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COMPARATIVE EVALUATION OF THE SOIL FERTILITY UNDER TEA AND VEGETABLE CULTURES IN THE LANKARAN PROVINCE OF AZERBAIJAN

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ABSTRACT: *The Lankaran province is a humid subtropic region in Azerbaijan. It is a foremost region in tea, citrus, grain, vegetable plants production. We have performed long researches in the soils under tea and vegetable cultures of the Lankaran province, a modern fertility level of the soils under tea and vegetable cultures has been determined on the basis of the references- fund materials and private researches. Evaluation of the soils under tea and vegetable cultures by quality was carried out based on the obtained initial information and the weak podzolic yellow soils were selected for the soils under tea, the humic- boggy soils were selected for the soils under vegetable (100 scores), the bonitet scores of the other soils were fixed in comparison with them. Then an average account bonitet score of the soil diversity was calculated, an average account score of the tea lands was 76 scores, but an average account score of the vegetable lands was 78 scores. The agroproduction grouping of the soils under tea and vegetable cultures was performed in the Lankaran province: the 1 st group –an area of the high qualitative soils under tea culture is 53,5%; but it is 20,75% in the soils under vegetable culture, the IV group-lower qualitative soils are used under tea culture (4, 46%), but they aren't used under vegetable.*

KEYWORDS: soils under tea, soils under vegetable, bonitet score, agroproduction grouping, correction coefficients.

INTRODUCTION

Protection of the soil resources and rational utilization require their registration and evaluation. Since the second-half of the 90 th years the new soil relations which are formed in connection with the soil reforms have increased an importance of the measure in connection with the soil cadastre, including soil evaluation over and again. There is always a need for the value indices of the soil fertility expressed by a score during soli trade and lease operations or an application of the tax rules for the soils and distribution of the soil areas among the partners. While analyzing the research works being performed on the basis of the traditional evaluation methods they can be separated into two directions: genetic –industrial and agroecological, though they have general scientific- theoretic and methodic bases (Dokuchayev's genetic soil science). The first direction is to find genetic-industry values expressed by a score on the basis of the inner quality indices-diagnostic indications of soils in a level of the republic, region, district and economy. Such approach is given by a name of the total evaluation in the references (Karmanov *et al* 2002; Burlakova 2005; Ivanov 2001). For the first time Tumentsev (1975) called "genetic- industry" method of evaluation. Such works were performed in the 60-80 th years (Mammadov1988, 1990, 1997, 2003; Mammadova 2003, 2006) At present genetic-industrial evaluation of soils is widely applied in the plant(in the Institute of "Azstatelandstructure"). The second direction is to find the comparative values(by a score) of soils under separate agrosenozes on the basis of the soil- ecological

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request from the various agricultural, forage and forest plants. Such approach was show by a name of agroecological evaluation of the soils or special evaluation in the references. The research works being performed in our republic in 70-90 th years (Veliyev 1981 and oth.) were in this direction. Since middle of the 90 th years Karmanov (1975) used the soil-climate formulas and soil-ecological index and his methods of soil evaluation was agroecological for its essence (Aparin 2002; Medvedev *et al* 2006).

It is possible to separate some hierarchic levels depending on purposes and duties, evaluation fixing, comparative evaluation of the soils which assume scientific –theoretical and industrial importance:

1. Comparative evaluation of the republic soils; for the first time the soil evaluation in this hierarchic level was fulfilled in the 80-90 th years of the last century (Mammadov 1988). The soil evaluation in this level in our republic is important for protection, rational utilization, and settlement of the other scientific –theoretic and practical problems; This hierarchic level parameters of the soil evaluation are used during construction of the oil-gas pipelines (for. ex. Baku-Tbilisi-Ceyhan oil and Baku-Arzurum gas pipeline) with international and regional significant, building of the transport corridors, construction of the water storehouses and large economic complexes based on utilization of soil cover directly.

2. The soil valuation of the cadastre (a value) regions for soil-cadastre purposes (evaluating the soils with economic and normative money, calculating the soil tax tariffs).This is the second hierarchic level of soils and it is considered an important structural part of the state soil-cadastre. We should comment that the state soil cadastre is closely connected with some problems of the legal, natural and economical state of the soils, fulfillment of the soil protective measure in a local and republic standard, definition and prognostication of the directions in soil fund utilization. There is an enough experience in this area. After we obtained an independence, the changes being fulfilled according to the selected political and economical direction required innovations in attitude towards the soil. The researches in this area assume a scientific-theoretic and practical importance. During the researches being performed in such level the main bonitet scales of the soils are required for each soil cadastre(value) region, the standard soils are distinguished and the values of soils being expressed with a score are found in the districts. At present 25 soil cadastre (value) regions were separated in the republic, four of them are in the Lankaran province (Lankaran-Astara, Jalilabad, Lerik-Yardimli, Peshtasar- Buravar). This level of the evaluation assumed a great importance recently. So, the soils trade, lease and tax values were calculated over the soil-cadastre (value) regions in some normative documents which serve the regulation of soil attitude.

3. Soil evaluation in the administrative region: it is the third hierarchic level of the soil evaluation, it serves the regulation of the soil treatments(soil trade, leasing) and rational use from the soil resources in the region. An essence of the soil valuation works in the administrative region consists of generalization in soil evaluation works being performed in the concrete economies and finding an average account score or value index. The bonitet scores of the soil diversity in this level are found by application of the correction coefficients to the value indices (bonitet scores) of the soils. On a main scale from the soil-cadastre region. The materials being obtained as a result of the soil evaluation take place as a valuable means in fulfillment of the following concrete

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practical works: analyzing an economical action of the organizations and institutions, farms that are busy with the agricultural crop production, defining the measures of the soil normative values being expressed with money: fixing an initial value during soils leasing, trade, leaving as deposit; calculating losses happened as a result of soils use in non- agricultural areas.

4. Economic evaluation of soils; this level of the traditional evaluation was performed on the basis of the soil-research materials in the farms (kolkhoz and sovkhoz) on a scale of 1: 10000 and 1: 25000 beginning from the 70 th years of the last century. At present a modernized method of the soil economical evaluation is applied in the Institute of Land Project.

5. "Contour evaluation of soils" is a last hierarchic level and it is fulfilled on the basis of the soil research materials scale of 1:5000, 1: 1000. An importance of this soil evaluation rises in connection with the formation of small soil proprietorships. Now fulfilling the "Contour (boundary evaluation of soils)" couldn't be applied in the farm because of the definite economic, financial and technical difficulties. The works in this area are scientific –research characteristic.

METHODOLOGY

A total area of the Lankaran province taken as a research object is 636338 hectares. The physico-chemical analyses over the following methods of the soil samples taken from the investigated zones were performed to fix a fertility level of the soils under tea and vegetable cultures in the Lankaran province: total humus and nitrogen by I.V.Turin's method; total prosphorus and total-potassium –by rentgenspectral method; absorbed Ca^{2+} and Mg^{2+}- D.I.Ivanov's method.

While working out an evaluation of the soils under tea and vegetable cultures in the Lankaran province, we were guided by the mathematic analysis of the private research results, the long statistic and practical materials collected over the research object, methodical instructions as " Methodical instructions about soil evaluation in Azerbaijan" (1973), "Soil evaluation" (1997), "Principles of the soil agroindustrial grouping map's composition in Azerbaijan" " (1992), "Methodic recommendations about an evaluation of the soils under vine and tea cultures in Azerbaijan SSR" (1979).

The soil parameters taken as a value criterion were calculated over the depths in which the plant roots can be spreaded: 0-20 cm, 0-100 cm. and an opportunity is obtained to evaluate various layers of soils separately. The value criteria selected for the soil evaluation in the research object (humus, nitrogen, phosphorus, potassium and a sum of absorbed bases) have been calculated on the basis of the following formula (over the layers 0-20 cm, 0-50 cm, 0-100 cm):

$$P=\frac{(l.p.v)}{100} \qquad (1)$$

Here, P-humus, nitrogen, phosphorus reserve over the layers, t/h; *p*- humus, nitrogen, phosphorus quantity, by %; *v*- soil density over the given stratum, m^3/h.

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The soil subtype possessing the highest parameters for the inner diagnostic characters in these soils was selected as a standard and a fertility level of other soils was fixed in relation with it. During the value scale composition it was calculated over the formula (2):

$$B = \frac{C_f}{C_e}.100 \qquad (2)$$

here, *B*-a bonitet score of soil; C_f - a factual (real)measure of any character and indications of soil. C_e- a measure of the appropriate parameters of the standart soil.

The total bonitet scores of the soil diversity were calculated on the basis of the following formula using the main bonitet scale and correction coefficients (leaching degree, granulometric composition, podzolication, gleyzation):

$$B_d = B_t.C_l.C_p.C_{gp}.C_g \qquad (3)$$

here, B_d- a bonitet score of soil diversity; B_t-a bonitet score of the soil type. Correction coefficients: C_{gp}- for granulometric composition; C_l- for a leaching degree; C_g- for a gleying degree and so on.

RESULTS AND DISCUSSION

Complex natural condition, relief, climate, motley of the biological factors and structure, character and regimes of soil cover, i.e. fertility caused the plant ecological changeability. The variety of the agroecological condition in Azerbaijan served as a good background for various agricultural areas development. It is possible to cite the Lankaran province as an example. From yellow soils of the humid subtropics in the province to grey-brown of the arid fields or meadow –steppe of the subalp zone an availability of horizontal and vertical zonality law was a reason for development in some economical areas, tea-growing, citrus-growing, vine-growing, grain –growing(including paddy -growing) and vegetable-growing. In comparison with the other regions of the republic, both the ecological condition (climate, plant cover and so on) and soil cover of the Lankaran province were enough investigated (Kovalev 1966; Ahadov 1979; Veliev 1981; Mammadova 2003).

In the 70-80 th years of the last century, the agricultural areas of Union importance-development of teagrowing, citrusgrowing, vegetable growing, winegrowing serves as a good background for the soils investigation and evaluation agoecologically. We should note that the researches in the field of the soil evaluation in the Lankaran province were in the agroecological direction since the fist periods (from the 70 th years of the XX century). A very brief character of these works are as the followings: The agroecological characters and evaluation of soils under tea culture were investigated by Ahadov (1976) in the humid subtropics of the Astara administrative district. The author determined criteria and correction coefficients for the valuation concerning tea culture need under half-stationary condition. As a result of Veliev's researches (1981) a bonitet scale of the tealand and vinelands in the Masalli and Jalilabad administrative zone was composed, the soil resources were determined and their agroindustrial grouping was fulfilled. An evaluation of the soils under tea was shown in Mammadova's (2003, 2004, 2006) researches. Thorough information about it was given in the present investigation. The soil agroindustrial grouping as a necessary continuation of the soil evaluation is very important in fulfillment of some cadastre measures

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including, in soils economical evaluation or definition of its value being expressed by money. Generally, the soils agroindustrial grouping is one of the most significant stages (soils evaluation → soils economical evaluation) in soil evaluating works.

Since the 70-80 th years of the last century the agroindustrial grouping have been advantaged on the basis of the bonitet scores. Since this period the agroindustrial grouping of the soils, in the agriculture and forest areas has been performed based on the bonitet score in Azerbaijan. As a result of these researches the areas, an average value score of their soils and relative value coefficients were defined.

There are 2 directions of the agroindustrial grouping on the basis of the soil bonitet scores: total agroproduction grouping of soils and special agroindustrial grouping of soils. Total agroindustrial grouping of soils is based on a principle of the bonitet scores grouping. An importance of the researches is great in evaluation of the modern state in the available soil resources and correctly placing the agricultural areas in the regions.

Unlike the total agroindustrial grouping of soils, their special agroindustrial grouping is grounded on soils evaluation (special evaluation) by intending a soil-ecological requirement of the separate agricultural plants or plant groups. This direction of the soil agroindustrial grouping is advantaged in the republic. As is obvious from the research work character, the soil evaluation is in genetic-production and agroecological direction, they are available in a parallel form and they serve the separate purposes- to meet the farm's requirements (soil-cadastere measures) and to place agricultural plants. But now the changes happened in agriculture especially in soil treatments, increase of the farm experience and scientific-theoretic knowledge in connection with the rules of performing the soil and soil-evaluation works and changes occurred in agriculture, especially in soil treatments on the other hand passing long time from the previous research works gave an opportunity to look over this problem principally.

A new approach of the soil evaluation in the Lankaran province is based on two principal propositions:

I. The Lankaran province is limited by the natural and administrative borders (the Caspian Sea in the east, Azerbaijan-Iran boundary in the west, southwest and south), is formed as a zone complex from a historical and natural- economy standpoint therefore its natural resources, including soils investigation and evaluation are performed in the single system and on the basis of the single agroecology.

II. The bonitet scores of soils in the soil-cadastre (value) regions were taken out from the single agroecological scales of the province. The soil bonitet scores are based on the appropriate agricultural plant scales depending on agriculture direction: Lankaran – Astara soil cadastre region –tea citrus, Lerik- Yardimli grain-and Jalilabad region –vine.

Table 1.Evaluation scale of the soils and tea plantations productivity in the Lankaran province

A name of soils	Bonitet score	
	For character (x)	For productivity (y)
Yellow mountain-forest	100	100
Podzolic yellow	89	94

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Podzolic –yellow clayey	85	72

An availability of the correlative relation between some diagnostic indications of soils and agricultural plants defines the methodic approach characters during an evaluation according to soil agroecology. It is rather important in choice of the standard soils, finding of the value criteria and application of the correction coefficients. Undoubtedly, the soil factors determined a fertility level of the lands under grain, vine tea and vegetable aren't the same. If hydrological acidity (pH) in the soils under tea culture participates as a leading fertility factor, a quantity of humus and thickness of the humus stratum in the soils under grain and vine culture is rather significant. An attitude of agricultural a plants to salinization, solonetzification, surplus humidity, soil density, granulometic composition and other soil factors is very different. All these features were intended during the evaluation according to soils agroecology.

Tea lands. When we evaluated the tea lands according to agroecology, we had two principal aims: 1) To involve the tea lands of the Lankaran province by the evaluation works; 2) To select value criteria correctly intending the soil-ecological requirements of the tea plant. I.I.Karmanov's formula (1975) of the ecological index being modificated for the tea culture has been used (4):

$$SE_i = 6{,}07 \cdot (2 - V) \cdot n^{\frac{E_t > 10(MC - 0{,}05)}{CC + 100}} \qquad (4)$$

Here, SE_i- soil ecological index; *V*- soil density (0-100cm), g/cm^3; *n*-"useful" bulk (0-100cm), %; *E> 10t* - a sum of the temperatures above 10; *CC*- continental coefficient (to Ivanov); *MC*- moisturizing coefficient.

This approach method was used as a valuable means in evaluation of the tea lands according to agroecology because tea cenoz needs not only the soil, but also the climate factors, it is obvious from Karmanov's new modificated formula. The standard soil was selected as in traditional evaluation and the bonitet scores were found on the basis of the ecological factors comparison which influences on its inner diagnostic indications and fertility.

As a result of these researches it was determined that weak podzolic yellow soil (100 scores) was a standard soil for the tea plant in the Lankaran province. The bonitet scores of the main bonitet scale in the tea lands were given on the following table based on generalization and specifying of the performed research works (Table 2).

Table 2. Bonitet scores of the main bonitet scale in the soils under tea culture in the Lankaran province

A name of soils	Bonitet score
Typical yellow mountain-forest	91
Weak podzolic yellow mountain forest	92
Weak podzolic -yellow	100
Mean podzolic -yellow	88
Strong podzolic –yellow gley	68
Weak podzolic -yellow	88
Weak podzolic –yellow gleyic	91

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Mean podzolic –yellow gleyic	78
Weak podzolic –yellow gleyed	90

In comparison with the standard soil in the main bonitet scale the tealands in the Lankaran province got the following values: typical yellow mountain –forest -91 scores; weak podzolic yellow mountain forest -92 scores; mean podzolic yellow -88 scores; strong podzolic yellow gleyed-68 scores; weak podzolic –yellow gleyed -88 scores; weak podzolic –yellow gleyic-91; mean podzolic-yellow gleyic -78; mean podzolic-yellow gleyed-90. Not only the constant diagnostic indications or climate parameters which were selected as a standard during the soil evaluation, but also podzolization (pseudopodzolization) and gleyzation prosses in soil characteristic for humid subtropic, granulometric content, erosion influence on tea plant productivity and fertility of the soils under tea plant. These factors were taken into account in evaluation by the correction coefficients being taken from the reference sources.

Table 3. Correction coefficients for various indications of the soils under tea culture in the Lankaran province

Name of soils	Leaching rate				
Yellow –mountain -forest	unleached	Weak leached	Mean leached	Strong leached	
	1,0	0,91	0,53	0,28	
Podzolic-yellow	1,0	0,91	0,52	0,28	
Podzolic-yellow-gleyic	1,0	0,91	0,52	0,28	
Granulometric content					
Yellow mountain forest	Light loamy	Mean loamy	Heavy loamy	Clayey	sandy
	0,89	1,00	0,96	0,68	-
Podzolic-yellow	0,76	1,00	0,96	0,68	-
Podzolic-yellow-gleyic	0,76	1,00	0,96	0,68	-
Podzolic rate					
	Weak podzolic	Mean podzolization	Strong podzolization		
For all the soils	1,00	0,80	0,6		
	Gleyzation rate				
	Gleyed from surface	Gleyed from depth	Gleyic from surface	Gleyiv from depth	
For all the solis	1,00	0,97	0,44	0,33	

In soil-ecological requirements of the tea culture pH, thickness of the root spreading layer and other characters and indications play a significance role in productive formation. The observations which we have performed in the weak podzolic yellow , weak podzolic yellow mountain-forest, weak podzolic-yellow gleyic, mean podzolic yellow gleyed tea lands gave a chance to define dependence of tea culture productivity on pH index and to perform precision in the available correction coefficients (Table 4).

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Table 4.Tea culture productivity and correction coefficient of pH index

pH	Weak podzolic yellow, weak podzolic yellow mountain-forest		Weak podzolic- yellow gleyic, mean podzolic yellow gleyed	
	Productivity c/h	Correction coefficient	productivity	Correction coefficient
3,0-3,5	61,8	0,72	55,0	0,68
3,5-4,0	70,4	0,82	62,9	0,78
4,0-4,5	78,9	0,92	72,0	0,89
4,5-5,0	85,8	1,00	80,0	0,99
5,0-5,5	84,9	0,98	80,9	1,00
5,5-6,0	82,5	0,96	80,0	0,98
6,0-6,5	76,9	0,90	72,6	0,90
6,5-7,0	68,5	0,80	63,5	0,78
7,0-7,5	62,6	0,73	60,9	0,75

As is obvious from the research materials, depending on pH index parameters, the highest productivity of the tea plant changes by 4,5-5,0 in the weak podzolic yellow and weak podzolic yellow mountain –forest soils; 5,0-5,5 in the weak podzolic –yellow gleyic , mean podzolic yellow gleyed soils. Minority and majority of pH index than these parameters lead to decrease of productivity.

An application of the correction coefficients helps us to find the total bonitet scores in a level of the soil sort and diversity under tea culture, to specify the bonitet scores of the main scale which were fixed on the basis of the limited criteria (Table 4). Not only the available soils under tea culture , but also the soil diversities that have a potential for tea-growing after the definite agrotechnical measure were included in the following table. We called such soils “tea land” (good for tea) in our work. A total area of the tea land over the Lankaran zone is 30394,2 hectares and forms 4,78 % in the single soil fund of the province. As is seen from the table 53,5% or 15803,9 hectares belong to the high qualitative soils (I group), 32,5% or 9638.65 hectares to the good qualitative (II group); 5,13 % or 1513,2 hectares to the mean qualitative soils (III group), 8,91 % or 2631,4 hectars to the low qualitative soils. An average account score over the bonitet classes, total bonitet score and comparative value coefficient of these soils were given on table 5. As is obvious from our researches 86,0% or 25442,55 hectare of the tea lands in the Lankaran province are from of I-II quality groups. (agroproduction), and they involve X, IX,VIII,VII bonitet classes.

The other soils (4144,6 h or 13,64%) are from of III,IV,V quality groups and they are belonged to VI, V, IV, III bonitet classes depth gleyey character according to the same unfit indices and they aren’t used under tea plantations, But meliorative measures including deep trench can lead these soils to fit state for the tea planting. The draining works should be performed to prevent the surplus humidity in these soils. Therefore the surplus surface waters must be abolished. The gleyization process must be weakened opening the water ditches which aren’t deep in the yellow podzolic –gleyic surface soils.

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Table 5. Quality groups of the soils under tea and a total bonitet score over the bonitet classes and comparative value coefficients

Quality group of soils	Bonitet score	area		Total bonitet score	Comparative value coefficient
		h	%		
I high quail-	100-91	4598,4	15,6	98	1,29
tative soils	90-81	11205,5	37,9	86	1,14
II good qua-	80-71	5304,8	17,46	72	0,95
litative soils	70-61	4333,85	14,26	68	0,90
IIImean qua-	60-51	1513,2	4,98	56	0,74
litative soils	50-41	-	-	-	-
IV low quali-	40-31	1355,8	4,46	34	0,45
tative soils	30-21	1275,6	4,20	28	0,37
V conven-	20-11	-	-	-	
tional until	< 11	-	-	-	
Other soils		806,2	2,66	-	
Total		30394,2	100,0	76	1,00

We paid attention to the correction coefficients with the factors which influence on the soils under tea plant and tea lands, their total bonitet scores comparative value coefficient became the following form (Table 6).

Table 6. Total bonitet scores of the open bonitet scale in the soils under tea culture from the Lankaran province

Name of solis	Total bonitet score	Area, h	Comparative value coefficient
Typical yellow mountain forest	68	132,5	0,89
Weak podzolic yellow mountain forest	87	1443,2	1,14
Mean podzolic yellow mountain forest	46	274,5	0,60
Weak podzolic -yellow	97	4522,5	1,27
Mean podzolic- yellow	64	2293,6	0,84
Strong podzolic –yellow gleyecation	66	452,6	0,87
Weak podzolic –yellow gleyecation	80	15212,6	1,05
Weak podzolic –yellow gleyed	30	1413,4	0,39
Mean podzolic –yellow gleyed	32	1218,0	0,42
Mean podzolic –yellow gleyecation	72	3031,3	0,94
Other soils:	-	400,0	-
Total:	76	30394,2	1,00

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The weak podzolic yellow soils (4522,5h) have the highest index (97 scores) in the bonitet scale such as in the main bonitet scale. The lowest value indices were observed in the weak podzolic-yellow gleyic (30 scores) and mean podzolic –yellow gleyic (32 scores soils). We can explain that "gleyzation" possesses unfit physical and water-physical characters.

Vegetable lands. Agroecological evaluation of the vegetable lands was studied very weakly. Nethertheless, vegetablegrowing is considered one of the most leading areas both in the republic and in the Lankaran province. As is obvious from the analysis over vegetable-growing and potato-growing in the Lankaran province, this economy area possesses great development perspectives. If the high productivity is connected with the productive regionalized sorts, then there is a great importance to arrange separate vegetable cultures correctly on the basis of soils agroecological investigation and evaluation. Therefore an agroecological evaluation of the vegetable lands has a great scientific-theoretic and industrial importance.

In the 70-80 th years of the last century Mammadov (1990) expressed an opinion about possibility and importance of agroecological evaluation, composed an initial principal evaluation scale, showed correction coefficients. The authors were satisfied with the preparation of the bonitet scale and correction coefficients system, but they didn't fulfill the next stages of the evaluation (construction of the open scale, agroindustrial grouping of soils, finding the (Coefficient of Comparative Dignity (CCD) of soil groups, because the researches were performed in the limited zone, its consequences were published in a mean bulky article. Paying attention to the present state of the soils use under vegetable culture in the Lankaran province, an evaluation of the vegetable lands was performed by us.

While composing a main bonitet scale of the vegetable lands, humus, nitrogen, phosphorus, potassium, calcium structural humic-marshy soils assuming a great importance for the vegetable cultures (cabbage, tomato, pepper, potato, aubergine) were taken as a standard, other soils of the province got appropriate values in comparation with it (Table 7). The researches were performed in the area with 79694,0 hectares, i.e. 12,5% of the province zone. Weak podzolic-yellow gleyed, mean podzolic-yellow gleyed, strong podzolic-yellow gleyed, leached meadow-brown, typical meadow-brown, dark meadow, marshy –meadow, silty-marshy soils participated in the evaluation.

Table 7. Total bonitet scores of the main bonitet scale in the vegetable lands from the Lankaran province

Name of soils	Bonitet score
Weak podzolic-yellow gleyed	93
Mean podzolic-yellow gleyed	90
Strong podzolic-yellow gleyed	85
Leached meadow-brown	79
Typical meadow-brown	80
Dark -meadow	87
Marshy-meadow	91
Humic-marshy	100
Silty-marshy	94

In comparison with the standard soils (humic-marshy) weak podzolic-yellow gleyed soils were- 93 scores, mean podzolic-yellow-gleyed-90 scores. strong podzolic-yellow gleyed-85 scores, leached meadow-brown-79 scores, typical meadow- 80 scores, dark-meadow-87

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scores, marshy-meadow-91 scores, silty-marshy soils-94 scores. A high humidity degree of the soil profile is characteristic for humic-boggy and silty-boggy. Subsoil water level in these melioratited soils was expediently descended and its impact on tillage layer was limited a little. The subsoil water level was less than 70 cm in the research areas. The researches were performed in tomato, cucumber, whitehead cabbage tillage in Lankaran and Masalli. Our researches show that the vegetable cultures are very sensitive for three main indications of the soil fertility: soil density, soil environment reaction (pH) and soil nutrient. We have worked out a system of correction coefficients for these indications (Table 8).

The sensitiveness of the vegetable plants for other indications of the soil-salinization, solonetzification, hydromorphic. But the correction coefficients of these indications were worked out. The total bonitet scores of the vegetable land diversity were found, the agroindustrial grouping was performed, the comparative value coefficients of the soil groups were found (Table 8).

Table 8. Correction coefficients for the different indications in the soils under vegetable cultures of the Lankaran province

Name of soils	Granulometric structure						
	Light loamy	Mean loamy	Heavy loamy	Clayey	Sandy		
Mountain-brown	0,89	1,00	0,92	0,78	-		
Brown	0,88	1,00	0,91	0,79	-		
Grey- brown	0,89	1,00	0,92	0,78	-		
Meadow	0,87	1,00	0,89	0,75	-		
	pH						
For all soils	< 5,5	5,5-6,0	6,0-6,5	6,5	6,5-7,0	7,0-7,5	>7,5
	0,78	0,85	0,92	1,00	0,95	0,83	0,77
	Skeletal						
For all the soils	Skeletal		Weak skeletal		Mean skeletal		
	1,00		0,95		0,70		
	Density						
	<20		20-30		>30		
For all the soils	0,62		0,77		1,00		
Provision rate	Nutrient			Correction coefficients			
	N	P	K	N	P	K	
Very weak	40	15	300	0,33	0,33	0,50	
Weak	40-70	15-30	300-400	0,46	0,51	0,58	
Mean	70-120	30-45	400-600	0,79	0,84	0,83	
High	120	45	600	1,00	1,00	1,00	

The researches related to an evaluation of the vegetable lands was 79694,0 hectares, 22,75% or 18135,16 hectares were high qualitative (I group) soils, 74,03% or 59007, 91 hectares were good qualitative (II group) soils and totally 1,64% or 1316,83 hectares were qualitative (III group) soils (Table 9). it is known that these soils were formed by draining artificial marshes and many parts of the natural boggy zones for using under paddy plantations. So, these soils

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are covered with seasonal loamy –sandy and dust-loamy deposits. The soil forming process occurs with a participation of the meadow plants under the temporary humidity condition as a result of the surface and subsoil water.

Table 9. Total bonitet score and comparative value coefficient over the bonitet classes and quality groups in the vegetable lands

Qualitative group of soils	Bonitet class	Area		Total bonitet score	Comparative value coefficient
		h	%		
I high qualitative soils	100-91	7524,96	9,44	92	1,18
	90-81	10610,2	13,31	83	1,07
II high qualitative soils	80-71	55812,46	70,03	77	0,99
	70-61	3195,45	4,00	65	0,84
III mean qualitative soils	60-51	950,43	1,19	56	0,72
	50-41	366,4	0,45	47	0,61
IV low qualitative soils	40-31	-		-	
	30-21	-		-	
Vconventional unfil	< 11	-		-	
				-	
Other soils:		1234,1	1,54	-	
Totality:		79694,0	100	78	1,00

The factors which influence on fertility and the bonitet score of vegetable lands are taken into account by the value criteria and correction coefficients and the mean account scores on the open bonitet scale of these soils were given on table 9. The humic- marshy soils on the soil bonitet scale got the highest score. A total area of these soils was 499,9 hectares and it formed 0,63 % of the vegetable lands. The weak podzolic-yellow gleyed (82 scores), mean podzolic-yellow gleyed (82 scores), marshy-meadow soils surround a large zone according to the high fertility and area in the Lankaran province. A total area of these soils is 25855,92 hectares, the vegetable lands of the province form 32,4%.

CONCLUSION

1. The contemporary morphogenetic and soil-ecological features were determined on the basis of soils under tea and vegetable cultures, field-laboratorial, cameral researches, reference and fund materials in Lankaran.

2. Qualitative evaluation of the soils under tea and vegetable cultures in the Lankaran province was performed, a main bonitet scale was constructed, the weak podzolic yellow soils were selected as a standart for the soils under tea culture, the humic-marshy soils were selected as a standard for the soils under vegetable lands (100 score), the bonitet scores of other soils were fixed in comparison with them.

3. The open and total bonitet scores were constructed in order to fix bonitet scores of the soil diversities in the research zone by applying the correction coefficients, a mean account bonitet score and comparative value coefficient were calculated: it was defined as a result of the carried out researches that a total mean account score of the tea lands over the province was 76 scores, but a total mean account score was 78 scores.

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4. The agroindustrial grouping of soils was performed on the basis of the open bonitet scale in the soils under tea and vegetable cultures and the bonitet scores and areas over agrogroups were fixed. It was determined that 53,5 % of the highest qualitative soils were used (I group) under tea culture, 74,03% of the good qualitative soils (II group) were used under vegetable culture.

RECOMMENDATION

The consequence of the materials over the qualitative evaluation in the soils under tea and vegetable cultures, Main and total bonitet scales, agroindustrial groupping according to tea and vegetable culture of the zone, correct and rational use from soil resources under tea and vegetable plant in the research object, soil cover protection are recommended to be used as a basis in a problem settlement of the fertility restoration and progress.

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