European science review

№ 1–2 2017
January–February

«East West» Association for Advanced Studies and Higher Education GmbH

Vienna
2017

European Sciences review

Scientific journal

№ 1–2 2017 (January–February)

ISSN 2310-5577

Editorial office

European Science Review "East West" Association for Advanced Studies and Higher Education GmbH, Am Gestade 1 1010 Vienna, Austria

E-mail:

info@ew-a.org

Homepage

www.ew-a.org

European Science Review is an international, German/English/Russian language, peer-reviewed journal. It is published bimonthly with circulation of 1000 copies.

The decisive criterion for accepting a manuscript for publication is scientific quality. All research articles published in this journal have undergone a rigorous peer review. Based on initial screening by the editors, each paper is anonymized and reviewed by at least two anonymous referees. Recommending the articles for publishing, the reviewers confirm that in their opinion the submitted article contains important or new scientific results.

East West Association GmbH is not responsible for the stylistic content of the article. The responsibility for the stylistic content lies on an author of an article.

Instructions for authors

Full instructions for manuscript preparation and submission can be found through the "East West" Association GmbH home page at: http://www.ew-a.org.

Material disclaimer

The opinions expressed in the conference proceedings do not necessarily reflect those of the «East West» Association for Advanced Studies and Higher Education GmbH, the editor, the editorial board, or the organization to which the authors are affiliated.

East West Association GmbH is not responsible for the stylistic content of the article. The responsibility for the stylistic content lies on an author of an article.

Included to the open access repositories:

Typeset in Berling by Ziegler Buchdruckerei, Linz, Austria.
Printed by «East West» Association for Advanced Studies and Higher Education GmbH, Vienna, Austria on acid-free paper.

2000 m^3/ha of water. On hydromorphic lands (groundwater level 1,5 ÷ 2 m) and with a shallow layer of soil (0.5 ÷ 1m) should not sand and pebble artificial soil moisture accumulation ratios exceed 1000 ÷ 1500 m3/ha. In our conditions, to determine the salt leaching standards V. R. Volobuev expedient to use the formula.

$$N = 10000 \cdot h \cdot \lg(S_n / S_d)^{\alpha} \quad (11)$$

Here: N — leaching rates, m3/ha; h = capacity of the washed soil-ground layer, m; S_n — salt content in the layer is washed prior to washing (% of dry weight soil-ground); S_d — allowable salt content (% dry weight of soil-ground); *α* — salting rate determined according to experimental industrial washings. Significance soleotdachi depends on water-physical properties of soils and their changes for a variety of loam within the following limits:

– For light mechanical composition depending on the composition of salt — 0.62 (chloride — Cl = 40–60%) — 0.82 (sodium sulfate);

– For the loamy soils of the inhomogeneous structure corresponds α = 0.92 (chloride type of salinity) — 1.12 (sodium sulfate-type);

– For clay or loam with low salting *α* = 1.22 (chloride type of salinity) — 1.42 (sodium sulfate), etc.

The formula for the calculation of V. R. Volobuev less salting land reduces the rate of salt leaching, thus it is advisable to salt leaching standards equate to the above regulations moisture accumulation.

In our conditions, the main method of combating soil salinity is to build on fields year-round washing mode.

$$K_P = \frac{O_P + N + O_C}{ET_C} = 1,1 \div 1,2 \quad (12)$$

CP is the coefficient of leaching regime of irrigation land is based on many years of advanced materials, on the recommendation should be K_p = 1.1–1.2.

In justifying modes and agricultural irrigation standards must take into account a variety of weather conditions and crop technology. To account for the changing weather conditions by way of watering crops as the main option, you must take the totality of precipitation in vegitation period. Calculation of one-time and seasonal irrigation standards for FAO methodology and program SROPWAT to evaluate the efficiency of water use in irrigation systems, water saving in the current and future level of development, water use criteria with a decrease in water supply, determine the exact water needs and water management features.

To determine the norms washing salinity V. R. Volobuev expedient to use the formula. In view of the above, the calculation of one-off and seasonal irrigation standards the same for all irrigated areas of FAO method and program CROPWAT should be used in the Republic of Uzbekistan respectively, adapting and making adjustments.

References:

1. Schroeder V. R., Safonov V. F., Vasiliev I. K., Parenchik R. I., Riftin A. R. Calculated values of irrigation norms of agricultural crops in the basins of the Amu Darya and Syr Darya rivers. – Tashkent. – 1970. – P. – 292.
2. Bespalov N. F., Malabaev N. I., Mambetnazarov B. S., Kuchkarov D. K. Irrigation of crops of cotton crop rotation (hydromodule zoning and modes of crop irrigation by regions of the Republic of Uzbekistan). – Tashkent. – 1992. – P. 191.
3. Schroeder V.R, Vasiliev I. K., Trunov T. A. Hydromodule zoning and calculation of irrigation norms for cotton in the arid zone//Problems of design and efficiency of the irrigation systems in Central Asia collection of scientific papers, – Issue 8, – 1977, – P. 28–41.
4. Ikramov R. K. Clarification of irrigation scheduling of crops and hydro-zoning of irrigated land – the actual problem//O'zbekiston қishloқ hўzhaligi, – No. 3, – 2015. – P. 32 b.
5. Kostyakov A. N. Fundamentals of reclamation, – M.: Sel'khozgiz, – 1951. – P. 652.
6. Hachenko S. I. Water regime management on reclaimed land in the non-black soil zone (hydrological aspects). – A.: Gidrometeoizdat, – 1987. – P. 239.
7. Kwan R. A., Vyshpolsky F. F., Zhdanov G. N. Irrigation norms of crops in Kazakhstan (recommendations). – Zhambyl, – 1990. – P. 75.
8. FAO materials on Irrigation and Drainage 24. "Water consumption selhozkultur" Scientific Information Centre of the Interstate Coordination Water Commission (SIC). – Tashkent. – 2000. – P. 127.
9. Publications FAO Irrigation and Drainage 56 "Evapotranspiration plants" Scientific Information Center of Interstate Coordination Water Commission (SIC). – Tashkent. – 2001. – P. 296.
10. SNIP 08/02/03 85 Drainage systems and facilities/USSR State Building. – M.: TSITP USSR State Committee. – 1986.
11. Laktan N. T. Watering cotton – M. Kolos, – 1978. – P. 175.
12. IkramovR.K. Principles of management of water-salt regime of irrigated lands of Central Asia in the conditions of water scarcity/Tr. SANIIRI. – Tashkent: GIDROINGEO, – 2001. – P. 191.
13. Ramazanov A., Yakubov H. washings and recharge irrigation. – T.: Mehnat, – 1988. – P. 192.

DOI: http://dx.doi.org/10.20534/ESR-17-1.2-177-181

Begmatov Ilkhom Abduraimovich,
Tashkent Institute of Irrigation and Melioration, Uzbekistan.
E-mail: ilkhommatbe@mail.ru

Land meliorative status in irrigated lands of Syrdarya province

Abstract: Article describes the assessment results of land meliorative status in new improved complex approach in districts of Syrdarya province. Research was mostly conducted in the districts. Moreover, the recommendations for improvement of each district is presented.

Keywords:vegetation period, groundwater mineralization, soil salinization, irrigated lands, cadastre, land meliorative status, water supply, wells, closed horizontal drainage.

Introduction

In the region, initial studies on meliorative zoning conducted by V. N. Legostaev and B. S. Konkovin 1961 year. The research proposed a methodology that developed for designing meliorative activities. At that time there was less experience on different types of drainage to against land salinization and was not been using the methods of justification of meliorative activities based on water-salt balance.

A great contribution to the development of methods of engineer-meliorative zoning was done in the 1960s by A. A. Rachinskiy, who summarized the theoretical basis for the study of meliorative zoning based on water-salt balance that required for any meliorative project. However, these studies on meliorative zoning were aimed on meliorative projects of development of new agricultural lands.

Currently indicators of land melioration status cannot be separated from water supply, drainage and technical condition of hydromeliorative systems.

Maintenance of drainage network in operating condition — the basic requirement to ensure a drainage on lands where applicable horizontal drainage, and also in co-operation of this kind of drainage with others. An analysis of the technical condition of drainage network of Syrdarya province farms has shown that as the drainage's technical condition deteriorates, the area of medium — and strongly saline lands and lands with unacceptably high levels of ground water increase, which ultimately affects the productivity of crops.

The presidential decree of the Republic of Uzbekistan of April 29, 2012 "About measures for further improvement of irrigated land and the efficient use of water resources", as well as the state program for development of the water sector for the period 2013–2017, require a deeper study, planning and implementation measures to improve meliorative condition of irrigated lands, as well as improving the scientific methodological basis of scientific studies, which leads to the relevance of the topic.

The literature on water balance calculations in the melioration, there is mainly addressed issues of drawing up balances in a season, a year, or for long time. In the present time when water and other natural resources are limited, it is necessary to a conduct more detailed researches on the regulation of water-salt balance of irrigated lands with time series, such as a month. This is necessary in the operation of hydromeliorative systems and in preparation of projects for improving the integration of natural and economic conditions of the object and establishing the optimum technical and economic parameters of hydromeliorative systems.

In modern practice, actual and forecasted water-salt balance are compiled for one or several territories, or for administrative areas. Due to the fact that the impact of drainage areas include roads, canals, settlements, the overall water balance necessary to be on the gross area of meliorated circuit. This allows to take into account the hydraulic relationship "big" and "small" drainage systems, to more accurately predict the depth of groundwater table and the load on drainage.

The purpose of this research is to carry out meliorative zoning of Syrdarya province, which allows to properly orient in planning of strategies of melioration work and the proof of their effectiveness.

Meliorative zoning for the first time carried out on existing hydromeliorative system, basing on the analysis of actual melioration regimes and recommended settings on the forward-looking terms, based on general and particular water-salt balance.

Study area

The area of research is located in the South Central part of the Open Steppe. According to the administrative division, the research area relates to Sardoba, Havat, Mirzabad Bayaut, Gulistan, Sayhun, Syrdarya and Akaltyn District of Syrdarya province.

The total area Syrdarya province of 427600 hectares, where 298800 hectares is irrigated land. The main crops of the land are cotton (37% of the area) and wheat (30% of the area), with gross harvest of 250344 tons of cotton and 356318 tons of grain (in 2011).

Materials and methods

There has been developed the principles and methodology for meliorative zoning. There has been developed parameters for meliorative regimes for different hydrogeological-soil-meliorative and economic conditions, taking into account the use of resources of collector-drainage waters for irrigation. Achieved meliorative zoning of Syrdarya province on the complexity of melioration and drainage module with the appropriate parameters of recommended meliorative regimes. Additionally, there is refined methods of technical and economic comparison of different types of drainage, zoning map developed by type and size of drainage.

Results and discussion

During the vegetation period of 2011, groundwater depth are divided differently. Saykhunobod, Gulistan and Boyovut districts 1.5–2 m (45–85%), and 2–3 meters (7–51%) were in depth. Areas of Oq oltin, Sardoba, Havas, Mirzaabad and Syrdarya districts were 2–3 meters (62–92%) in depth (Figure 2).

When we analyze the distribution of groundwater mineralization areas, Saykhunabad, Syrdarya, Gulistan districts were 1–3 g/l (50–83%), Boyavut, Oqoltin, Havas, Mirzaabad districts were 3–5 g/l (55–80%), Sardoba district were 5–10 g/l (62%) (Figure 3)

At the end of the vegetation period in 2011, the soil salinity distribution in almost all districts were low saline (77–96%) and high saline (1–20%), and in Mirzabad district almost 50% of the land were medium salined (Figure 4).

Meliorative status of Bayaut, Sardoba, Oqoltin, Mirzaobod, Havas districts of Syrdarya provinces were very low (0–1,1%), poor areas were 8–23%.

Assessment of water supply for irrigated land during the vegetation period following formula were used [1].

$$B_З^{ВП}\,\eta_C + B_{КДС} \quad \langle \quad K_В^{ВП}\left[O_P\right]^{CB}\psi^{CB} \qquad (1)$$

Where: $B_З^{ВП}$ — water sampling during the vegetation period m^3/ha; η_C — Coefficient of irrigation systems; $K_З^{ВП}$ — A decrease in the average irrigation rate, in this case, the maximum yield of agricultural crops will decline by at least 10% in this case. According to "Guidebook", $K_З^{ВП}$ — growing to an average of 0.80, while SANIIRI of the Academy of Sciences the end of the recycling that coefficient is 0.83; $\left[O_P\right]^{CB}$ — Irrigation water mineralization of 1 g/l, which is a significant case for the structure of agricultural real average rate m^3/ha; $\psi^{св}$ — the status of land reclamation and irrigation account of increase in irrigation water was achieved a significant increase in the extent of the corrective coefficient average indicator.

$$\left[O_P\right]^{CB} = \frac{O_P^1 f_1 + O_P f_2\, O_P f_3 + \ldots + O_P^n f_n}{\sum_{i=1}^{n} f_i}, \text{m}^3/\text{ha} \qquad (2)$$

Here: $O_P^1, O_P^2, O_P^n \ldots$ — corresponding to the areas of gidromodul clear standards for agricultural irrigation, m^3/ha; f_1, f_2, f_3 separate fields for crops, ha.

In case of water resources shortage and propensity to land salinization, the water availability of non-vegetation period should be calculated for (from November until April).

$$B_З^{МВ}\,\eta + B_{КДВ} \quad < \quad K_В^{МВ}\left[B\right]_{МВ}^{CC}\psi^{CC} \qquad (3)$$

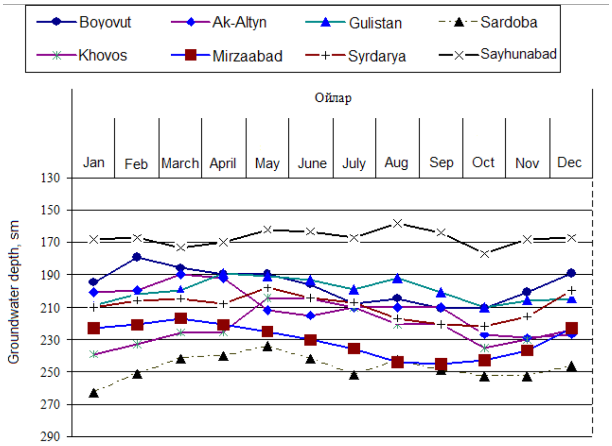


Figure 1. Groundwater depth by months

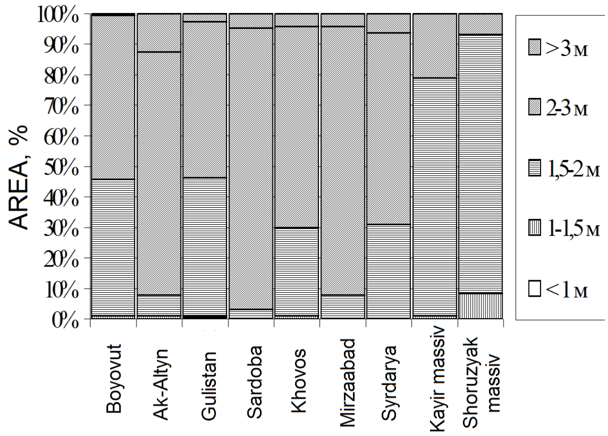


Figure 2. Groundwater depth during the vegetation period

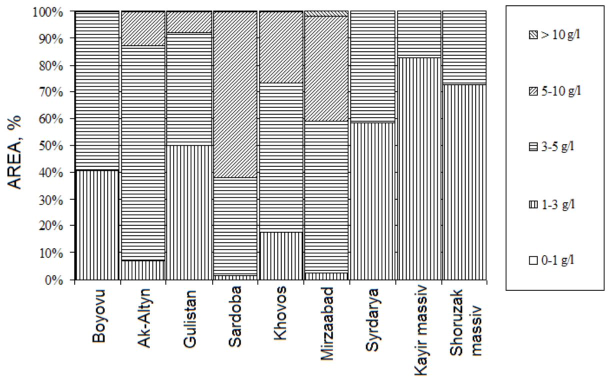


Figure 3. Groundwater mineralization during the vegetation period

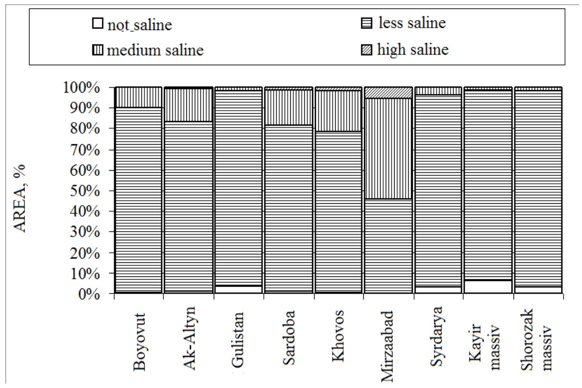


Figure 4. Soil salinity level at the end of vegetation period

In case of water resources shortage and propensity to land salinization, the water availability of non-vegetation period should be calculated for (from November until April).

$$B_3^{MB}\eta + B_{КДВ} < K_B^{MB}\left[B\right]_{MB}^{CC}\psi^{CC} \quad (3)$$

Water demand for non-vegetation period:

$$\left[B^{MB}\right] = \sum_{i-S_O}^{S}\sum_{0}^{F} N_{ij} f_{ij} + \sum_{i-1}^{n} m_j^{B3} f_j^{B3} + O_P^{3эр} f_{3эр}, \text{ m}^3/\text{ha} \quad (4)$$

Here: N_{ij}, f_{ij} — leaching norm and area, m³/ha; i — level of soil salinity; j — soil texture; S, S_O — initial and maximum level of soil salinity; m_j^{B3}, f_j^{B3} — leaching level and area according to soil texture, $O_P^{3эр} f_{3эр}$ — wheat irrigation norm and area in non-vegetation period; K_B^{MC} — coefficient of beforehand identification the water supply. According to SANIIRI, this coefficient equal to K_B^{MB} = = 0,90.

During the non-vegetation period the water use is not enough over the entire Syrdarya province (30–50%). In Ak-Altyn and Sardoba districts the water use was not enough during the vegetation period (70–76%), while in Sayhunabad district the water has been used more than enough (140%) and in other districts the water supply was sufficient.

Even in Syrdarya basin the water resources are enough, during the non-vegetation period the water use coefficient is very low. Causes of such not efficient use of water resources could be not proper actions during leaching also weakness of technics, fuel and labor.

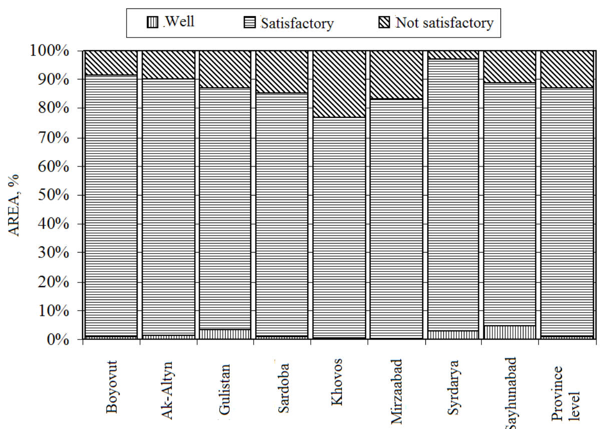
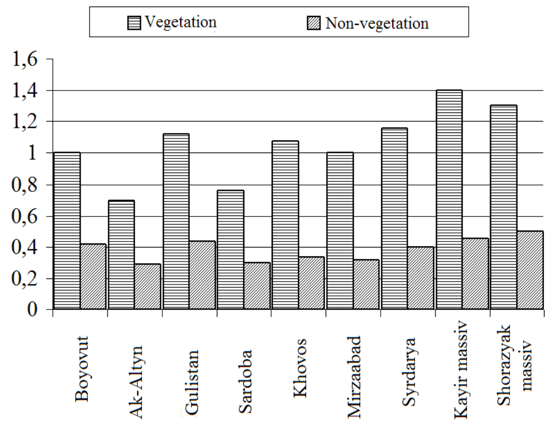


Figure 5. Meliorative status of land Figure according to land cadaster



6. Coefficient of water use by districts

During the year in districts the leaching water supply was not sufficient level (0.77–1.09) (Figure 7) (According to SANIIRI recommendation should be 1.2–1.3). The coefficient of leaching water over the year can be calculated by using:

$$K = \frac{B_{\partial} + O_c + B_{\text{кдс}} + B_{\text{вд}} - C\text{б}_{\partial}}{ET_{\partial}} \qquad (5)$$

Here: $B_А$ — amount of irrigated water by canals, m³/ha; O_c — amount of rainfall, m³/ha; $B_{КДС}$ — irrigated drainage water, m³/ha; $B_{ВА}$ — irrigated well water, m³/ha; $Cб_А$ — amount of drained water from area, m³/ha; $ET_А$ — amount of evapotranspiration, m³/ha;

Ak-Altyn, Sardoba, Khovos, Mirzaabad districts of Syrdarya province mostly designed with closed drainage systems (46–77%), Gulistan, Syrdarya, Sayhunabad districts with open drainage systems (70–77%) and Boyovut district with vertical drainage systems (57%).

Calculation of drainage level [1]

$$Д_{ф} = \frac{Д_{Г} + Д_{В}}{B + O_C + Ф_{МК} + П - О - С} \qquad (6)$$

Here: $Д_Г$ — amount of drainage water from horizontal drainage, m³/ha; $Д_В$ — amount of drainage water from vertical drainage, m³/ha; B — amount of water provided for district, m³/ha; O_c — amount of precipitation, m³/ha; $Ф_{мк}$ — amount of filtration from main canals, m³/ha; $П$ — amount of water came from underground, m³/ha; $О$ — amount of water flowed from underground m³/ha; $С$ — operational water use, m³/ha;

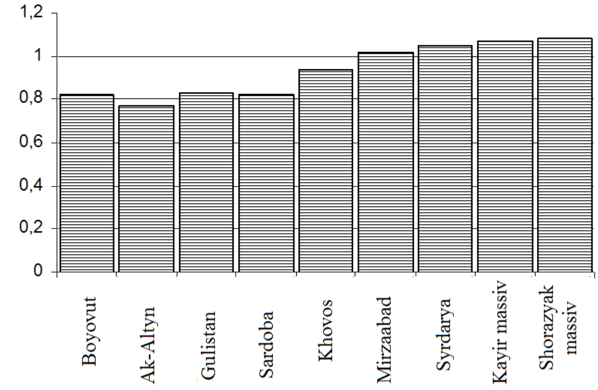


Figure 7. Regime of leaching

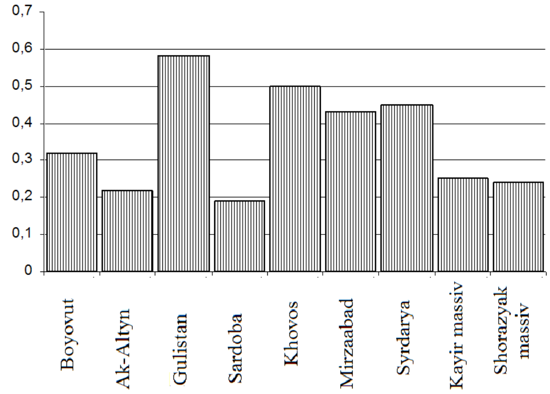


Figure 8. Level of drainages

In 2011 the productivity of cotton and wheat was diverse. In Boyovut, Ak-Altyn, Gulistan, Syrdarya, Sayhunabad va Sardoba the cotton yield was 2,0–2,8 thousand kilogram per hectare and wheat crop was 4,7–5,4 thousand kilogram per hectare. Meanwhile, in Khovos and Mirzabad dirctricts cotton yield was 1,5–1,6 thousand kilogram per hectare and wheat yield 2,2–2,8 thousand kilogram per hectare (Figure 9). It show that crop productivity was various according to soil salinity level.

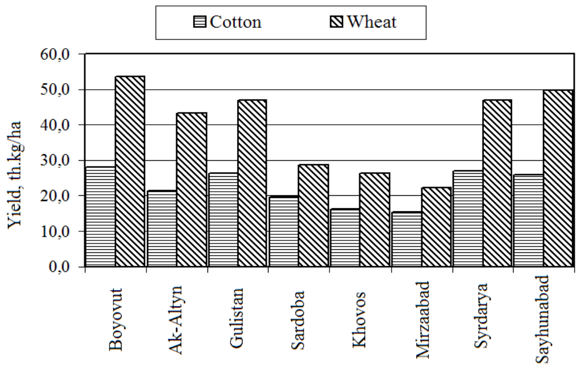


Figure 9. Cotton and wheat yields by districts

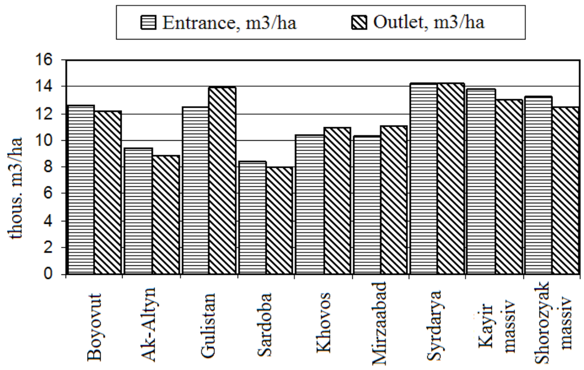


Figure 10. Water balance by district

According to data on total water balance by distrcits the water resources divided variously to districts (10, 11, 12 – Figures)

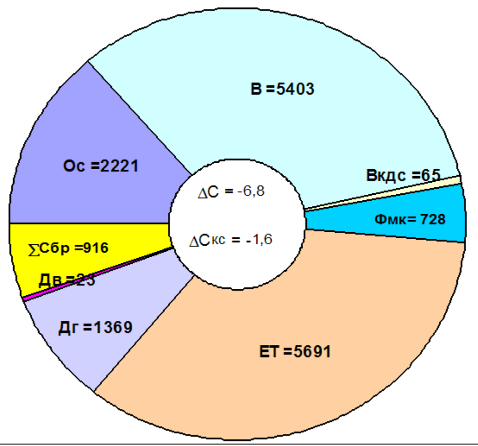
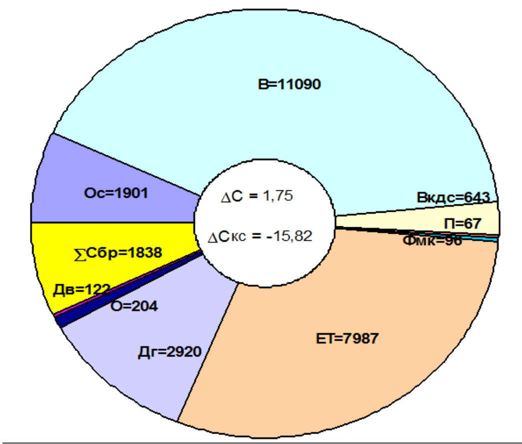


Figure 11. Water balance of Sardoba district



12. Figure Water balance of Kayir massiv (Sayhunabad district)

Here: O_c — amount of precipitation, m³/ha; B — amount of irrigated water by canal to districst, m³/ha; $B_{КДС}$ — amount of used water for irrigation from collector-drainage system, m³/ha; $B_{ВА}$ — amount of used water for irrigation from vertical drainage, m³/ha; П — amount of water came from underground, m^3/ha; $Ф_{мк}$ — amount of filtration from main canals, m^3/ha; ET — amount of evopotransporation, m^3/ha; $Д_г$ — amount of water went through horizontal drainage, m^3/ha; O — amount of water flowed from underground, m^3/ha; $Д_в$ — amount of water went through vertical drainage, m^3/ha; $\Sigma_{сбр}$ — total amount of waste water, m^3/ha; ΔC — change of salt base over the balance contour; $\Delta C_{кс}$ — change of salt base in root zone.

Conclusion

Has been done complex analysis of meliorative processes in Syrdarya province including water-salt balance, causes and directions for improvements.

Improvement on meliorative status of Syrdarya province in progress and yearly 0.5–21 tons/ha salt has been decreasing. But, because of inefficient use of water resources and leaching technologies most of lands still salined which effective crop yield.

Structured drainages in irrigated lands are currently functioning in satisfactory level. Nevertheless, if during non-vegetation period the water for leaching will be in required level the technic condition and functioning of drainages will be well.

Rehabilitation of vertical and horizontal drainages also maintain pumps and motors including changing of old parts is needed.

Use of drainage water during vegetation period in Boyovut, Gulistan. Syrdaya and Sayhunabad districts could minimize limit of water use from canals and provides chance to irrigate more water to Ak-Altyn, Khovos, Sardoba, Mirzaabad districts.

References:

1. Ikramov R. K. Principles of water-salt regime management in irrigated lands of Central Asia in during the water scarcity. – Tashkent: Gidroingeo, – 2001.

Contents