21,12	2,30±0,163
Potatoes	19,90	1,43±0.023	19,28	8.4±0.551	18,94	2,65±0,171
	27,99	0,83±0.019	23,66	7.1±0.571	22,60	1,62±0,124
Garlic	37,01	0,74±0.017	15,47	7.6±0.340	17,42	2,36±0,135
	33,45	0,62±0.017	26,01	6.5±0.575	14,32	2,12±0,104
Whitehead	31,06	1,91±0.049	22,13	9.1±0.685	23,77	4,07±0,328
cabbage	29,02	1,47±0.049	25,09	7.1±0.606	19,96	3,27±0,222
Vegetable bean	24,45	2,16±0.205	26,77	10.6±0.801	20,19	5,14±0,355
	27,70	1,67±0.205	26,77	8.0±0.802	22,79	3,76±0,297

Note: n – Quantity of frequency; x – average,V,% – coefficient variation; x±т0,05Sx.

Table 16. *Biodiagnostic of irrigated grey-meadow soils (ferments, average 4 y).*

Scheme 1. *Four-field vegetable fodder crop rotation.*

Variants	Depth, cm	n	Invertaza V,%	Invertaza $x \pm T_{0.05}S_x$	Ureaza V,%	Ureaza $x \pm T_{0.05}S_x$
I	0-25	72	14,04	9,15 ±0,542	15,49	3,72 ±0,244
Annual lucerne	25-50	72	10,03	7,94 ±10,03	17,64	3,34 ±0,248
II Lucerne of	0-25	72	15,27	10,30 ±15,27	13,06	4,32 ±0,242
the second year	25-50	72	8,72	9,37 ±8,72	15,59	3,90 ±0,257
III	0-25	72	12,98	9,00 ±12,98	22,88	3,06 ±0,296
Cucumber	25-50	72	16,88	7,57 ±16,88	25,35	2,39 ±0,257
IV	0-25	72	13,54	8,92 ±13,54	25,02	2,74 ±0,290
Tomatoes	25-50	72	14,87	7,60 ±14,87	27,32	2,08 ±0,240

Table 16. *Continued.*

Scheme 1. *Continued.*

Variants	Fosfataza V,%	Fosfataza $x \pm T_{0.05}S_x$	Catalaza V,%	Catalaza $x \pm T_{0.05}S_x$	Dehidrogenaza V,%	Dehidrogenaza $x \pm T_{0.05}S_x$
I	28,51	1,95 ±0,234	24,87	6,9 ±0,537	7,25	5,52 ±0,169
Annual lucerne	28,49	1,65 ±0,199	25,87	4,7 ±0,503	10,96	4,16 ±0,193
II Lucerne of	12,31	2,68 ±0,139	14,94	8,2 ±0,518	7,24	5,86 ±0,180
the second year	13,77	1,88 ±0,110	23,84	5,2 ±0,524	7,94	5,33 ±0,180
III	12,90	1,04 ±0,058	19,64	6,5 ±0,540	11,03	5,66 ±0,265
Cucumber	24,39	0,44 ±0,046	26,34	4,7 ±0,524	17,28	4,81 ±0,342
IV	19,46	0,89 ±0,075	22,65	6,2 ±0,594	13,03	5,16 ±0,284
Tomatoes	27,12	0,68 ±0,077	29,94	3,6 ±0,455	17,17	4,66 ±0,337

Scheme 2. *Constant.*

Variants	Depth, cm	n	Invertaza V,%	Invertaza $x \pm T_{0.05}S_x$	Ureaza V,%	Ureaza $x \pm T_{0.05}S_x$
Tomatoes	0-25	72	19,85	7,20 ±19,85	33,55	1,95 ±0,275
	25-50	72	21,98	5,85 ±21,98	41,49	1,25 ±0,219
Cucumber	0-25	72	19,93	6,27 ±19,93	33,94	1,63 ±0,234
	25-50	72	20,95	5,09 ±20,95	49,48	0,95 ±0,199

Scheme 2. *Continued.*

Tomatoes	53,75	0,31±0,068	32,08	4,2±0,557	31,08	3,79±0,495
	47,63	0,23±0,046	43,78	2,7±0,499	48,75	2,04±0,420
Cucumber	50,59	0,25±0,054	37,42	3,3±0,522	34,95	2,75±0,406
	54,77	0,21±0,046	38,89	2,7±0,449	29,05	1,57±0,193

Table 17. *Biodiagnostic of irrigated alluvial meadow-forest soils (ferments, average 6 y.)*

Variants	Depth, cm	n	Invertaza		Ureaza	
			V,%	$x \pm \tau_{0.05} s_x$	**V,%**	$x \pm \tau_{0.05} s_x$
1	2	3	4	5	6	7

Table 17. *Continued.*

Variants	Fosfataza		Catalaza		Dehidrogenaza	
	V,%	$x \pm \tau_{0.05} s_x$	**V,%**	$x \pm \tau_{0.05} s_x$	**V,%**	$x \pm \tau_{0.05} s_x$
1	8	9	10	11	12	13

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

I Annual lucerne+	0-25	108	13,57	9,28±0,428	9,83	4,56±0,153
barley	25-50	108	15,60	8,53±0,449	8,06	4,02±0,110
II Lucerne of	0-25	108	6,41	11,18±0,243	9,20	5,05±0,157
the second year	25-50	108	8,05	10,51±0,288	9,65	4,59±0,152
III	0-25	108	8,86	8,44±0,510	10,86	3,84±0,124
Onion	25-50	108	9,56	7,81±0,253	12,48	3,37±0,143
IV	0-25	108	8,08	8,42±0,231	12,16	3,76±0,155
Cucumber	25-50	108	8,65	7,86±0,231	11,22	3,20±0,120
V Whitehead	0-25	108	9,11	10,06±0,312	10,10	4,19±0,145
cabbage	25-50	108	10,95	9,06±0,337	10,77	3,45±0,126
VI Green fodder+	0-25	108	9,44	10,73±0,345	11,48	4,04±0,157
tomatoes	25-50	108	10,33	9,58±0,337	13,18	3,55±0,159

Scheme 1. *Continued.*

I Annual lucerne+	20,45	1,06±0,073	14,87	6,8±0,343	23,60	5,20±0,418
barley	27,00	0,82±0,075	15,48	6,1±0,320	25,80	3,83±0,337
II Lucerne of	18,89	1,23±0,080	12,78	8,1±1,489	20,48	5,59±0,390
the second year	17,48	1,07±0,063	17,02	7,3±0,422	21,50	4,74±0,347
III	15,30	0,62±0,033	10,71	6,1±0,222	23,38	4,82±0,384
Onion	29,13	0,36±0,035	13,89	5,2±0,245	21,86	3,64±0,271
IV	19,44	0,78±0,051	15,98	6,5±0,353	20,01	3,91±0,265
Cucumber	24,18	0,57±0,047	16,52	5,8±0,326	19,88	3,01±0,204
V Whitehead	15,97	0,99±0,053	11,24	6,9±0,263	22,25	4,69±0,355
cabbage	24,79	0,46±0,039	14,05	5,9±0,282	23,00	4,09±0,320
VI Green fodder+	19,35	0,88±0,057	10,06	8,1±0,277	16,24	5,09±0,279
tomatoes	17,96	0,61±0,037	11,49	7,3±0,286	13,24	4,30±0,194

Scheme 2. *Constant.*

Cucumber	0-25	108	12,40	6.48±0.273	14,59	2,90±0,145
	25-50	108	14,64	5.52±0.714	15,18	2,50±0,129
Whitehead	0-25	108	15,17	7.41±0.381	14,22	3,04±0,147
cabbage	25-50	108	13,66	6.10±0.284	14,14	2,58±0,124
Tomatoes	0-25	108	13,78	6.82±0.320	12,61	3,02±0,129
	25-50	108	11,35	5.64±0.218	12,22	2,30±0,096
Onion	0-25	108	12,87	5.86±0.257	19,65	3,14±0,210
	25-50	108	11,62	4.87±0.192	20,40	2,82±0,196

Scheme 2. *Continued.*

Cucumber	20,73	0,55±0,039	18,02	5,6±0,343	20,44	2,57±0,180
	27,11	0,35±0,033	21,18	4,9±0,353	19,48	2,10±0,139
Whitehead	27,22	0,45±0,041	14,41	5,7±0,279	28,21	3,43±0,335
cabbage	27,11	0,35±0,033	18,29	5,0±0,310	25,96	2,89±0,255
Tomatoes	28,23	0,56±0,053	13,64	5,9±0,273	19,12	3,27±0,212
	29,87	0,41±0,041	16,65	5,3±0,300	15,78	2,62±0,141
Onion	27,90	0,34±0,033	15,55	5,3±0,279	24,85	1,99±0,167
	33,29	0,19±0,022	17,63	4,6±0,398	25,54	1,76±0,153

Table 18. *Biodiagnostic of irrigated gleyey-yellow soils (ferments, average 5 y.)*

Variants	Depth, cm	n	Invertaza		Ureaza	
			V,%	$x \pm T_{0.05} S_x$	V,%	$x \pm T_{0.05} S_x$
1	2	3	4	5	6	7

Table 18. *Continued.*

Variants	Fosfataza		Catalaza		Dehidrogenaza	
	V,%	$x \pm T_{0.05} S_x$	V,%	$x \pm T_{0.05} S_x$	V,%	$x \pm T_{0.05} S_x$
1	8	9	10	11	12	13

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

I	0-25	90	8,19	12,53 ±0,383	8,28	3,24 ±0,100
Tomatoes	25-50	90	7,45	11,35 ±0,316	6,93	2,62 ±0,123
II White head	0-25	90	7,50	13,11 ±0,349	9,62	3,27 ±0,117
cabbage + maize	25-50	90	8,21	11,34 ±0,349	9,36	2,66 ±0,092
III	0-25	90	8,19	10,69 ±0,328	11,98	2,78 ±0,125
Onion	25-50	90	12,25	9,16 ±0,420	13,96	2,44 ±0,127
IV	0-25	90	9,59	13,20 ±0,474	7,84	3,87 ±0,113
Vegetable bean	25-50	90	10,20	11,57 ±0,443	8,01	3,28 ±0,098
V	0-25	90	10,76	13,28 ±0,535	9,89	3,81 ±0,141
Vegetable bean	25-50	90	9,34	11,16 ±0,390	8,05	3,31 ±0,100

Scheme 1. *Continued.*

I	15,58	2,04 ±0,119	23,00	4,1 ±0,353	13,43	14,10 ±0,709
Tomatoes	21,06	1,41 ±0,111	26,58	3,1 ±0,308	13,76	11,46 ±0,590
II White head	8,23	2,37 ±0,074	16,78	5,2 ±0,326	12,50	14,63 ±0,685
cabbage + maize	13,00	1,90 ±0,092	20,92	3,6 ±0,281	14,85	12,02 ±0,668
III	12,72	1,86 ±0,088	22,74	3,8 ±0,324	17,02	12,11 ±0,771
Onion	24,29	1,15 ±0,105	20,75	2,7 ±0,209	16,71	8,38 ±0,525
IV	13,97	2,63 ±0,137	13,88	5,9 ±0,308	12,95	14,78 ±0,715
Vegetable bean	19,20	2,16 ±0,158	14,52	4,5 ±0,244	13,26	12,92 ±0,642
V	13,26	2,59 ±0,129	17,46	5,6 ±0,367	9,83	14,80 ±0,545
Vegetable bean	18,58	2,05 ±0,141	14,14	4,1 ±0,217	15,42	12,51 ±0,722

Scheme 2. *Constant.*

Tomatoes	0-25	90	14,27	10,65 ±0,568	10,55	2,73 ±0,109
	25-50	90	14,68	9,37 ±0,515	13,97	2,33 ±0,121
White head cabbage	0-25	90	15,95	9,96 ±0,595	21,53	2,38 ±0,193
	25-50	90	12,16	8,64 ±0,394	24,78	2,12 ±0,197
Maize for silage	0-25	90	10,55	10,42 ±0,412	17,46	2,96 ±0,193
	25-50	90	10,45	8,89 ±0,349	19,35	2,72 ±0,195
Onion	0-25	90	15,48	9,30 ±0,539	25,83	2,18 ±0,211
	25-50	90	16,54	7,88 ±0,488	27,01	1,92 ±0,195
Vegetable bean	0-25	90	14,18	11,27 ±0,599	14,41	3,35 ±0,180
	25-50	90	15,20	10,39 ±0,590	15,43	2,92 ±0,168

Scheme 2. *Continued.*

Tomatoes	20,44	1,57 ±0,121	28,13	3,0 ±0,316	14,81	12,93 ±0,718
	30,06	0,64 ±0,072	27,42	2,5 ±0,256	16,47	9,12 ±0,521
White head cabbage	26,23	1,03 ±0,100	21,22	4,5 ±0,357	16,48	11,78 ±0,672
	29,53	0,87 ±0,096	28,94	2,9 ±0,295	17,43	7,97 ±0,482
Maize for silage	23,43	1,01 ±0,088	22,60	3,9 ±0,330	15,15	11,50 ±0,603
	29,76	0,83 ±0,092	28,77	2,8 ±0,301	20,43	8,52 ±0,603
Onion	29,78	0,68 ±0,076	28,35	2,2 ±0,234	19,34	8,40 ±0,564
	29,86	0,54 ±0,059	27,94	1,8 ±0,189	20,1	6,55 ±0,457
Vegetable bean	18,32	1,81 ±0,110	21,40	4,3 ±0,344	14,75	12,71 ±0,650
	24,22	1,10 ±0,100	21,57	3,7 ±0,299	15,22	10,40 ±0,547

Table 19. *Biodiagnostic of irrigated grey-brown soils (nitrification and ammonification, average 5-6 yy).*

Variants	Depth, cm	n	Nitrification		Ammonification	
			V,%	$x \pm \tau_{0.05} S_x$	V,%	$x \pm \tau_{0.05} S_x$

Scheme 1. *Six-field vegetable-fodder crop rotation.*

I	0-25	108	12,47	74,5 ±3,158	26,75	21,1 ±1,920
Annual lucerne+ barley	25-50	108	11,37	63,1 ±2,442	17,03	15,2 ±0,881
II Lucerne of	0-25	108	12,11	85,2 ±3,507	26,06	23,4 ±2,171
the second year	25-50	108	11,78	70,1 ±2,807	15,93	18,3 ±0,991
III	0-25	108	12,28	69,1 ±2,885	23,44	22,1 ±1,761
Watermelon	25-50	108	12,71	59,1 ±2,554	23,23	17,3 ±1,367
IV	0-25	108	12,79	53,9 ±2,344	25,82	19,9 ±1,748
Potatoes	25-50	108	16,58	36,3 ±2,046	29,60	13,1 ±1,318
V	0-25	108	15,38	46,5 ±2,432	23,45	18,1 ±1,442
Garlic	25-50	108	14,05	30,9 ±1,477	28,48	12,4 ±1,202
VI White head	0-25	108	14,88	61,3 ±3,101	17,95	22,8 ±1,391
cabbage+ tomato	25-50	108	19,26	47,5 ±3,111	16,82	17,0 ±0,973

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

I	0-25	90	19,18	43,3 ±3,106	27,64	17,3 ±1,790
Potatoes	25-50	90	18,14	32,9 ±2,232	30,58	12,3 ±1,408
II	0-25	90	15,02	60,4 ±3,397	16,44	22,5 ±1,384
Vegetable bean	25-50	90	16,34	49,8 ±3,046	21,03	17,7 ±1,392
III	0-25	90	16,40	52,1 ±3,198	17,18	19,9 ±1,279
Watermelon	25-50	90	20,11	43,6 ±3,282	19,20	14,2 ±1,021
IV	0-25	90	11,68	54,8 ±2,396	18,45	19,8 ±1,367
Tomatoes	25-50	90	16,28	39,1 ±2,378	21,34	16,3 ±1,300
V	0-25	90	13,70	67,5 ±3,460	20,26	22,6 ±1,714
Vegetable bean	25-50	90	10,67	56,6 ±2,261	23,26	18,1 ±1,576

Scheme 3. *Constant.*

Tomatoes	0-25	108	26,24	34,3 ±3,060	39,54	13,8 ±1,854
	25-50	108	25,79	27,3 ±2,370	26,85	10,7 ±0,977
Watermelon	0-25	108	22,95	34,4 ±2,685	26,92	16,3 ±1,491
	25-50	108	24,15	24,1 ±1,979	26,47	13,3 ±1,197
Potatoes	0-25	108	22,39	32,5 ±2,475	31,38	11,6 ±1,238
	25-50	108	22,52	25,0 ±1,914	41,21	8,9 ±1,246
Garlic	0-25	108	24,22	28,1 ±2,313	30,33	11,0 ±1,134
	25-50	108	36,56	20,4 ±2,536	25,94	8,7 ±0,767
Whitehead	0-25	108	28,00	32,9 ±3,133	18,04	17,7 ±1,450
cabbage	25-50	108	34,42	26,4 ±3,091	25,59	13,3 ±1,157
Vegetable bean	0-25	90	16,08	42,7 ±2,571	26,58	18,1 ±1,800
	25-50	90	20,57	34,9 ±2,688	24,71	14,8 ±1,369

Table 20. *Biodiagnostic of irrigated grey-meadow soils (nitrification and ammonification, average 4 y).*

Variants	**Depth, cm**	**n**	**Nitrification**		**Ammonification**	
			V,%	**$x \pm \tau_{0.05} S_x$**	**V,%**	**$x \pm \tau_{0.05} S_x$**
Scheme 1. *Four-field vegetable fodder crop rotation.*						
I	0-25	72	16,26	12,3 ±0,845	23,22	42,7 ±4,189
Annual lucerne	25-50	72	18,86	10,6 ±0,845	23,92	34,7 ±3,507
II Lucerne of	0-25	72	14,52	13,6 ±0,834	22,99	49,3 ±4,790
the second year	25-50	72	19,26	11,5 ±0,936	26,94	40,8 ±4,645
III	0-25	72	18,63	11,0 ±0,865	26,37	39,9 ±4,279
Cucumber	25-50	72	20,86	9,2 ±0,811	22,52	30,4 ±2,894
IV	0-25	72	21,25	10,2 ±0,915	22,50	37,5 ±3,565
Tomatoes	25-50	72	22,73	8,3 ±0,797	22,95	27,5 ±2,666
Scheme 2. *Constant.*						
Tomatoes	0-25	72	29,69	7,3 ±0,915	27,71	27,4 ±3,206
	25-50	72	32,44	5,9 ±0,809	31,03	19,3 ±2,532
Cucumber	0-25	72	29,91	6,7 ±0,847	30,11	21,9 ±2,76
	25-50	72	30,39	5,4 ±0,694	22,58	15,3 ±1,459

Table 21. *Biodiagnostic of irrigated alluvial meadow-forest soils (nitrification and ammonification, average 6 y).*

Variants	**Depth, cm**	**n**	**Nitrification**		**Ammonification**	
			V,%	**$x \pm \tau_{0.05} S_x$**	**V,%**	**$x \pm \tau_{0.05} S_x$**
Scheme 1. *The six-field vegetable-fodder crop rotation.*						
I Annual lucerne+	0-25	108	26,54	34,2 ±3,087	29,73	35,8 ±3,619
barley	25-50	108	19,98	26,3 ±1,787	24,44	24,4 ±2,028
II Lucerne of	0-25	108	21,77	46,5 ±3,441	24,47	42,8 ±3,562
the second year	25-50	108	17,67	33,6 ±2,018	21,70	34,5 ±2,546
III	0-25	108	18,84	25,7 ±1,328	23,24	36,7 ±2,901
Onion	25-50	108	17,43	18,5 ±1,095	25,66	27,5 ±2,399
IV	0-25	108	23,6	20,5 ±1,714	26,85	27,5 ±2,511
Cucumber	25-50	108	22,55	16,0 ±0,295	17,84	18,4 ±1,116
V Whitehead	0-25	108	21,89	30,1 ±2,239	30,45	30,3 ±3,138
cabbage	25-50	108	26,69	25,5 ±2,268	33,86	21,6 ±2,487
VI Green fodder+	0-25	108	22,28	30,4 ±2,303	24,68	40,6 ±3,407
tomatoes	25-50	108	23,59	22,8 ±1,828	24,14	27,2 ±2,232
Scheme 2. *Constant.*						
Cucumber	0-25	108	29,63	16,1 ±0,390	30,10	22,4 ±2,93
	25-50	108	25,77	10,9 ±0,955	24,80	14,5 ±1,222
Whitehead	0-25	108	27,94	19,4 ±1,842	34,56	24,9 ±2,925
cabbage	25-50	108	31,65	13,6 ±1,463	41,31	17,6 ±3,550
Tomatoes	0-25	108	27,17	17,3 ±1,597	29,34	25,0 ±2,493
	25-50	108	31,21	12,9 ±1,369	30,27	18,8 ±1,934
Onion	0-25	108	23,75	13,0 ±1,051	30,70	20,7 ±2,160
	25-50	108	21,61	10,5 ±0,771	28,47	19,1 ±1,848

Table 22. *Biodiagnostic of irrigated gleyey-yellow soils (nitrification and ammonification, average 5 y).*

Variants	**Depth, cm**	**n**	**Nitrification**		**Ammonification**	
			V,%	**$x \pm \tau_{0.05} S_x$**	**V,%**	**$x \pm \tau_{0.05} S_x$**

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

I	0-25	90	18,43	27,4 ±1,890	10,87	112,5 ±4,576
Tomatoes	25-50	90	23,72	18,1 ±1,607	15,78	101,6 ±5,886
II White head	0-25	90	23,32	25,1 ±2,191	7,83	119,7 ±3,510
cabbage + maize	25-50	90	26,94	18,0 ±1,814	8,43	110,4 ±3,481
III	0-25	90	21,28	20,2 ±1,609	9,37	105,3 ±3,694
Onion	25-50	90	21,39	14,3 ±1,146	10,27	88,9 ±3,419
IV	0-25	90	20,16	31,5 ±2,376	7,79	129,1 ±3,766
Vegetable bean	25-50	90	20,13	23,7 ±1,786	14,43	107,1 ±5,785
V	0-25	90	20,29	29,1 ±2,210	9,73	123,7 ±4,502
Vegetable bean	25-50	90	18,39	18,1 ±1,246	11,57	107,4 ±4,649

Scheme 2. *Constant.*

Tomatoes	0-25	90	30,49	18,9 ±2,157	17,12	103,5 ±6,632
	25-50	90	27,15	11,4 ±1,158	19,29	93,3 ±6,736
White head cabbage	0-25	90	35,03	15,3 ±1,597	17,38	104,7 ±6,810
	25-50	90	35,31	11,3 ±1,492	17,29	96,9 ±6,269
Maize for silage	0-25	90	31,31	13,7 ±1,605	13,68	89,9 ±4,604
	25-50	90	20,94	9,8 ±0,769	11,86	79,1 ±3,512
Onion	0-25	90	29,07	11,3 ±1,228	11,57	94,0 ±4,071
	25-50	90	24,22	8,6 ±0,779	11,17	82,0 ±3,428
Vegetable bean	0-25	90	34,66	18,4 ±2,386	12,25	114,8 ±5,262
	25-50	90	28,48	12,5 ±1,333	15,12	98,7 ±5,098

Table 23. *Biodiagnostic of irrigated grey-brown soils (CO_2 and shattering cellulose, average 5-6 yy).*

Variants	**n**	**CO_2**		**Shattering cellulose**	
		$V,_{\%}$	**$x \pm \tau_{0.05} S_x$**	**$V,_{\%}$**	**$x \pm \tau_{0.05} S_x$**
1	2	3	4	5	6

Scheme 1. *Six-field vegetable-fodder crop rotation.*

I Annual lucerne+ barley	108	10,36	3,44 ±0,012	33,33	9,7 ±1,099
II Lucerne of the second year	108	9,22	3,79 ±0,012	21,70	12,0 ±0,885
III Watermelon	108	8,66	3,52 ±0,104	20,53	10,2 ±0,712
IV Potatoes	108	10,16	3,08 ±0,106	36,37	10,0 ±1,236
V Garlic	108	9,08	2,83 ±0,086	33,61	8,1 ±0,923
VI White head cabbage+ tomato	108	8,98	3,52 ±0,108	20,33	11,6 ±0,802

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

I Potatoes	90	11,25	2,92 ±0,123	33,19	8,3 ±1,031
II Vegetable bean	90	9,1	3,61 ±0,123	24,33	11,3 ±0,517
III Watermelon	90	9,09	3,32 ±0,113	17,05	8,7 ±0,556
IV Tomatoes	90	14,86	3,15 ±0,174	17,28	10,4 ±0,672
V Vegetable bean	90	9,52	3,61 ±0,127	23,16	11,2 ±0,972

Scheme 3. *Constant.*

1	2	3	4	5	6
Tomatoes	108	17,72	2,77 ±0,167	26,46	7,8 ±0702
Watermelon	108	15,71	2,66 ±0,143	27,09	7,6 ±0,700
Potatoes	108	15,51	2,69 ±0,141	39,25	7,0 ±0,934
Garlic	108	17,62	2,48 ±0,149	38,14	5,8 ±0,751
Whitehead cabbage	108	16,75	2,8 ±0,159	49,88	9,5 ±0,628
Vegetable bean	90	26,91	3,01 ±0,051	28,44	8,4 ±0,138

Table 24. *Biodiagnostic of irrigated grey-meadow soils (CO_2 and shattering cellulose, average 4 y).*

Variants	**n**	**CO_2**		**Shattering cellulose**	
		V,%	**$x \pm \tau_{0.05} S_x$**	**V,%**	**$x \pm \tau_{0.05} S_x$**

Scheme 1. *Four-field vegetable fodder crop rotation.*

I Annual lucerne	72	18,42	18,42 ±0,164	18,14	27,2 ±27,2
II Lucerne of the second year	72	21,64	21,64 ±0,219	12,99	30,4 ±30,4
III Cucumber	72	22,21	22,21 ±0,219	17,86	26,1 ±26,1
IV Tomatoes	72	22,46	22,46 ±0,215	10,98	28,1 ±28,1

Scheme 2. *Constant.*

Tomatoes	72	2,03	2,03 ±0,248	18,18	23,3 ±23,3
Cucumber	72	30,10	1,85 ±0,236	22,55	20,5 ±20,5

Table 25. *Biodiagnostic of irrigated alluvial meadow-forest soils (CO_2 and shattering cellulose, average 6 y).*

Variants	n	CO_2		Shattering cellulose	
		V,%	$x \pm T_{0.05} S_x$	V,%	$x \pm T_{0.05} S_x$

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

I Annual lucerne+ barley	108	17,59	3,18 ±0,019	22,29	19,5 ±1,477
II Lucerne of the second year	108	10,72	4,10 ±0,149	21,73	26,8 ±1,981
III Onion	108	14,04	3,40 ±0,161	26,83	16,0 ±1,459
IV Cucumber	108	14,00	2,83 ±0,135	32,66	16,6 ±1,844
V Whitehead cabbage	108	9,94	3,18 ±0,108	26,97	18,4 ±1,687
VI Green fodder+ Tomatoes	108	12,64	3,66 ±0,157	27,77	19,7 ±1,860

Scheme 2. *Constant.*

Cucumber	108	15,24	2,65 ±0,137	33,14	13,0 ±1,465
Whitehead cabbage	108	14,23	2,90 ±0,143	34,90	14,6 ±1,732
Tomatoes	108	13,50	3,08 ±0,141	30,23	16,0 ±1,644
Onion	108	15,39	2,55 ±0,151	38,86	11,8 ±1,559

Table 26. *Biodiagnostic of irrigated gleyey-yellow soils (CO_2 and shattering cellulose, average 5-6 yy).*

Variants	n	CO_2		Shattering cellulose	
		V,%	$x \pm T_{0.05} S_x$	V,%	$x \pm T_{0.05} S_x$

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

I				18,38	23,8 ±1,638
Tomatoes	90	10,22	5,86 ±0,226		
II White head				21,29	25,0 ±1,993
cabbage + maize	90	11,22	6,40 ±0,269		
III				28,81	17,5 ±1,886
Onion	90	14,51	4,55 ±0,246		
IV				19,15	25,4 ±1820
Vegetable bean	90	13,49	6,76 ±0,340		
V				19,72	27,6 ±2,038
Vegetable bean	90	13,98	6,80 ±0,354		

Scheme 2. *Constant.*

Tomatoes					
	30	11,66	5,25 ±0,230	20,25	20,0 ±1,515
White head					
cabbage	90	12,13	5,30 ±0,219	25,95	19,8 ±1,923
Maize for silage					
	90	12,66	4,97 ±0,297	24,65	22,4 ±2,066
Onion					
	90	17,38	3,62 ±0,236	31,43	14,1 ±1,658
Vegetable bean					
	90	16,52	6,14 ±0,379	21,05	23,1 ±1,820

So, biodiagnostics of the soils under the growing plants on the crop rotation and constant tillage was given on the basis of the got factual figures. The researches show that using of the manure plant residues with nitrogen, biological stimulators and others for regulation of biological immobilization, an application of the crop rotation is necessary. It is necessary to look at the plants alternation as a regulation of the biological processes intensity and direction. The crop rotation is a means forming an optimal condition for a regulation of the soil biological characters, from this point of view the biodiagnostics of the soils on the crop rotation and constant tillage was given for the definition of the cultural level being subjected to the antropogen effect. A change of the biological parameters in which direction can be clearly seen from the comparison of the cultured soils with the virgin versions.

6.2 An Integral Parameter of the Soils Biological State in the Subtropic Zone

The soil is one of the ecosystem components and it reflects an evolution and an activity of the components (rock, animate organisms, a climate condition and etc). Some ideas are put forward for the purpose of charactering of the soils biological activity in soil biology. Up to now the ideas, methods which were offered didn't give a chance to evaluate the soils complexly in a biological method. Because of soils biological indicators and variety of their unity generalization of them and saying a complete idea about it made some problems. From this point of view the methods which were worked out by different authors. With this purpose a comparative-ecological analysis of the soils spreaded over a vertical zonality was conducted by S. A. Aliyev (1978) in Azerbaijan, the overturn objective laws of organic substances as a result of the biological and biochemical processes were learnt in dynamics, 7 seasonal phases of the biological processes were shown depending on the ratio between the soil and environment: 1.very weak phase of the biological processes at the frosty period; 2. a weak seasonal phase of the biological processes; 3.revival of the biological activity; 4. an active period of the biological processes; 5. very active period of the biological processes; 6. depression of the biological processes under a arid condition; 7.Stopping of the biological processes activity completely.

An investigation of the seasonal phase of the biological processes makes a notion about a change of the organic and mineral part of soil depending on vertical zonality and soil regime. This gives a chance for learning of soils deeply, understanding of the use character from the nutrient under an influence of the separate biological factors, a role of enzyme and microorganisms, their influence on plants productivity and definition of the processes character occurring in the soil. Study of these factors deeply can be a basis in working out of the measures based on scientific side in management of the soil processes for the purpose of the fertility increase (Aliyev, 1978).

D. G. Zvaginsev (1978) composed a unit evaluating scale for characterizing of the soils biological activity; it is possible to speak about a level of the biological activity of soils under any condition on the basis of it. The author offer some evaluating scales in order to characterize the soils form the standpoint of the biology: 1) for a quantity of soil microorganisms; 2) for an activity of soil ferments (is calculated a soil weight); 3) for an activity of the soil ferments (is calculated for $1cm^2$ surface of soil) as a result he offered 5-score evaluating scale in order to compare a biological activity: 1.very poor; 2. poor; 3.average; 4.rich; 5.very rich.

A systematic analysis of the soils fermentative activity, this is, studying of the soil component characters with the soil-ecological parameters gives a chance to imagine about soil ferments level, fermentative processes and their dynamics. F. Kh. Khaziyevs (2005) systemic-ecological method cleared up a reason of the change of the ferments activity in a space limit, this method gives an opportunity to tell the change that will be happened before hand as a result of the change of ecological parameters separately or together and three-block conceptual model of the systemic-ecological approach was worked out in formation of the soil fermentative activity, a block separation of ferments (block A), ferments immobilization (stabilization) block (block C) and ferments effect (activity) block (block) block F) enter here. As a result of the systemic-ecological approach application a structure and quantity of soil microflora change in soils ecological-biological evaluating depending on physical-chemical and agrochemical features in different soil types (Kharshum, 2005). M. Lerios (1999) with the co-authors offered an index of the soil fertility definition grounding on close contact between a total quantity of nitrogen and Ca of microb biomass, mineral nitrogen, phosfor monoesterases, beta-glucose and urease ferments. A main purpose in application of the enzymatic test is in the absence of the unit idea for the soils fertility index up to now (Insam, 2001; Stefanie 1984). F. Stefanie (1984) together with the co-authors and R.Dick (1994) offer to use of the enzimatic indices as a biochemical index of soil fetility (BISF).The scientists of Poland consider advisable the use of the soils fetility from biochemical index (BISF) as an indicator parameter of soils (Wyszkowska and et al., 2000), this method gives a chance to express an opinion about the biochemical processes occuring in the soil by paying attention to a quantity of total CO_2(carbon dioxide) (Xing, 2001). K. SH Kazeyev with co-authors worked out an integral index method of the soils ecological-biological state (IIBS) for an evaluation of soils from the standpoint of the biology its main principles and research methods are reflected in some works (Kazeyev and et al., 2004; 2005). The principles of the offering methods are the following in learning and evaluating of the soils biological activity: biological objects, complex approach to learning of their soil reproductions with the abiotic environment: definition of the erudite ecological and biological parameters, therefore definition of IISBS; profile genetic and comparative-geographical approach in soils ecological evaluating; a control for the important variation of the soil feature in time and space; use of the same method and research methods (Kazeyev and et al., 2004). An integral parameter of the soils biological state gives an opportunity to define a direction of the changes occurring in the soil as a result of the complex approach to the soil parameters.

Despite an efficiency of the application of some biological parameters, a complex application of the biological state in some soils together with the integral index of the biological state yields good results in evaluation of the antropogen effect and soils diagnostics.

While saying a complex approach to learning of biological objects together with soil and abiotic environment, the ferments activity that is secreted by phyto-, zoo-and microbiosenoz and humus state. Main genetic features of the soil are understood. The definition of one index isn't only enough in the evaluation of the soils biological activity, because every index reflects one side of the biological activity occuring in the soil.

The soils bonitet score shows a yielding ability this is, a difference of soils one from other (being good) on the basis of the same economic expenses (Mammadov, 1998; Kazeyev and et al., 2004). An integral parameter of the soils biological state is calculated according to the total quantity of the different biological indicators, such approach gives an opportunity to evaluate (on cm^2 of surface) for all the profile, separate genetic layers of the biological activity of each soil, to compare an biological activity among the different soils by means of the comparative geographical analysis, to define a level of the antropogen influence on soils biology and gives a chance to determine fertility in a space depending on geographical environment factors and objective laws of the soil activity formation (Dadenko, 2005; Zavarzin, 1994). The biological activity plays an important role in formation and degradation of the soils fertility. Evaluation of the soils biological activity level is near soil fertility estimation (Valkov and et al., 2001). So, we can speak about a change of the soil fertility for its biological activity, and this gives an opportunity to use from the integral indicator of the soils biological state widely in soils monitoring, bioindication and learning of the antropogen effect.

The biological indicators activity usually reduces as a result of the antropogen effect on the soil, and an increase of the separate indicators score of the soil biological activity is observed. A decrease BISF of the soils forms a straight dependence with the degree of the antropogen effect (Kazeyev and et al., 2003). As a result of an intensive use of the soils they are degraded or destruct wholly. Destruction of the soils ecological state, decrease of the fertility and biological activity occur in degradation process, therefore an integral index of the biological activity reduces, that’s why the last parameter makes an opportunity to investigate the ecological changes in time in the degradation process (Kazeyev and et al., 2004).

Integral index biological state of soil (IIBS) can be used in soils degradation; per formation of the scientific and natural protective measures in soils classification for a degradation degree; biondication and biodiagnostics of degraded soils; soils biomonitoring; destruction of ecosystem under an antropogen and natural influence; an evaluation of the effect on the environment; ecologically normalization of the polluted soils and other degradation processes; working out of the methods for improvement of the polluted soils; definition of the permissible limit of the antropogen effect in the zone; composing of the ecological maps (regionalization, prognostication and etc); prognosticating of the ecological effect of the economical activity in the available region; evaluating of the disaster risk; conduction of the ecological experts certification (Kazeyev and et al., 2004).

The definition of some parameters that shows the microflora quantity in the same soil render that they change in a large interval depending on the season (2-3 times and more) IISBS differ 5-9%, this proves a possibility of the use from the biological activity in soil biodiagnostics and biomonitoring, use of the separate indicators of microflora alone doesn’t justify itself wholly and an application of this method is reflected in some works (Babayev and et al., 2009; Orudzheva, 2009). IIBS was calculated and compared (Fig. 5) on the basis of biodiagnostics of the growing plants on the constant tillage and on the six-field vegetable-fodder crop rotation (I scheme), five-field vegetable leguminous crop rotation (II scheme) in the irrigative grey-brown soils. From Fig. 5 it is obvious that a value of IISBS changed by 63-100% on the 1st scheme, 65-73% on the 2nd scheme and 42-67% on the constant tillage. Biodiagnostics for the biological parameters under the growing plants on four-field crop rotation in the irrigative grey-meadow soils was given on Table 27 and IISBS was calculated on the basis of the complex biological indicators.

This indicator changed by 86-100% on the crop rotation, 41-47% on the constant tillage (Fig. 6). IISBS under the tomato on the crop rotation was 45% more than constant tomato; 45% more under the cucumber than the constant cucumber. IISBS was defined and reflected on Table 27 on the basis of the biodiagnostics given on Table 27 according to the defined biological indicators of the growing plants on the constant tillage and six-field vegetable-fodder crop rotation in the irrigative alluvial meadow-forest soils.

An integral indicator of the soils biological state changed 67-100% on crop rotation in the irrigative alluvial meadow-forest soils and a higher indicator was under the two-year lucerne, the lower one was under the cucumber (Fig. 7).

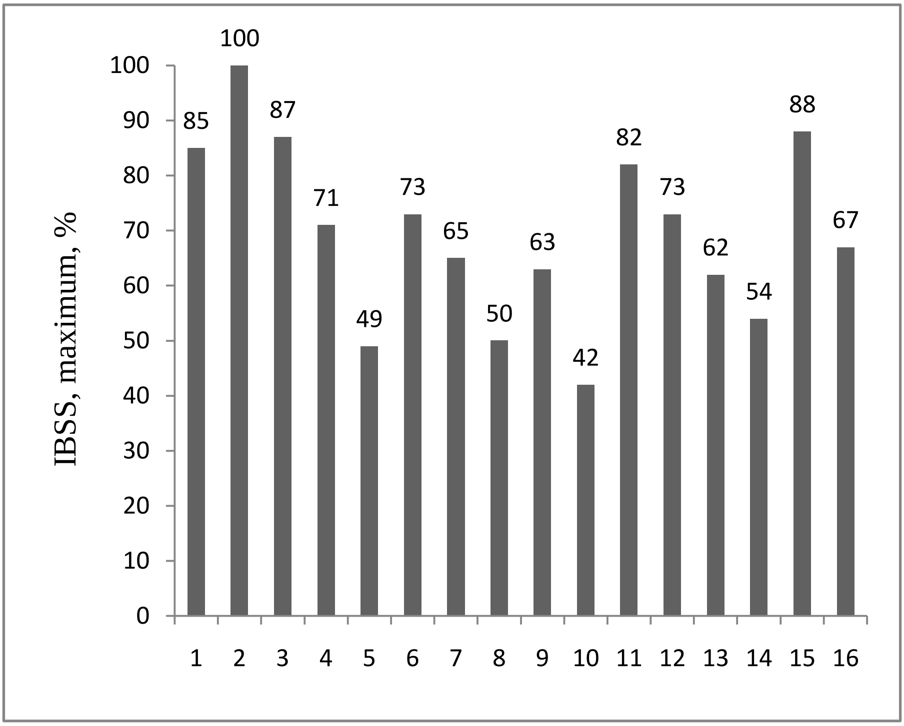

Fig. 5. *IBSS under plants in irrigated grey-brown soils (0-25 cm), (maximum %).*

Symbols

I scheme-1, 2, 3, 6, 9, 11.

II scheme-4, 7, 12, 15.

constant tillage-5, 8, 10, 13, 14, 16.

1-annual lucerne+barley.

2-lucerne of the second year.

3, 4, 5-watermelon.

6, 7, 8-potatoes.

9, 10-garlic.

11-white head cabbage+tomatoes.

12-ii scheme tomatoes.

13-constant white head cabbage.

14-constant tomato.

15, 16-vegetable bean.

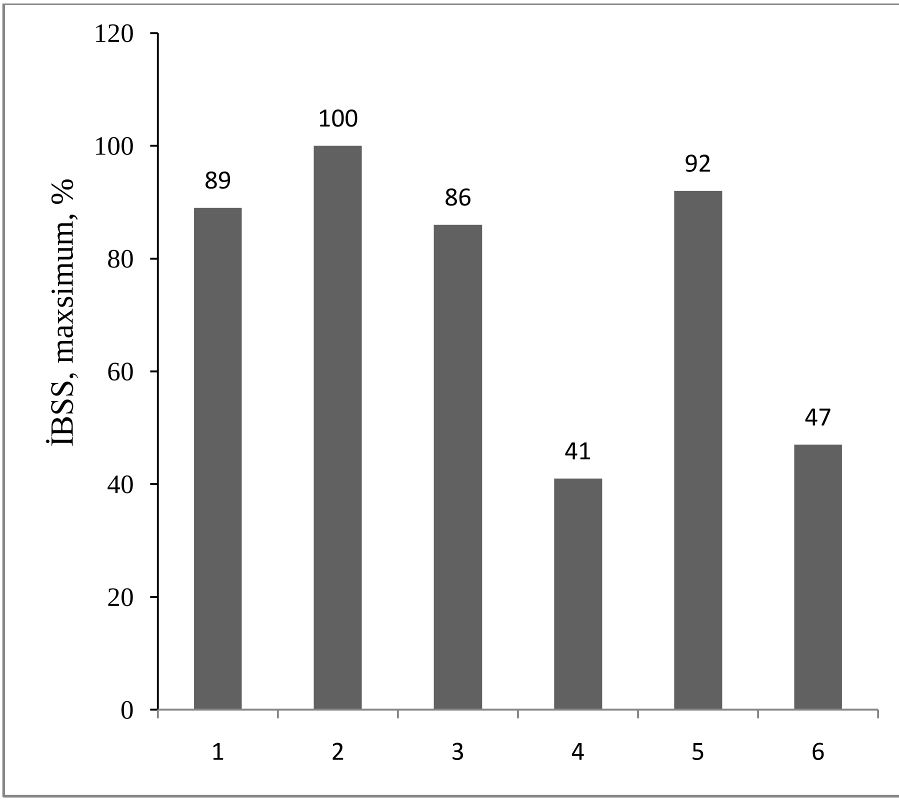

Fig. 6. *IBSS under plants in irrigated grey-meadow soils (0-25 cm), (maximum %).*

Symbols

1-annual lucerne.

2-lucerne of the second year .

3, 5-crop rotation.

4, 6-constant tillage.

3, 4-cucumber.

5, 6-tomatoes.

An integral indicator of the soils biological state on the constant tillage changed by 49-60% interval, the least one was under an onion. A positive effect of the lucerne on the crop rotation made a condition for IISBS keeping in a high level in the soils under the onion.

The biodiagnostics of vegetable-leguminous was given (Table 19) on the basis of the biological activity parameters of the soils under the growing plants on the constant tillage and on the crop rotation and IISBS was calculated for the complex biological parameters (Fig. 8). As it is obvious from Fig. 8 that IISBS vibrated by 70-100% under the tomato, white head cabbage+maize, onion, vegetable bean versions on the crop rotation; 53-77% on the constant tillage. The biological activity was 17-23% less than IISBS crop rotation during growing of the plants on the constant tillage. So, IISBS definition on the basis of the complex biological parameters reflects the changes occurring in the soil depending on use of them. The soil comparative biodiagnostics with the virgin versions on the crop rotation and constant tillage in the irrigative grey-brown grey-meadow, alluvial meadow-forest and gleyey-yellow soils was given on Table 19. The ecological-biological state of the integral parameter was calculated for definition of the change of the different biological parameter in what direction depending on using direction of the soils. The information about an integral parameter of the biological state of the gleyey-yellow soils in the alluvial meadow-forest and humid subtropic zone of the mild, grey-brown subtropic zone in the dry subtropic zone was given in the authors works (Babayev et al., 2009; Orudzheva, 2009; 2011; 2012). An integral parameter of the biological state in the irrigative grey grey-brown soils was 18% more on the 1st scheme than-virgin versions (Fig. 9), 12% more on the 2nd scheme, 34% and 30% more than the constant tillage. As a result of culturing of virgin soils a quantity of humus, nitrogen, other biogen elements from the fertility parameters of the grey-brown soils increases, physical features improve, some changes in the kind structure of microflora are formed and a total quantity of microorganisms rises (Kharshum, 2005).

A change of the biological parameters in the irrigative grey-meadow soils in comparison with the virgin versions on the crop rotations and constant tillage in what direction can be seen very clearly from Fig. 9 IISBS of the irrigative grey-meadow soils was 100% on the crop rotation, 65% on the constant tillage and 85% under virgin version. The consequences show that as a result of the use of the grey-brown and grey-meadow soils on the crop rotation, an application of the high agrotechnics, good soils-ecological condition is created in comparison with virgin versions and a total quantity of microorganisms, biological activity rises. An integral indicator of the biological state in the alluvial meadow-forest soils was 100% under virgin versions and it was 12% higher than the crop rotation; 40% higher than the constant tillage (Fig. 9). The numbers show that the biological activity decreased than the virgin versions as a result of use from the alluvial meadow-forest soils under the agricultural plants under high agriculture condition. An integral index of the biological state in the gleyey- yellow soils formed 100% under virgin versions, 92% on the crop rotation and 70% on the constant tillage (Fig. 9). This index was 8% more on the virgin versions than crop rotation; 30% more than the constant tillage. Being higher of this index on the virgin versions of the gleyey-yellow soils than the other versions show an increase of the biological parameters under an antropogen effect.

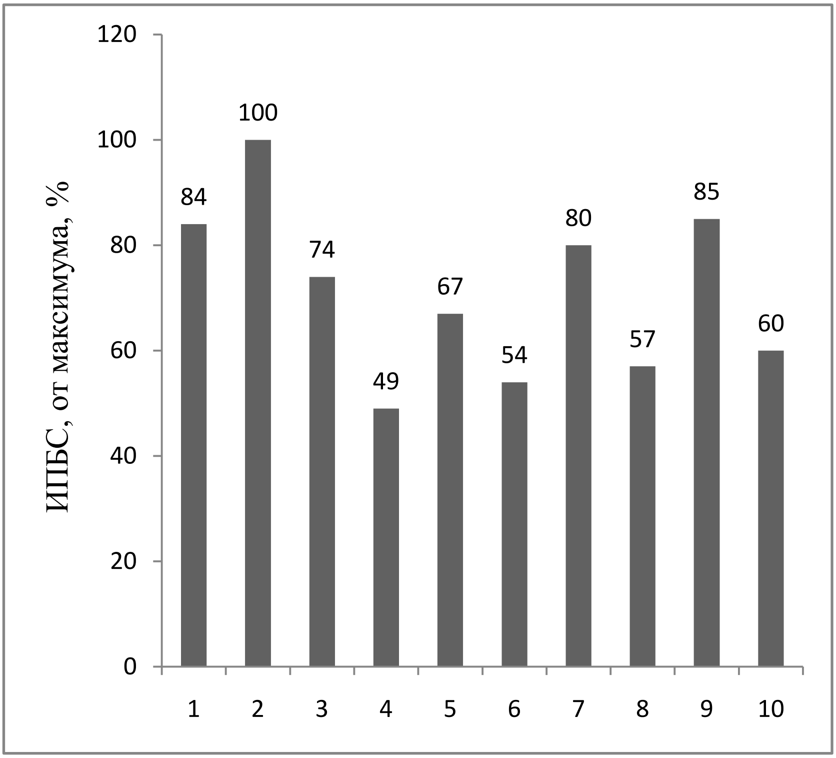

Fig. 7. *IBSS under plants in irrigated alluvial meadow-forest soils (0-25 cm), (maximum %).*

Symbols

1, 2, 3, 5, 7, 9-crop rotation.

4, 6, 8, 10-constant tillage.

1-annual lucerne+barley.

2-lucerne of the second year.

3, 4-onion.

5, 6-cucumber.

7, 8-white head cabbage.

9, 10-green fodder+ tomatoes.

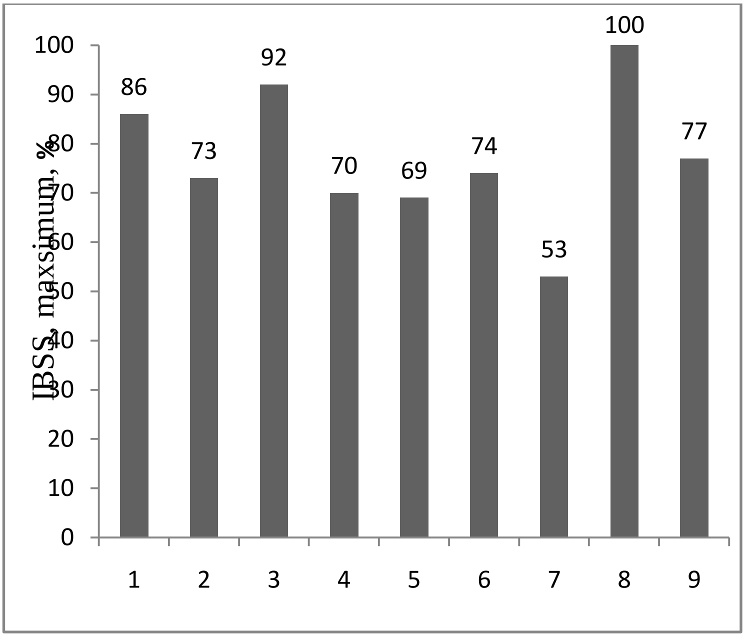

Fig. 8. *IBSS under plants in irrigated gleyey-yellow soils (0-25 cm), (maximum %).*

Symbols
1, 3, 6, 8-crop rotation.
2, 4, 5, 7, 9-constant tillage.
1, 2-tomatoes.
3-white head cabbage+maize.
4-constant white head cabbage .
5-constant maize.
6, 7-onion.
8, 9-vegetable bean.

The authors offer the five-score scale in order to evaluate the soils on an ecological side, here biological activity is 81-10% higher; 61-80% high; average 41-60%; 21-40% low and lower than 20% (Kazeyev and et al., 2003; 2004). According to the available scale because of the use of the grey-brown, grey-meadow, alluvial meadow-forest and gleyey-yellow soils and vibration by

82-100% of the integral index of the soils biological state under the virgin versions, they are concerned the soils with the highest biological activity, because of being 60-70% of the integral index under the constant versions they are concerned the soils with the average and high biological activity.

An integral index of the soils biological state was determined according to the culturing level and soils types under (virgin and irrigative versions) of the plants, soils in the irrigative grey-brown, grey-meadow, alluvial meadow-forest and gleyey-yellow soils. An integral index of the biological state of the alluvial meadow-forest and gleyey-yellow soils in agriculture was a reason for the decrease of the biological activity, therefore decrease of IIBS.

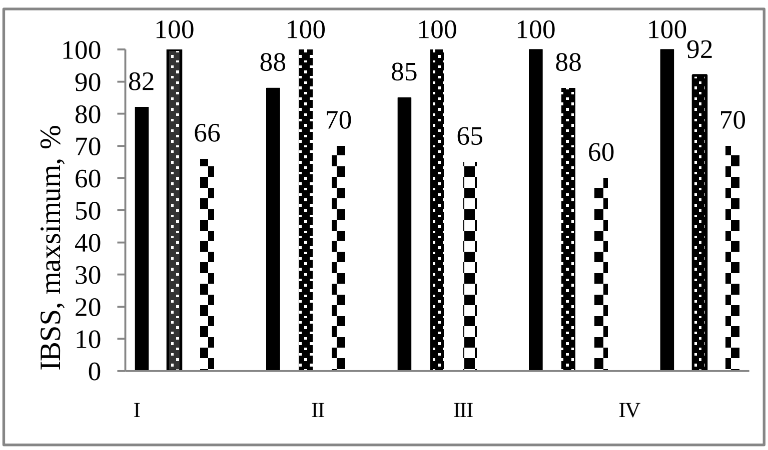

Fig. 9. *IBSS of soils, (maximum %).*

1, 2, 3-I scheme-grey-brown soils.
4, 5, 6-II scheme-grey-brown soils.
7, 8, 9-grey-meadow soils.
10, 11, 12-alluvial meadow-forest.
13, 14, 15-gleyey-yellow soils.
1, 4, 7, 10, 13-virgin plots.
2, 5, 8, 11, 14-crop rotation.
3, 6, 9, 12, 15-constant.

So, a high agricultural culture was a reason for an increase biological parameters of the irrigative grey-brown and grey-meadow soils than virgin version, therefore an increase of IISBS. Despite changing of the biological indices in a different direction in the irrigative alluvial meadow-forest and irrigative gleyey-yellow soils the fertility parameters influenced on stability, keeping of IISBS in a high level positively. The consequences prove a possibility of the soil parameters management thank to an application of the high agricultural culture under an irrigative condition in the soils spreader in the subtropic zone.

Table 27. *Biodiagnostics of soils of subtropic zone.*

Variants
Invertaza, mg of glucose/g of soil per day
Ureaza, mg of NH_3/g of soil per day
Fosfataza, mg of P_2O_5/10 g of soil per h
Catalaza, cm of O_2/g of soil per min
Dehidro-genaza, mg of TFF/ 10 g of soil per day
Nitrifi-cation, mg of N-NO_3/kg of soil per 14 day
Ammoni-fication, mg of N-NH_3/kg of soil per 14 day
CO_2 kg/ha ħ
Shattering intensity of cellulose, %
Number of micro-organisms, thousand CFU/g dry soil
IBSS, %

Scheme 1. *Arid subtropical zone-grey-brown soils (I scheme-The six-field vegetable-fodder crop rotation).*

Virgin plots	11,40	4,10	1,91	10,8	4,38	46,8	17,8	2,50	8,4	1318	82
Crop rotation (I scheme)	11,77	3,14	2,65	13,2	6,08	65,1	21,2	3,36	10,3	2157	100
Constant tillage	8,97	2,20	1,55	8,7	3,48	34,2	14,8	2,74	7,7	1214	66

Scheme 2. *Arid subtropical zone-grey-brown soils (II scheme-The five-field vegetable-beans crop rotation).*

Virgin plots	11,40	4,10	1,91	10,8	4,38	46,8	17,8	2,50	8,4	1318	88
Crop rotation (II scheme)	11,24	3,09	2,70	12,3	5,71	55,6	20,4	3,32	10,0	1822	100
Constant tillage	8,97	2,20	1,55	8,7	3,48	34,2	14,8	2,74	7,7	1214	70

Scheme 3. *Arid subtropical zone-grey-meadow soils (The four-field vegetable-fodder crop rotation).*

Virgin plots	7,29	2,13	2,56	4,8	6,81	8,9	52,7	1,87	17,8	1385	85
Crop rotation	9,34	3,46	1,64	7,0	5,55	11,7	42,4	2,28	28,0	2328	100
Constant tillage	6,74	1,79	0,28	3,8	3,27	7,1	23,3	1,94	22,0	1106	65

Scheme 4. *Semiarid subtropical zone-alluvial meadow-forest (The six-field vegetable-fodder crop rotation).*

Virgin plots	12,8	5,6	1,48	6,2	6,75	25,7	50,4	4,90	17,4	2836	100
Crop rotation	9,69	4,24	0,93	7,1	4,88	31,2	35,6	3,39	19,5	3661	88
Constant tillage	6,64	3,03	0,48	5,6	2,81	16,5	23,3	2,80	13,9	2617	60

Scheme 5. *Moderately humid subtropical zone-gleyey-yellow (The five-field vegetable-beans crop rotation).*

Virgin plots	13,7	3,8	2,86	4,5	16,03	23,9	132,8	8,40	29,5	2869	100
Crop rotation	12,6	3,39	2,30	4,9	14,08	26,7	118,1	6,07	23,9	3185	92
Constant tillage	10,3	2,72	1,22	3,6	11,46	15,5	101,4	5,06	19,9	2718	70