World Applied Sciences Journal 25 (8): 1161-1165, 2013
ISSN 1818-4952

DOI: 10.5829/idosi.wasj.2013.25.08.13384

Assessment of the Condition Irrigated Land Sharing with GIS-Tehnologiy Use

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Submitted: Sep 16, 2013; **Accepted:** Oct 21, 2013; **Published:** Oct 30, 2013

Abstract: The main objective of agrarian sector of economy of the Republic Kazakhstan is a providing the population with food and processing industry – raw materials. Food security of any state as the guarantee of steady satisfaction of requirement of its population in variety and high-quality food, mainly at the expense of own forces, means and sources of providing is an integral part of national security.

Key words: Economy · Kazakhstan · Food security · Industry

INTRODUCTION

The food security [1] is the system of economic, organizational, technology, social, ecological and other factors directed on stable functioning of agro-industrial complex for the purpose of satisfaction of the population by various and competitive food on scientifically reasonable norms, creations of demanded stocks of production. As a result of carried-out reforms in agrarian sector legal and organizational conditions for functioning of various forms of ownership and managing are created, unreasonable administration is eliminated, privatization of the enterprises is carried out. Nowadays in the country process of reforming of the state agricultural enterprises is almost complete, there were basic changes in structure of property of agricultural producers where the non-state forms become prevailing. Positive shifts are reached in recent years in country agriculture, first of all in agriculture. In the conditions of the accelerated transition to the new economic relations the problems connected with deterioration of a qualitative condition and degradation of farmlands became aggravated. In some regions these processes gained so deep character that restoration of the degraded lands and their return to active economic use by existing methods and means already represent the most difficult task. Along with it the tendency to absolute and relative reduction of productive agricultural grounds [2, 3] remained.

Adverse processes of a transition period caused reduction of land and resource potential, in these conditions, restoration and further development of capacity of agro-industrial complex, get to the category of serious social and economic problems and demand performance of a complex of urgent actions. Now among the directions industrially - innovative development of the country, by the first of priorities it is allocated for agro-industrial complex and processing of agricultural production. The main purpose is - increase of efficiency of agricultural production and the solution of questions of food security, through its optimization and rational use of natural capacity of regions of the country. The carried-out analysis of production of plant growing in system of agrarian and industrial complex of the country is directed on establishment of efficiency of cultivation of various crops in regions (areas) of the country (Figure 1).

The total area of the lands occupied with agricultural crops, on the republic, for the analyzed period increased with 18.37 to 20.12 million hectares or for 9.5%. Dynamics of change of the areas of crops of crops in a section of areas is various. In a number of areas the increase tendency - Almaty – 12.6 thousand hectares, or 1.4% and reduction of the areas of crops - SK – 38.5 thousand hectares or for 5.3% is observed; Zhambyl– 20.1 thousand hectares, or for 3.9%, Kyzylorda – 5.5 thousand hectares or 3.6%. Dynamics of cultivated areas is characterized in Table 1, Figure 2.

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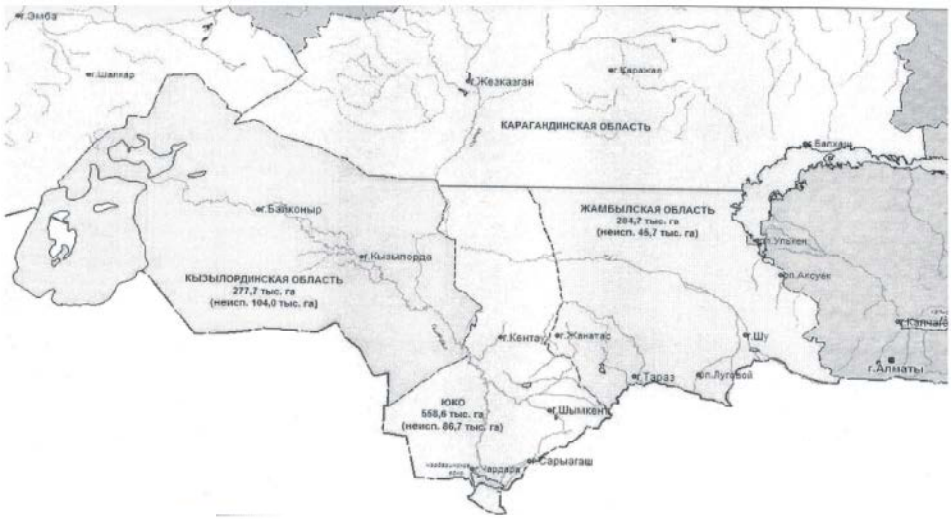

Fig. 1: Arrangements of lands of the southern region of Kazakhstan

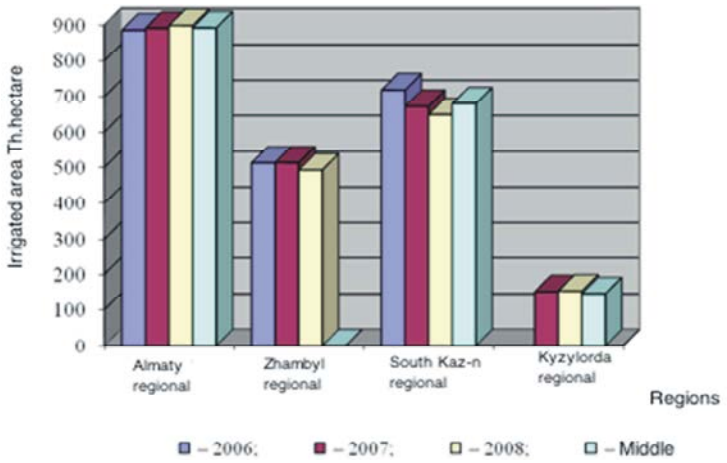

Fig. 2: Cultivated areas of the southern areas of Kazakhstan

Table 1: Cultivated areas on areas (all categories of farms), one thousand hectares

	Years					
Areas	2006	2007	2008	Middle for 2006-2008 yy.	Increase, reduction	2008y to 2006y, %
On the Southern region	2268	2230.3	2185.7	2228	51.3	11.4
Almaty	885.7	891.1	898.3	891.7	12.6	1.4
Zhambyl	512.8	513.5	492.7	506.3	-20.1	-3.9
Kyzylorda	151.6	153.6	146.1	150.4	-5.5	-3.6
The SK	717.9	672.1	648.6	679.6	-38.3	-5.3

In the general structure of crops the greatest specific weight is occupied by the grain crops, which share as a whole on the republic for the analyzed period made about 81%. On areas the specific weight of grain crops fluctuates ranging from 11.3 to 91.4%. Among grain it is necessary to allocate corn crops for grain. The main areas of crops are concentrated generally in Almaty and Zhambyl areas.

In ensuring food security of the republic also important value is allocated for production of rice. The main region of cultivation of rice is Kyzylorda and Almaty areas. It should be noted that for the considered period, the areas taken with rice were reduced by 11.9 thousand hectares or for 13.5%. Reduction of the areas happened generally in Kyzylorda area of - 10.2 thousand hectares. Reduction of the areas of crops of this culture in

Kyzylorda area is quite explainable; in 2006 and 2007 cultivation of this culture in area was unprofitable and only since 2008 the profit is got.

Reduction of the areas of valuable commercial crops as sugar beet (the main region of cultivation – Almaty area) and cotton (The southern Kazakhstan area), respectively on 7.6 thousand hectares (55%) and on 27.2 thousand hectares (1.3%) is observed also. Such cultures as potatoes and vegetables are cultivated almost in all areas of the republic and the area from year to year increase. The same tendency is traced and on melon cultures. So the area taken with potatoes increased by 9.8 thousand hectares (6.4%), vegetables on 8.0 thousand hectares (7.7%), melon fields by 13.9 thousand hectares (33.1%) (Figure 3).

The main indicator of efficiency of cultivation of crops is its productivity. Differentiation of productivity indicators on areas testifies about unused reserves on increase of its size in areas with low productivity of this culture. Productivity grain for the considered period decreased, on the republic as a whole with 13.0 to 11.0 c/hectare. Productivity of corn on grain on the average on the republic made 45.4 c/hectare and rice – 37.6 c/hectare. Productivity of potatoes, vegetables and melon cultures for the analyzed period as a whole on the republic also decreased by 6.5, 1.0 and 4.5% respectively. The same tendency is traced on all other cultures and productivity (Figure 4).

The analysis of the crops given to productivity still remains low and did not reach level of productivity of the advanced farms and the preforming period. The main reasons for decrease in productivity of crops were violation of the production technology of crop production, violation of terms of crops and processing's in view of lack of equipment and fuels and lubricants, untimely and insufficient introduction of mineral and organic fertilizers and some other the organizational and economic reasons. On irrigated lands, except the above-noted reasons it is possible to call also: deterioration of a meliorative condition of lands, shortcomings of irrigating water, violation of a mode of an irrigation of cultures, inopportuneness of carrying out after irrigation processings, deterioration of a technical condition of irrigating systems, low-quality carrying out waterings and some other works. Noted reasons of decrease in productivity and reduction of cultivated areas are caused by lack of equipment and current (financial) assets at again organized agro formations of various forms of managing, considerable disparity of the prices of industrial and agricultural output.

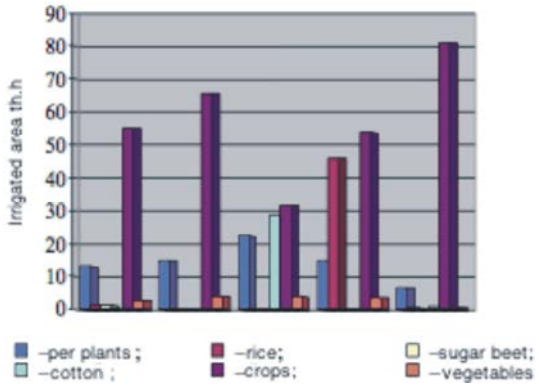

Fig. 3: Structure of cultivated areas of the southern region of RK

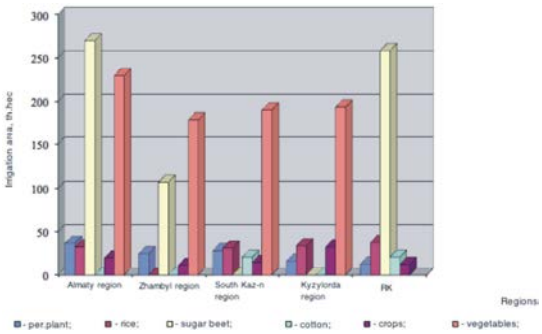

Fig. 4: Productivity of cultivated agricultural cultures of the southern region of RK

Violation of an agrotechnology of cultivation of crops, not paying in of mineral and organic fertilizers under crops of the agricultural grounds, these actions demanding carrying out for increase of fertility of soils, led reduction of cultivated areas of crops, decrease in productivity of crops to a shortage of considerable volumes of crops [4].

In agrarian sector of Kazakhstan, along with other acute problems, there is poorly realized an introduction in its activity of achievements of information technologies. Due to the attachment of any object of agro-industrial complex to geographical coordinates at producers of agrarian sector of economy of the developed states special value was gained by technologies of geoinformation systems. GIS along with the spatial analysis of data opens ample opportunities for research and optimization of all infrastructures of spatial objects. The GIS technologies are successfully applied for complex (economic, marketing, agrotechnological, meliorative, agroecological, etc.) analysis of activity of subjects of agrobusiness. GIS is irreplaceable for the forecast on the basis of the analysis, an assessment and control of

Fig. 5: GIS database of southern region of Kazakhstan

succession of events, decision-making and operational management. Use of GIS allows conducting analytical activity not only in three-dimensional space, but also in last, real and future time that it is almost difficult to execute by means of traditional technologies.

Application of modern technologies on the GIS database, is based on space methods of the remote sensing of Earth (RSE) which allow to increase quickly effective management of production of agricultural production, its productivity and competitiveness that is proved on the example of developed (the USA, Canada, Europe) and even developing countries (Thailand, the Republic of South Africa, the countries of Latin America, etc.). It occurs because of possibility of the analysis of situations throughout all studied natural and territorial complex.

Now in Kazakhstan GIS - technologies widely take root into activity both in other structures of management and on management of water and land resources. Fruitful activity of these structures visually confirms working capacity and productivity of GIS of technologies received by DZZ which is used at the solution of thematic tasks – from local level to large-scale global state programs i.e. who allows to lift agriculture on new level, by introduction of innovative projects of cultivation of the zoned crops considering features of irrigated lands of the southern region of the republic. The solution of an objective by means of GIS allows to pass briefly and long-term forecasts for any period.

GIS development and deployment - technologies in agrarian production consists of several independent stages: Field or site GIS; Agroenterprise GIS; GIS of administrative division (area, area) or country region; agrarian GIS of the country as a part of the national electronic government and so forth.

The example of development of GIS of a field taking into account heterogeneity of its separate sites in Kazakhstan already is available. On system of competitive grants of the World bank and the Ministry of Agriculture of the Republic of Kazakhstan (SKG WB and MCX RK) the "Development of Information Technology and Technical Means for the Differentiated Application of Mineral Fertilizers with Use of the Space Navigation System (GPS, GLONASS)" project, which purpose to show advantages of use of separate elements of the GIS technology to receiving economically justified crop of crops on separately taken field is developed.

Complex monitoring of indicators is made for the solution of an objective on the basis of raster pictures of massifs of an irrigation of the region and the GIS database which allowed to make by carrying out overlay processes vectorization of raster attributive materials, which as a result of steel the base and a basis for a choice and justification of resource-saving technologies of an irrigation of irrigated lands of the southern region (Figure 5), [5] is created.

On the basis of the received indicators it is possible to draw the following conclusions that the southern areas of the republic it is characterized by high heat security and changes from 2800 °C to 4400 °C, very low quantity of a falling out precipitation and changes from 100 to 400 mm a year, limit borders from shallow (95%) to abounding in water (5%) years of a water supply and limit indicators of various year of water security (from 5% to 95%) and their limit values (Figure 6) are defined.

On the basis of monitoring of long-term data taking into account multiple factor DB of GIS it is possible to predict short and long-term indicators of productivity of the zoned crops cultivated in the region of research (Figure 7), [6].

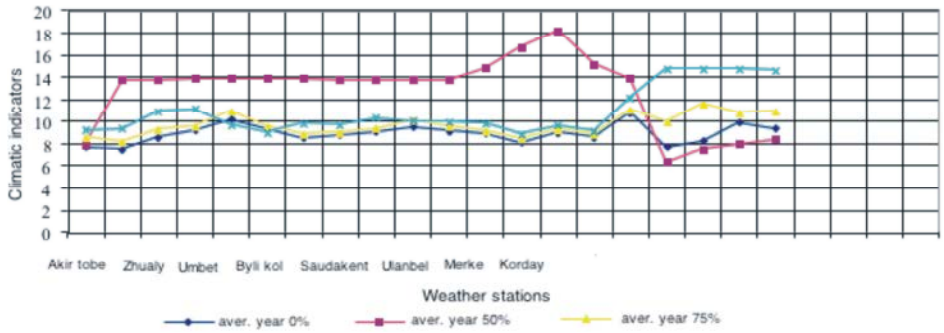

Fig. 6: Limit climatic borders of division into districts of lands by years of security

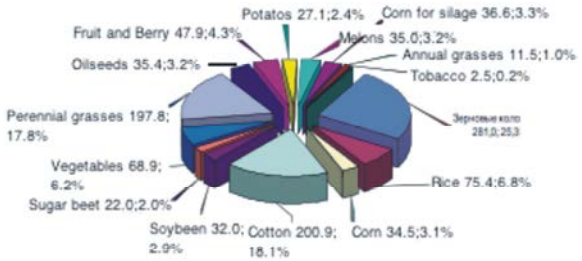

Fig. 7: Expected indicators of productivity of cropsb

Multiple-factor monitoring of the GIS temporary and spatial informational-attributive database allows to analyze, supervise, prove, estimate and to predict a choice of resource-saving technologies of an irrigation at cultivation of the zoned crops taking into account expected year water - security from local to global at strict observance of complex efficiency and ameliorative condition of irrigated lands on the basis of materials of remote sensing.

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