The problem of land use in conditions of food security provision

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Abstract As a result of the land reform, a new land system was formed, which gave rise to new phenomena in the land use system in the conditions of the market economy. The most important new problems of modern land use include the elimination of significant arable land areas from agricultural circulation. The paper proposes a comprehensive consideration of the possible involvement of these unused lands. It is based on taking into account natural and assessing the suitability of arable land usage in certain natural climatic conditions. The market economy requires arable land to ensure the efficiency of crop production. Actually usable land resources can provide sustainable or unsustainable efficiency. Sustainable inefficiency indicates the unsuitability of individual arable sites for efficient crop production. The natural and economic land potential can be used sufficiently effectively only if there are sufficient conditions to ensure production by labor, technical means, basic means of production, financial resources. Involvement of unused land is solved only as a complex problem. This is the correct and balanced approach and implementation of State programs in the field of land use that ensures food security.

1. Introduction
The “rational use of land” scientific-production paradigm formed in the 30s of the previous century in the conditions of planned economy was the guiding star of the land use management system. As the main target setting in the system of land resources use, rationality was formulated in the 30s of the previous century and had a clear task of ensuring planned economy. It was based on three aspects — full, correct and efficient use of land. [9] The aspect of proper use has always been maintained by the state. In planned and market production, it provides non-economic (legal) regulation of land use for the development of the whole society. Therefore, it is essentially the state aspect of land use management.

In a planned economy, the main goal of land use was to fully provide the growing needs of the society with food and raw materials. It was ensured by the full use of land resources, which became the main focus of land use development. It was the one that allowed to increase the scale and volume of production. During the development of virgin and fallow land, this approach has led to unreasonable involvement of little and even unsuitable land in agricultural use. The subsequent write-off of these lands has improved the situation to a small extent. There was no thought of the effective use of land in that period. At the same time, this state event (virgin land development) had the best material, technical and labor support, including at the expense of the regions with traditional crop production. But even in the conditions of planned economy, the processes of its self-regulation led to a significant
weakening of the land use conditions in other regions of the country, which caused a reduction in the used land acreage in several regions of the USSR. In the 70s, this became especially noticeable in the non-chernozem zone of Russia. The subsequent equalization of economic support for agriculture in the regions of the USSR led to a certain equalization of the land disuse share. It was an objective phenomenon. In general, increases in land use acreage and agricultural production scale have not been sufficiently provided with productive resources throughout the country. However, the accepted paradigm of rational land management and its prevalence of completeness and correctness and strict control over it by the state led to the inefficiency of crop production in a considerable scale. Measures to “write off” some of the land and withdraw it from agricultural use have not changed the situation radically. Therefore, there were contradictions between the state and the producers about the completeness and correctness of land use [8].

The agrarian reform brought in changes in the basics of land use. It began to rely on the postulates of the market economy. The market has become a regulator of the scale, volumes and directions of agricultural products production. [3,6] On the basis of supply and demand comparison and market price formation this allows to determine the need for the acreage and quality of land resources. But at the same time, ensuring the production of the necessary products volume has also fallen into the background. The main thing in the land use system is not providing an increasing number of products produced, but ensuring the efficiency of its production.

An essential prerequisite in the classical and even transformed model of a market economy is the availability of a “reserve army” of resources, primarily of labor and land. Labour's reserve army is clear or hidden unemployment. In the USSR, conditions of closed economy and state prices regulation ensured almost full employment of the rural population. The transition to the rails of intensive production technologies and possibilities of acquiring highly productive equipment leads to the release of a significant number of workers. The state has already agreed with the existence of unemployment as a necessary phenomenon of a market economy.

However, the existence of “reserve” (unused) land is not yet recognized by the state. Objectives are set, measures aimed at unconditional involvement in agricultural circulation of these lands are determined [7]. This is also motivated by food security provision. The rationality of land use as a paradigm of rational land use still remains. However, the prevalence of the effective relative full and correct land use has not taken full place, despite the fact that in the transition to a market economy in a certain market situation, parts of land has no sufficient crop production efficiency. Part of the land is not used because of lack of both manpower and equipment. Therefore, the land disuse in market-oriented production is quite an objective phenomenon. However, the lack of land use has quite tangible economic consequences — a decrease in the tax mass and revenue portion of the budget, underutilization or inefficient utilization of other resources, such as manpower, machinery, buildings, structures, deterioration of the situation in the food market. [1] The state resists the general direction of market economy development in the land use system also because of the need for food security. This is partly due to the socio-economic situation of the land tax acquirer — local government. This tax is often the main source of the revenue portion of the local budget replenishment. Land disuse cuts it drastically. Therefore, additional money from the state is required to ensure the livelihoods of the rural population.

Therefore, land disuse gains importance of a serious economic problem for agriculture and society living in this territory. This allows it to be considered and solved not only as a problem of land administration, but also as a comprehensive problem of the entire agricultural sector. It has three main parts of its solution — the suitability of land for use, the availability of conditions of use, and the efficiency of production in selected areas of arable land.

2. Methods of research

The basis for solving the problem is to establish the suitability of the site for use in agricultural production. This is primarily due to the quality of natural and climatic conditions and the quality of the land itself as a natural body, being landform and soils. In order to assess natural suitability, it is neces-
sary to possess modern materials of soil and soil erosion surveys and the agrologists' conclusion on the usage suitability of these soils depending on yearly climatic features.

The next stage of solving the problem is the availability and quality of the basic factors of crop production (fixed assets, equipment, labor, finance) which are essential conditions for land use. Along with the scale and quality of these resources, an important aspect is their interconnected equilibrium primarily with the quantity and quality (potential) of land resources [5].

The final and most important land use problem in a market economy is the economic suitability of use for agricultural production. Sections providing profit, i.e. obtaining products at a cost exceeding the cost value [4,2], can be considered economically suitable.

3. Results of the study
The problem under consideration is multifactorial; it accumulates a number of processes taking place both in the economy of the country and in the organization of the most important sector of agriculture - crop production.

Let us consider its solution on the example of one of the districts of the Omsk oblast. Maryanovsky district is the territory of developed agriculture; it has a favorable location to the products sales market, the ecological situation is favorable for agriculture; the area has a total of 12 agricultural enterprises and 23 peasant farms, the total area of agricultural land in Maryanovsky district equals to 139 thousand hectares.

Table 1. Distribution of agricultural land areas by type of law.

| Agricultural organizations | Acreage in property | Acreage in rent |
|----------------------------|---------------------|----------------|
|                            | ha                  | %              | ha             | %              |
| OJSC PKZ “Omsky”           | 15425               | 100            | 0              | 0              |
| LLC Plemzavod “Ovtsevod”   | 0                   | 0              | 207            | 100            |
| CJSC “Znamya”              | 146                 | 2              | 9245           | 98             |
| LLC “Yuzhnoye”             | 0                   | 0              | 7818           | 100            |
| LLC “Druzhba”              | 864                 | 12             | 6475           | 88             |
| LLC “Zolotaya Niva”        | 0                   | 0              | 3690           | 100            |
| LLC “Orientir”             | 0                   | 0              | 1566           | 100            |
| LLC “Agro”                 | 0                   | 0              | 1420           | 100            |
| LLC “Kolos”                | 0                   | 0              | 1140           | 100            |
| LLC “Niva”                 | 0                   | 0              | 650            | 100            |
| SPK Plemzavod “Ovtsevod”   | 0                   | 0              | 10185          | 100            |
| Total                      | 16435               | 28             | 42396          | 72             |

The most common type of land right is the farmland rent (72 per cent). It prevails in farms of all organizational and legal forms, except OJSC PKZ “Omsky”, which owns 100 percent of the land. It follows that the cost part of crop production for the majority of the farms is burdened by the need to pay rent.

According to Rosreestr reports, the arable land is used completely in most farms. However, a certain area in the district is not used annually for various reasons (Table 2).

Table 2. Land use by agricultural organizations.

| it. N o. | Agricultural organization | Total agricultural land | Of these used by organizations | Usage percentage |
|----------|---------------------------|--------------------------|--------------------------------|-----------------|
| 1        | LLC “Orientir”            | 2474                     | 2474                           | 100             |
| 2        | LLC “Kolos”               | 1140                     | 1140                           | 100             |
| 3        | LLC “Yuzhnoye”            | 18497                    | 18497                          | 100             |
The natural conditions of use for farms are almost equivalent in the area. Climate parameters in the conditions of district's territorial latitude location are the same. The topsoil within the district is mostly uniform. The quality score for farms is quite high and differs from the average district values by no more than 4-5%. Which implies the same relative potential level of agricultural lands by farms and the absence of grounds for the natural and climatic nature of the land disuse. But even in this fairly prosperous area up to 20% of farms do not sow 10-20% of the arable acreage every year.

In other areas of the region, the situation is different. For example, in the northern forest-steppe zone, more than 40% of farms do not sow between 10 and 50% of arable land. In the alkali forest-steppe zone, the proportion of unused arable land reaches 50-60%. Earlier during the period of virgin land invasion, these lands were involved in arable circulation without sufficient justification (Nazyvayevsky, Tyukalinsky districts), but this did not make them suitable. This requires significant investments aimed at reclamation of alkali lands. Neither farms nor the state do not possess such money just yet. Therefore, these lands are unused for objective reasons, although some of it is sowed while creating risky farming. The risk nature of crop production on these lands forms instability in the development of both crop production and in the whole industry. Annually, producers spend funds and resources unproductively.

In addition to natural conditions and the established quality of land, land disuse is associated with real economic conditions. In fact, due to economic reasons, the potential of agricultural lands is still used in different ways, which is reflected in the yield of major cereal crops (Table 3)

| agricultural organization | Actual yield cwt/ha | Yield relative to regional average | Quality score | Estimated yield, under average conditions of arable use, cwt/ha | The level of land estimated potential | Level of arable natural potential use |
|---------------------------|---------------------|-----------------------------------|---------------|---------------------------------------------------------------|--------------------------------------|--------------------------------------|
| LLC Orientir              | 7.00                | 0.33                              | 78            | 20.23                                                         | 0.96                                 | 0.35                                 |
| LLC Kolos                 | 24.00               | 1.14                              | 81            | 21.00                                                         | 1.00                                 | 1.14                                 |
| LLC Yuzhnoye              | 15.10               | 0.72                              | 80            | 20.74                                                         | 0.99                                 | 0.73                                 |
| CJSC Znamya               | 29.10               | 1.39                              | 82            | 21.26                                                         | 1.01                                 | 1.37                                 |
| LLC Agro                 | 11.40               | 0.54                              | 79            | 20.48                                                         | 0.98                                 | 0.56                                 |
| LLC Plemzavod Ovtsevod   | 25.80               | 1.23                              | 82            | 21.26                                                         | 1.01                                 | 1.21                                 |
| SPK Plemzavod Ovtsevod   | 20.00               | 0.95                              | 80            | 20.74                                                         | 0.99                                 | 0.96                                 |
| LLC Zolotaya Niva         | 17.90               | 0.85                              | 79            | 20.48                                                         | 0.98                                 | 0.87                                 |
| LLC Druzhba               | 24.10               | 1.15                              | 81            | 21.00                                                         | 1.00                                 | 1.15                                 |
| LLC Niva                 | 19.20               | 0.91                              | 79            | 20.48                                                         | 0.98                                 | 0.94                                 |
| OJSC PKZ Omsky            | 8.90                | 0.42                              | 78            | 20.23                                                         | 0.96                                 | 0.44                                 |
| Average by region         | 21                  | 81                                |               |                                                               |                                      |                                      |
The table shows that the use level of high enough arable natural potential for the area by farms varies. For CJSC “Znamya”, LLC “Plemzavod Ovtsevod”, LLC “Druzhba” and LLC “Kolos”, this indicator is higher than the average regional level. But in three farms (LLC “Orientir”, LLC “Agro”, JSC “PKZ Omsky”) it is 2-3 times smaller. These data indicate incomplete and most importantly inefficient use of land in a number of agricultural organizations of the region.

**Table 4. Parameters of land use conditions per 100 ha of arable land.**

| Agricultural organization | Fixed assets, thousand rub. | Agricultural machines, thousand rub. | Manpower, pers. level | Average level of conditions |
|--------------------------|----------------------------|-------------------------------------|-----------------------|---------------------------|
| OJSC PKZ Omsky           | 1655                       | 430                                 | 0.8                   | 0.60                      |
| LLC Plemzavod Ovtsevod   | 239                        | 101                                 | 0.14                  | 0.10                      |
| CJSC Znamya              | 1989                       | 437                                 | 0.62                  | 1.00                      |
| LLC Yuzhnovye            | 1308                       | 442                                 | 0.63                  | 0.20                      |
| LLC Druzhba              | 1381                       | 714                                 | 1.00                  | 0.70                      |
| LLC Zolotaya Niva        | 961                        | 703                                 | 0.97                  | 0.30                      |
| LLC Orientir             | 572                        | 572                                 | 0.82                  | 0.05                      |
| LLC Agro                 | 101                        | 49                                  | 0.70                  | 0.10                      |
| LLC Kolos                | 246                        | 223                                 | 0.32                  | 0.60                      |
| LLC Niva                 | 171                        | 133                                 | 0.19                  | 0.30                      |
| SPK Plemzavod Ovtsevod   | 1469                       | 110                                 | 0.16                  | 0.50                      |

In this situation, the reasons are related to the difference in the organization of crop production and the supply of the main production factors.

It can therefore be assumed that the use of the productive land potential in the area is greatly influenced by the conditions of land use, the quality of the organization of its use (organization of production processes in crop production).

Indicators characterizing the conditions of land use along with the quality of the land itself are the provision of crop production with labor resources, buildings, structures, agricultural machines. (Table 4)

The analysis shows that the differences in the conditions of crop production supply by the main production factors for farms in general reach 400%. Therefore, it is important to test the assumption of the land use conditions impact on the level of natural land potential use.

**Table 5. Land use and indicators of crop production.**

| Agricultural organization | Level of arable use conditions | Level of arable natural potential use | The cost of crop production, per 100 hectares thousand rub. | Profit Crop production, 100 ha thousand rub. |
|--------------------------|--------------------------------|--------------------------------------|----------------------------------------------------------|---------------------------------------------|
| OJSC PKZ Omsky           | 0.74                           | 0.44                                 | 476                                                      | 52                                          |
| LLC Plemzavod Ovtsevod   | 0.12                           | 0.12                                 | 44                                                       | -                                           |
| CJSC Znamya              | 0.87                           | 0.87                                 | 1093                                                     | 95                                          |
| LLC Yuzhnovye            | 0.50                           | 0.50                                 | 2667                                                     | 1338                                        |
| LLC Druzhba              | 0.80                           | 1.15                                 | 1044                                                     | 223                                         |
| LLC Zolotaya Niva        | 0.58                           | 0.87                                 | 286                                                      | 24                                          |
| LLC Orientir             | 0.38                           | 0.35                                 | 390                                                      | 139                                         |
| LLC Agro                 | 0.28                           | 0.56                                 | 5                                                       | 1                                           |
| LLC Kolos                | 0.35                           | 1.14                                 | 155                                                      | 20                                          |
| LLC Niva                 | 0.19                           | 0.94                                 | -                                                       | -                                           |
| SPK Plemzavod Ovtsevod   | 0.47                           | 0.96                                 | 320                                                      | 234                                         |

The data shown in table 5 show diversity in land use outcomes. With insufficient organization of crop production processes and differences in the land use conditions (more than 4 times), both the lev-
el of land potential use (from 0.12 to 1.15 in 10 times) and the results of management (the cost of crop production per 100 hectares and crop profit per 100 ha) differ quite sharply (Table 5). Differences in the efficiency of land use give rise to the need to withdraw land that does not provide sufficient returns from circulation. Such areas include those that have a low quality level (quality score) with a high level of costs (energy intensity, contour, remoteness). These lands become unused. To get them to agricultural circulation, measures are needed to improve soil quality (land reclamation, fertilizers) and reduce costs (roads improvement, energy intensity and contour reduction). These are activities require significant investment and this task cannot be solved without the assistance of the state agricultural organizations.

A third party that actively interferes with the land-use system is the market (agricultural products and logistics of land use). In modern conditions, it is the market that forms prices for all goods and largely determines the profitability of crop production, and therefore the use of land on arable plots.

On the example of arable array in the southern forest-steppe zone, model calculations show that the potential of land in fields varies quite widely. According to the data of a fairly favorable year 2018, sufficient returns are provided at all sites. At the same time, on most sites it allows to ensure profitability of crop production. However, a 20% decrease in the market price or an increase in market value on the main crop production logistics elements also by 20%, which happens quite often, shows that crop profitability (considering general economic costs, taxes, rent, inflation, etc.) is not achievable on 2 sites. In this situation, disuse of such sites should be considered market-justified.

### Table 6. Efficiency of arable use in case of changes in the products market or their production conditions.

| Sites no. | Yield, cwt/ha | Cost of sold products, Rub/ha | Estimated cost index | Production costs rub./ha | Net income rub./ha | Production profitability, % |
|-----------|---------------|-------------------------------|---------------------|------------------------|-----------------|-----------------------------|
| Initial data for 2018, product price -600, rub./cwt, costs per 1ha - 5000 rub. | | | | | | |
| 1 | 16 | 9600 | 1.13 | 5650 | 3950 | 70 |
| 2 | 13 | 7800 | 1.15 | 5750 | 2050 | 35 |
| 3 | 13 | 7800 | 1.18 | 5900 | 1900 | 32 |
| 4 | 12 | 7200 | 1.17 | 5850 | 1350 | 23 |
| 5 | 16 | 9600 | 1.18 | 5900 | 3700 | 62 |
| 6 | 16 | 9600 | 1.07 | 5350 | 4250 | 79 |
| 7 | 19 | 11400 | 1.11 | 5500 | 5900 | 107 |
| 8 | 18 | 10800 | 1.12 | 5600 | 5200 | 98 |
| 9 | 16 | 9600 | 1.17 | 5850 | 3750 | 64 |
| Decrease in prices of products -500 rub./cwt, costs for 1ha - 5000 rub. | | | | | | |
| 1 | 16 | 8000 | 1.13 | 5650 | 2350 | 42 |
| 2 | 13 | 6500 | 1.15 | 5750 | 750 | 13 |
| 3 | 13 | 6500 | 1.18 | 5900 | 600 | 10 |
| 4 | 12 | 6000 | 1.17 | 5850 | 150 | 3 |
| 5 | 16 | 8000 | 1.18 | 5900 | 2100 | 35 |
| 6 | 16 | 8000 | 1.07 | 5350 | 2650 | 50 |
| 7 | 19 | 9500 | 1.11 | 5550 | 3950 | 71 |
| 8 | 18 | 9000 | 1.12 | 5600 | 340 | 6 |
| 9 | 16 | 8000 | 1.17 | 5850 | 2150 | 37 |
| Decrease in products price -600, rub./cwt, increase in costs for 1ha - 6000 rub. | | | | | | |
| 1 | 16 | 9600 | 1.13 | 6780 | 2820 | 42 |
| 2 | 13 | 7800 | 1.15 | 6900 | 900 | 13 |
| 3 | 13 | 7800 | 1.18 | 7080 | 720 | 10 |
| 4 | 12 | 7200 | 1.17 | 7020 | 180 | 3 |
| 5 | 16 | 9600 | 1.18 | 7080 | 2520 | 36 |
| 6 | 16 | 9660 | 1.07 | 6420 | 3240 | 50 |
| 7 | 19 | 11400 | 1.11 | 6660 | 4740 | 71 |
| 8 | 18 | 10800 | 1.12 | 6720 | 4080 | 61 |
| 9 | 16 | 9600 | 1.17 | 7020 | 2560 | 36 |
Therefore, agricultural producers should decide on the planting plan and land use before the beginning of the field period. When deciding on the use of land, it is necessary to identify lands that are sustainably efficient or sustainably not effective taking into account the many years of trends and development dynamics of the industry, the region, the economy as a whole. On the use of these lands, the solution can be quite certain. There is still an unsustainable efficiency land use zone where both profit and loss can be generated depending on natural and market conditions. This is a zone of economic risk, entrepreneurial initiatives and projects. Decisions on it should be taken not by the state but by the producers themselves. This is their right for initiative and risk in land use and crop production. In here, the state can act on the processes under consideration by subsidizing the use of certain land areas, production of individual crops, as well as through the implementation of special programs as a whole in the land use system and agricultural sectors.

4. Conclusion
Considered problems of land disuse in the modern economy show the complexity of the situation and multivectority of their solution. There should be no templates to make a decision. It should be taken separately for each land use. The assistance of the State is needed to address the involvement in agriculture; it is done through a program for agricultural land use improvement. In its composition, the following tasks should be consistently solved:

1. Establishment of land suitability for agricultural use. To do this, soil, hydrological, erosion examination should be carried out. This will establish the status and trends of land properties change and identify measures to overcome negative processes — soil protection farming, erosion control, irrigated, drained reclamation, reclamation of alkali lands.

2. Establishing the efficiency of land use in crop production and the allocation of sustainably efficient and sustainably inefficient lands on this basis. The first group of land should be used in crop production, and if some of the plots in this group are not used it must surely be returned to agricultural circulation. For sustainably inefficient land for production, new directions of their use should be found. The most difficult situation is with not sustainably efficient land. A set of measures to ensure sustainable efficiency needs to be developed. The extent of these activities is related to the availability of the necessary investments by the state.

3. Regulation of land use conditions. To do so, it is necessary to establish the supply level of agricultural organizations with manpower, technical means, buildings, plant facilities, investment resources, as well as equilibrium of those resources and land. On this basis, measures should be elaborated to develop the resource basis of crop production. This should be implemented in the form of an integrated program.

4. Food security in the land use system should be decided by the development of a special state program on the basis of the necessary investments for the required land resources to be returned to use.

The proposed approach will allow to transition to a balanced and economically reasonable problem solution of abandoned lands return into agricultural circulation.

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