Bazarkul Bekbenbetova[1], Bazhan Turebekova[2], Nurgul Yesmagulova[3]

WAYS OF EFFECTIVE USE OF WATER RESOURCES IN SOUTHERN REGIONS OF KAZAKHSTAN

The article describes the guidelines for determining the status and management of land and water resources in the southern region of the country with the aim of improving the productivity of agricultural crops and irrigation farming as a whole.

Keywords: *water resources, irrigated land, crops, buffer plants, humidity level.*

Базаркуль Бекбенбетова, Бажан Туребекова, Нургуль Єсмагулова

СПОСОБИ ЕФЕКТИВНОГО ВИКОРИСТАННЯ ВОДНИХ РЕСУРСІВ У ПІВДЕННИХ РЕГІОНАХ КАЗАХСТАНУ

У статті розглянуто основні напрямки визначення стану та раціонального використання земельних і водних ресурсів південного регіону країни з метою підвищення продуктивності як сільськогосподарських культур, так і зрошуваного землеробства в цілому.

Ключові слова: *водні ресурси, зрошувані землі, сільськогосподарські культури, вологозабезпеченість, буферні рослини.*
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Базаркуль Бекбенбетова, Бажан Туребекова, Нургуль Есмагулова

СПОСОБЫ ЭФФЕКТИВНОГО ИСПОЛЬЗОВАНИЯ ВОДНЫХ РЕСУРСОВ В ЮЖНЫХ РЕГИОНАХ КАЗАХСТАНА

В статье рассмотрены основные направления определения состояния и рационального использования земельных и водных ресурсов южного региона страны с целью повышения продуктивности как сельскохозяйственных культур, так и орошаемого земледелия в целом.

Ключевые слова: *водные ресурсы, орошаемые земли, сельскохозяйственные культуры, влагообеспеченность, буферные растения.*

Formulation of the problem. Under modern conditions, the study of the existing system of crop rotations through intensification of irrigated agriculture is impossible without including the mechanisms of dynamic regulation of existing water resources to stabilize the productivity of irrigated hectare, regardless the variations of nature.

In this regard, we think that on the irrigated lands part of the area must be occupied by crops, the growing season of which can be interrupted in case of lack of irrigation water, and the resulting intermediate products could be used for animal feed.

Analysis of key publications on the issue. Scientific basis for improving the effectiveness of the existing system of crop rotation through the intensification of irrigated agriculture was presented by T.K. Abishev (1978), U. Bauer (1975), I.F. Vasiliev (1985), V. Veklenko (2002), G.M. Kalymkulova (1975), V.P. Inozemtsev (1977), I.I. Khoroshilov and V.I. Khoroshilova (1976) et al.

[1] Candidate of Economic Sciences, Associate Professor, Department of Economics, L.N. Gumilyov Eurasian National University, Astana, Republic of Kazakhstan.
[2] Candidate of Economic Sciences, Associate Professor, Department of Economics, L.N. Gumilyov Eurasian National University, Astana, Republic of Kazakhstan.
[3] Candidate of Economic Sciences, Associate Professor, Department of Economics, L.N. Gumilyov Eurasian National University, Astana, Republic of Kazakhstan.

Stability problems of agricultural production and reclamation of agricultural land were considered in the works of Russian scientists V.N. Zhuravlev, S.A. Anokhin, A.S. Kalyuzhny and A. Borisov (2001). The integrated management of the factors of plant life, and the basis of simulations of the formation of crop agriculture was studied by B.B. Shumakov and E.P. Galyamin (1978), E.P. Galyamin, N.N. Mimotin and S.O. Siptits (1978) and others.

Despite the fact that in the practice of agriculture there is an experience of interruption of vegetation grain crops with their hay crops for green fodder for such activities has no scientific basis and can not be used in the system of long-term planning. Therefore, the establishment of sustainable crop rotation with the introduction of buffer cultures and the development of organizational measures to put the product in a buffer of plant growing livestock products determine the relevance of this study.

The main objective of the research is the assessment of land and water resources of the southern region of Kazakhstan, the definition of the nutritional value of products of buffer cultures and farms that may be based on dynamic cooperation.

The main results of the study. Now when the agriculture should reach a new level of technology, the appropriate scientific and technological progress has especially noticeable effect on the yield under unfavorable climatic conditions. So, in specific and sometimes complex conditions of agriculture, it is necessary to find the most effective techniques and methods to achieve higher yields and greater sustainability.

The main limiting factor in dry land agriculture is low and unsustainable crop moisture content in the most critical phase of their development. This factor primarily determines yield, quality and stability, and the impact of other activities (agriculture, fertilizers variety).

According to UNESCO, in the XXth century, water withdrawals for all needs of the world have increased six times and consumption during the same time – five times. In Kazakhstan, the share of irrigated agriculture accounts for over 70% of the water intake of the economy, which means that it is the sector which should focus on the effective use of water.

Consequently, there is a need to implement measures to rationalize water use and consumption in order to minimize the specific consumption of water in all sectors of the economy, especially in irrigated agriculture.

The main sources of irrigation in the country are numerous, constantly and periodically acting surface water streams. South and East water management areas are located in more favorable conditions. Here are concentrated the main surface water resources and possible for use for irrigation (64%) – the Syr Darya, Irtysh, Ili. These rivers are formed in the mountains and have a year-round runoff. Fed by glacial snow, much of their flow (80–90%) is held in spring and summer, which is conducive to irrigated agriculture. Flow variability in them (C = 0.2–0.7) is much less than in the rivers of the Northern and Central regions of the country. Total water resources are 113.0 km^3, from which 49.4 km^3 are formed outside, and 63.6 km^3 come from neighboring territories. The total irrigation capacity of all surface water sources with the regulation of the flow of 4.24 mln ha of regular irrigation and 166 mln ha of estuary (Evniyeva et al., 2006).

For example, in the southern region, in particular in Zhambyl region the total annual runoff surface water is 5.0 mlrd m^3 for irrigation and industrial purposes using

2.8 mlrd. m^3. The main river of the region is the Chu River, which originates in the Tian-Shanya in Kyrgyzstan, the main tributaries are Karakutu, Argayta, Ak-su, Kurgatta. The river flow is regulated. According to the interrepublican water allocation on the Chu River, the share of Zhambyl region (including natural and return flows) is 2790 mln m^3 of which 1540 mln m^3 go in the growing season (Evniyeva et al., 2006).

The second largest in the area is the Talas River, originating from the snows and glaciers of the northern slope of the Talas Alatau. Talas is a large water artery, giving life to the 5 districts of 2 countries. In its middle and lower flow it reaches the irrigated lands of Talase, Dzhambul, Sverdlovsk, Talas and Sarysu districts.

Assa river originates on the slopes of the Kara-Tau, near the border with Kyrgyzstan, at the confluence with the Ters Kurkureu-Su. The river has the annual flow of 206 mln m^3, the Kurkureu-Su river is 190 mln m^3. According to the provisions of the division of the river flow Kurkureu Su Zhambyl region owes 46% of the flow of the growing season and in full winter runoff (Evniyeva et al., 2006).

It is quite probable that the water economy of the republic in the coming years will be developing under water shortage. The deficit in the water basin is typical for Aral Sea, Balkhash, Ural endorheic of the river basins of Shu, Talas, Asa Sarysu, Turgay, Nura. So far, we have remained within the environmental water supply needs of the environment and biota. Limitation of water resources for the benefit of economic development has greatly affected the destruction of ancient natural systems in the lower Syr Darya, Ili, Shu, Talas Asa and other waterways.

Water scarcity, in aggregate with the current economic situation in the country, leads to the reduction of water consumption in the country. Currently, water withdrawal for agriculture has dropped to 15 (as compared to 26 km in 1992), the area of regular irrigation has halved (EU-UNDP project, 2010).

There has been the depletion (exhaustion) of the rivers Chu, Talas and Assa and the consequence of this was partial drying of lakes, floodplain reaches, lowering of ground water. As a result a reduction of the surface runoff in the lower reaches of the listed rivers is intense drying out areas and as a consequence of salinization, degradation of wetlands.

The disappearance of the natural sources of flooding, loss of productivity of hayfields and pastures in dehydrated floodplains and deltas of rivers led to increased grazing impact on the adjacent desert areas, so that there was (a as result of overgrazing and overload pastures) decline in pastures productivity.

At the same time, the reason for low productivity is the fact that not all areas receives the required number of irrigations, moreover, in some farms of the region these is a very low utilization rate of irrigation water.

So, if we consider the process of formation of the grain, for example in wheat it should be noted that the process consists of 3 stages: formation, ripening and maturation.

It should be noted that the seeds of the plant, which is one of the biological objects during swelling and germination, needs moisture, as water determines the structural and functional biological bases of macromolecules, the intensity and direction of metabolism. Therefore, qualitatively and quantitatively vegetative mass depends on productivity.

In the phase of tillering plants also heavily consume moisture and nutrients, the average daily water consumption in the period from germination to tillering is about 17 m^3/ha, in the phase of plants in the tube, it increases almost twice, earing grain – 4 times, by pouring grain – 3 times (Shumakov and Galyamin, 1978).

Maturation involves two phases of grain development: wax and full ripeness. Definitely that the period of maximum water consumption accounts for earing grain phase – early grain filling. For cereals this period is the process of differentiation of the embryo, determined by the growth of cone buds, laid the appropriate number of embryonic germ leaves and primary roots, formation of the shields. In the caryopsis plants begins the process of dehydration, although humidity tissue is kept at 70–75%, and the lack of moisture in the soil during this period can lead to defective grain or not full ripeness.

The impact of climate changes in crop irrigation regime accepted provision within the estimated 85–90%, which suggests that 10–15% (Kalymkulova, 1975) of the irrigation network is idle. Given the current trend to build pressure systems and closed pipelines that provide the maximum resource conservation, the same percentage of using expensive method increases the term of investment return.

Dependence of irrigation on climatic change has affected agricultural crops and in terms of its conformity factor of development and growth of plants. Biological basis for crops are laid in the early growing season, when water availability is high. However, further the infringement of irrigation plants sharply reduces yields, deteriorating quality indicators of agricultural products.

Moreover, it is noticed that the bigger productivity laid in genetic memory of plants is, the more catastrophic infringement of irrigation on the final yield. Therefore, most farms in dry conditions need additional water sources, ignoring the consequences for the ecology of rivers. The result was the disappearance of the lakes Akkol and Aschikol. The lake Bilikol is on the brink of draining. In order to improve the efficiency and the reasonable amount of water and the impact on irrigated land under these conditions, we must use buffer crops.

Buffers are those crops on which can reduce the total water withdrawal for irrigation systems not reducing the value of irrigation rates for other crops. Consequently, buffer cultures can be used at several stages of the growing season. For example corn, which has the final product – grain, intermediate – silage, also wheat is used for green forage, and granulation in combination with alfalfa.

In such a way, the introduction of the system of land use catch crops in dry years will sustain the planned water use crops with the final product of the crops, products which can be used as a feed converted into animal products – meat, milk etc.

Conclusions. At present the irrigated area in Zhambyl is 226.5 ha. Climatic conditions are favorable to the cultivation of these valuable crops such as vegetables, sugar beets, melons, maize, durum wheat. At the same time, with the development of animal husbandry in the area it is necessary to build a solid forage base, which imposes additional problems on irrigated lands because natural hayfields generally exhaust the opportunities.

However, along with it, there is an issue of water efficiency, as the irrational use of it in a number of years has led to the degradation of natural systems, salinization of land, disruption of ecological balance in the lower reaches of rivers.

Therefore, the development and implementation of measures to stabilize the environmental situation under crisis economic situation has the economic significance and saves resources.

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