Efficiency of using agricultural land in the context of natural and economic zones of the Krasnodar Kari in order to involve them into circulation

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Abstract. The efficiency of using agricultural land in the context of natural and economic zones of the Krasnodar Krai in order to involve them into circulation is studied in this paper. It is analyzed that the productive properties of the land directly depend on the fertility of the soil, which is characterized by soil types, humus reserves, mechanical composition and other indicators. Soil fertility was assessed, the indicator of which is the bonitet score.

1 Introduction

The Krasnodar Krai is famous for its fertile lands, but it must be remembered that the lands of the municipalities of the Krai somehow differ in quality. Consequently, the efficiency of agricultural production in individual regions will differ from each other.

In order to determine the efficiency of the use of agricultural land by municipalities of the Krasnodar Krai, taking into account the productive properties of land in the context of natural and economic zones, we will find, for a start, the average soil score for each municipal formation in the context of agricultural zones. There are six such zones in the region: Northern, Central, Western, Anapo-Taman, South-Piedmont, and Black Sea.

2 Materials and methods

From the materials of the assessment of the lands of the Krasnodar Krai (initial indicators of soil fertility) in 1990, we write down the soil scores of dry arableland and irrigated arableland in Table 1 by municipalities and group them by zones [1].

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### Table 1. Scores of bonitet of arable land by municipalities of Krasnodar Krai by zones.

| Municipalities              | Bonitet scores |   |   |
|----------------------------|----------------|---|---|
|                            | dry arable land | irrigated arable land |   |   |
| **Northern zone**          |                |                            |   |   |
| Beloglinsky                | 72             | -                          |   |   |
| Yeysky                     | 76             | -                          |   |   |
| Kanevsky                   | 79             | 80                         |   |   |
| Krylovsky                  | 75             | 72                         |   |   |
| Kushchevsky                | 75             | -                          |   |   |
| Leningradsky               | 80             | 78                         |   |   |
| Novopokrovsky              | 76             | 81                         |   |   |
| Pavlovsky                  | 80             | 79                         |   |   |
| Starominsky                | 74             | 74                         |   |   |
| Tikhoretsky                | 81             | 80                         |   |   |
| Shcherbinovsky             | 73             | 74                         |   |   |
| **Central zone**           |                |                            |   |   |
| Bryukhovetsky              | 83             | 83                         |   |   |
| Vyselkovsky                | 84             | 84                         |   |   |
| Gulkevichesky              | 83             | 68                         |   |   |
| Dinskoy                    | 81             | 81                         |   |   |
| Kavkazskoy                 | 82             | 82                         |   |   |
| Korenovsky                 | 85             | 85                         |   |   |
| Kurganinsky                | 83             | 67                         |   |   |
| Novokubansky               | 82             | 65                         |   |   |
| Primorsko-Akhtarsky        | 82             | 78                         |   |   |
| Tbilissky                  | 79             | 75                         |   |   |
| Timashevsky                | 84             | 85                         |   |   |
| Ust-Labinsky               | 81             | 77                         |   |   |
| Armavir                    | 77             | 74                         |   |   |
| Krasnodar                  | 78             | 75                         |   |   |
| **Western zone**           |                |                            |   |   |
| Kalininsky                 | 78             | 66                         |   |   |
| Krasnoarmeyskiy            | 66             | 57                         |   |   |
| Slavyansky                 | 49             | 39                         |   |   |
| **Anapo - Taman zone**     |                |                            |   |   |
| Temryuksy                  | 47             | 29                         |   |   |
| Anapa                      | 56             | 40                         |   |   |
| **South-Piedmont zone**    |                |                            |   |   |
| Abinsky                    | 58             | 51                         |   |   |
| Absheronksy                | 48             | 54                         |   |   |
| Belorechensky              | 61             | 59                         |   |   |
| Crimean                    | 57             | 40                         |   |   |
| Labinsky                   | 82             | 65                         |   |   |
| Mostovsky                  | 66             | 56                         |   |   |
| Otradensky                 | 83             | -                          |   |   |
| Seversky                   | 54             | 53                         |   |   |
| Uspensky                   | 74             | 75                         |   |   |
| GoryachyKlyuch             | 52             | 50                         |   |   |
| **Black Sea zone**         |                |                            |   |   |
| Tuapsinsky                 | 51             | 47                         |   |   |
| Gelendzhik                 | 46             | 46                         |   |   |
| Novorossiysk               | 58             | 59                         |   |   |
| Sochi                      | 42             | 45                         |   |   |
From table 1, it can be noted that the soil score of dry and irrigated arable land differs among themselves depending on the municipality, with the exception of Bryukhovetsky, Vyselkovsky, Dinsky, Kavkazsky, Korenovsky, which are located in the Central zone, and Starominsky district, as well as the city of Gelendzhik. In these municipalities, the soil score of dry and irrigated arable land is the same. In such areas as: Beloglinsky, Yeysky, Kushchevskovsky and Otradensky, there is no irrigated arable land, these areas are included in the Northern zone of the region.

In the report on the availability and distribution of lands in the Krasnodar Krai, we took information on the area of all arable land and the area of irrigated arable land. The area of dry arable land was found as the difference between the area of all arable land and the area of irrigated arable land [2].

All data on municipalities and areas by zones are shown in Table 2.

Table 2. Information on arable land areas by municipalities of the Krasnodar Krai by zones, hectares.

| Municipalities          | Total arable land | Irrigated arable land | Dry arable land |
|-------------------------|-------------------|-----------------------|-----------------|
| **Northern zone**       |                   |                       |                 |
| Beloglinsky             | 128308            | -                     | 128308          |
| Yeysky                  | 143691            | -                     | 143691          |
| Kanevsky                | 177018            | 7086                  | 169932          |
| Krylovsky               | 114587            | 1397                  | 113190          |
| Kushchevsky             | 197930            | -                     | 197930          |
| Leningradsky            | 109803            | 5127                  | 104676          |
| Novopokrovsky           | 179209            | 8526                  | 170683          |
| Pavlovsky               | 146676            | 3682                  | 142994          |
| Starominskiy            | 80877             | 1170                  | 79707           |
| Tikhoretsky             | 140348            | 7105                  | 133243          |
| Shcherbinovsky          | 105448            | 931                   | 104517          |
| **Central zone**        |                   |                       |                 |
| Bryukhovetsky           | 102057            | 5650                  | 96407           |
| Vyselkovsky             | 140913            | 5359                  | 135554          |
| Gulkevichesky           | 100995            | 6175                  | 94820           |
| Dinskoy                 | 83188             | 14775                 | 68413           |
| Kavkazsky               | 89870             | 9130                  | 80740           |
| Korenovsky              | 113038            | 6323                  | 106715          |
| Kurganinsky             | 111599            | 9737                  | 101862          |
| Novokubansky            | 138428            | 2832                  | 135596          |
| Primorsko-Akhtarsky     | 78229             | 4808                  | 73421           |
| Tbilissky               | 108834            | 12098                 | 96736           |
| Timashevsky             | 116564            | 5909                  | 110655          |
| Ust-Labinsky            | 15207             | 2641                  | 12566           |
| Armavir                 | 40927             | 12944                 | 27983           |
| Krasnodar               | 40927             | 12944                 | 27983           |
| **Western zone**        |                   |                       |                 |
| Kalininsky              | 96215             | 34309                 | 61906           |
| Krasnoarmeyskiy         | 129837            | 89741                 | 40096           |
| Slavyansky              | 109103            | 82467                 | 26636           |
| **Anapo - Taman zone**  |                   |                       |                 |
| Temryuksky              | 55017             | 14476                 | 40541           |
| Anapa                   | 31986             | 2611                  | 29375           |
| **South-Piedmont zone** |                   |                       |                 |
| Abinsky                 | 52162             | 27653                 | 24509           |
| Absheronksy             | 7188              | 465                   | 6723            |

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From the information given in Tables 1 and 2, we find the average bonitet of arable land in the municipalities of the region in the context of zones according to formula 1:

$$B_{av} = \frac{B_{dry} \cdot S_{dry} + B_{irr} \cdot S_{irr}}{S_{total \ arable \ land}},$$  \hspace{1cm} (1)

where $B_{dry}$ – dry arable land soil score;  
$S_{dry}$ – dry arable land area, ha;  
$B_{irr}$ – soil score of irrigated arable land;  
$S_{irr}$ – irrigated arable land area, ha;  
$S_{total}$ – total arable land area, ha.

Let’s calculate the average bonitet scores of arable land for all municipalities of the Krasnodar Krai according to formula 1 and group them by zones. Let’s write the obtained results in Table 3.

**Table 3.** Average scores of bonitet of arable land by municipalities of the Krasnodar Krai by zones.

| Municipalities | Scores |
|---------------|--------|
| **Northern zone** |  |
| Beloruchensky | 62008  |
| Crimean | 61747  |
| Labinsky | 100091 |
| Mostovskiy | 50638  |
| Otradenskoy | 99301  |
| Severskoy | 49071  |
| Uspenskoy | 54052  |
| Goryachkylyuch | 21111 |
| **Black Sea zone** |  |
| Tuapsinsky | 1247  |
| Gelendzhik | 90  |
| Novorossiysk | 9073  |
| Sochi | 3468  |
| **Central zone** |  |
| Bryukovetsky | 83  |
| Vyselkovskoy | 84  |
| Gulevichesky | 82  |
| Dinskoy | 81  |
| Kavkazskoy | 82  |
| Korenovsky | 85  |
| Kurgansky | 82  |
| Novokubanaskoy | 82  |
| Primorsko-Akhtarsky | 82  |
| Tbilissky | 79  |
### 3 Results

As a result of our survey, the most fertile regions were: Bryukhovetsky, Vyselkovsky, Gulkevichesky, Kavkazsky, Korenovsky, Kurganinsky, Labinsky, Leningradsky, Novokubansky, Otradnensky, Primorsko-Akhtarsky, Pavlovsky, Timashevsky, Tikhoretsky and Ust-Labinsky. Their soil score was above 80. All these areas are located in the Central and Northern zones of the region.

Less fertile areas and cities with a bonitet score less than 55 are: Apsheronsky, Crimean, Seversky, Slavyansky, and Temryuksky; the city of Anapa, Gelendzhik, GoryachyKlyuch, and Sochi.

### 4 Conclusions

The above data in the tables clearly show that the assessment scores for the municipalities of the region are quite high. Therefore, this allows concluding about the fertility of the land.

In our opinion, it is imperative to take into account the fertility of agricultural land in the Krasnodar Krai, since this will give an impetus to the functioning and development of the agricultural land market and, accordingly, the country's economy as a whole.

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