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INTEGRATED WATER RESOURCES MANagements ON-FARM LEVEL

These researches were carried out within the framework of the project “ On-farm soil and water resources management for sustainable agricultural systems in Central Asia ”, which was financed by the Asian Bank in cooperation with the International Center of Agricultural Researches in the Dry Areas (ICARDA). The researches were conducted by collaboration with National Scientific Centers in during of 2000-2002 years. Agriculture of Republic Uzbekistan is being occupied by more than 60 % of the total population and more than 90 % of foodstuffs are produced in this sector. Irrigated agriculture is producing over 90 % of the total agricultural production of the Republic. At the same time, yields of main agricultural crops such as cotton and wheat are still low. Accessible water resources are practically exhausted. Overall objectives of Uzbekistan as well as other republics of the Central Asia are maintenance with the foodstuffs; achievement of ecological stability; increase of the people’s income. That is why the Integrated approaching to the natural and manpower resources management is necessary for achievement of these purposes, instead of existing fragmentary technologies. Integrated approach is considered as a strategy for achievements of the purposes. Such approach allows taking into account political, economical, social and ecological aspects. Although studying of the soil and water resources management in Uzbekistan and neighbor countries has the long history, existing recommendations appreciably have outdated already, because agricultural restructuring is carried out intensively, former technical and economic estimations have been executed for the large state farms based on artificial financial relations. Therefore, available knowledge should be tested in the new conditions, be improved, and developed in view of developing realities. Thus, the developing social and economic situation and a status of the natural environment in the Central - Asian region demand new strategy of rational use of available water resources. The water-savings in all spheres of water use and water consumption is a unique source of water for sustainable development of economy of the new independent states and stabilization of ecological conditions in the region.

The project has consisted of the following components:

- I. Development of improved strategies for on-farm soil, water, and crop management (water management, irrigation methods, fertility, tillage, crop diversification)
- II. Assessing and improving farm-level irrigation and drainage management to ensure sustainability of irrigated cropping systems (leaching, drainage, irrigation methods and scheduling, crop selection).
- III. Assessing and improving utilization of marginal water sources (recycled water, drainage water, etc.).
- IV. Upgrading of potential of National agricultural and water-economic research services in the countries of Central Asia by the organization of training courses.

The researches were carried out in cooperation with ICARDA, Central Asian Scientific Research Institute for Irrigation (SANIIRI), Uzbek Cotton Growing Research Institute (UZCGRI) and Gallaaral branch of the Andizhan Institute of the Grain and Leguminous Crops, and also with farmers and workers of co-operative farms.

Within the framework of Component I the following irrigation technologies: furrow and djoyak (zigzag), contour irrigation technologies to improve uniformity of irrigation water distribution and to decrease the washout of fertile soil layers, utilization of K-9 and other polymers to reduce soil erosion, testing portable polyethylene shoots PPS-50 for improving water-use efficiency through reduction of irrigation rates, utilization of corrugated hoses for optimizing the process of preparation for irrigation have been tested in Boikozon farm of Parkent rayon Tashkent oblast

conditions with land's slope 0.09-0.11 (Kambarov B.F., Ikramov R.K., Yuldashev T.U., Rachimov N.R.). Trial experiments on improved irrigation technologies have been established on experimental plots planted under winter wheat, maize, potatoes and melon. Also were testing a certified technology of fodder beet, maize, and cotton irrigation under utilization of plastic film and its adoption for production conditions (Bezborodov G.A.). In all variants irrigation were carried out with optimum Irrigation technologies elements (the furrow's discharge and length, irrigation cutting time, net and gross irrigation rates). It were demonstrated economy of water up to 900-cub m water per ha, reduce up to zero soil erosion, water use efficiency increasing up to 1,5-2,0 times. Increase of labor productivity irrigators up to 2-2,5 times. For the first time the new irrigation device with water-releases PPS-50 regulating the charge is developed and designed. For the first time in Uzbekistan winter wheat irrigation tests on contour furrows are executed. Also the new technology with application PPS-50 and hydrants – extinguishers for such irrigation were created. The method for identifying of optimum elements of irrigation (the furrow's discharge and length, irrigation cutting time, net and gross irrigation rates) on the sloping lands was advanced. Scientific novelty consists: for the first time infiltration parameters at various designs furrows (djoyaks, utilized polymer K-9, contour furrows) and crops (a winter wheat, maize, potato, melon) were established experimentally on the basis of the theory of movement of an irrigation jet and water infiltration in soils in sloping lands.

Since April, 2002 investigations were carrying out on furrow irrigation technology on low slopes (flat areas) and subjected to salinization lands of Dzhabul farm of Khodgeily rayon of Republics Karakalpakstan. Due to rational of water use for cotton irrigation through furrows, and also creation of irrigation sites with a passer irrigation on furrows from single-breasted irrigation channels, achieves increase of water-availability up to 10-15 % (Kurbanbaev E.K., Karimova O.).

Self-pressured drip and drip-jet irrigation systems were constructed, production researches of irrigation technology of young vineyards and a vegetable - melons (water-melons, melons, tomatoes, the Bulgarian pepper, cucumbers, a potato in inter rows on the soils with slopes (0,1-0,15) are realized. The economy of water has made from 40 up to 60 % (Palvanov T.I., Ikramov R.K., Novikova A.V., Karimov S.).

Researches are executed according to potential and efficiency of use marginal (collector-waste waters) in agricultural systems of mentioned above cooperative farm Boikozon. The developed technique of an estimation of potential marginal waters is under production conditions tested, the adaptation convenient for simple peasants for rise and water delivery from a waste collector on adjoining along it irrigated sites is created. Yields of potato, corn, string beans, and also apples were higher than on the control (Ikramov R.K., Mamatov C.).

In two farms ("Kushman ata" and "Iskander" in S.Rashidov rayon of Syrdarya oblast) on alluvial proluvial plains of Hungry steppe on the average a watercourse of Syr-Darya on the soils subjected salinization, production researches of efficiency irrigation of cotton by sprinkler machines " Bainlih" (Germany) and seasonal - stationary system with medium-jet devices, were constructed from polyethylene are executed within the framework of the project (irrigation of repeated crops - chickpea, a spring wheat, carrots, cucumbers, water-melons, melons). On cotton irrigation it is achieved reduction of specific expenses of water on unit of a crop more, than in 2 times (Ikramov R.K., Maltsev S.N.).

Crop rotations are advanced by crops diversification and anti erosion processing of soils raising efficiency rainfed soils in Gallaaral rayon of Dzhezak oblast. It is established, for purposes: maintaining of positive humus balance, rational use of a moisture, reduction of water and wind erosion, processing soils after cleaning with the subsequent processing flat hoes or disk instruments, increasing of the general productivity of rainfed arable lands are necessary bringing leguminous crops to the circuit of a crop rotation (Yusupov H.).

On central experimental base Uzbek Cotton Growing Research Institute (UzCGRI) in Tashkent oblast were carrying out researches on diversification and intensification of agriculture at cultivation of a cotton and winter wheat as basic crops and anti erosion soil processing.

It is established, that sowing of crop of repeated leguminous cultures (mash-chickpea) after winter wheat and intermediate crops in short crop rotation cotton - winter grain improves agrophysical properties of soils and increases the contents of nutrients (humus, nitrogen). By researches of various circuits of the minimized autumn technology of preparation of soils it is established, that the greatest yields are reached by winter wheat sowed on a growing cotton by seeder CZK-2,1, together with at a plowed land (Hasanov B., Halikova F.).

Within the framework of the Component II production research on water salt regimes in irrigated lands subjected to salinization in farm "Kushman-ata" of S.Rashidovskiy rayon of Syr-Darya oblast (alluvial-proluvial plain - Hungry steppe, an average watercourse Syr-Darya) is executed. By Field experiences were tested water saving irrigation technology through furrow and by discrete way with the help of the switch of a stream on a background of the capital layout executed within the framework of the project, providing creation of minimally necessary washing mode of an irrigation. Efficiency of technology of winter-spring washings of the salted soils before and after carrying out of a capital lay-out is shown. Optimum combinations of irrigation regimes, ground and drainage water availability at which high crops yields are provided at the minimal expenses of water and work have been identified by inspection of the technical condition of the closed horizontal and open drainage, ground waters and soil salinity of aeration zones. It was determinate by mathematical modeling of water-salt regime on a background of drainage under a cover of a cotton and wheat. Besides are constructed and equipped 8 lysimeter with soils, which are not broken structure. For the first time researches on studying a share of participation of ground waters in root zone are carried out at cultivation of a winter wheat and repeated maize (Ikramov R.K., Tsai O.G.).

Within the framework of the Component III 2001-2002 production researches in farm "Kushmanata" of S.Rashidovskiy rayon of Syr-Darya oblast on use on an crops irrigation (cotton, sesame, pistachios, corn and trees of a mulberry) mineralized collector -drainage waters were carried out. Irrigation Variants by collector-drainage water in a "pure" kind (3,5-5,6 gram/litr), mixed with irrigating water (up to 3 gram/litr) and irrigating water from the channel (up to 1,5 gram/litr) were investigated. Researches have shown, that by sufficient degree of soil drainage in conditions of Hungry steppe with the high maintenance of ions of calcium in soil - absorbent complex, and also the chemical compound of collector-drainage waters concerning on negative ion to sulphatic, and on cation to Na-magnesian, deterioration of physical properties of soils does not occur. Depending on growth of a mineralization of irrigation water, crops productivity is a little reduced, however their cultivation remains profitable. Negative influence on crops quality it is not revealed. At the same time, by using of mineralized collector-drainage waters on crop's irrigation, from spring by the autumn there is a big restoration soil salinity, that demands additional expenses of water and work for soil leaching and a drainage (Ikramov R.K., Mamatov S.).

Experimental Site in territory of farm "Dustlik" Besharik rayon of the Fergana oblast where wind speed reaches up to 15-24 m/s have been established for testing saline water utilization for windbreak forest strip. Two experiments have been set up at the established experimental site. First experiment have been based on the existing windbreak forest strips. The other one have been initiated by planting drought- and salt-tolerant tree varieties: black poplar, Bollet poplar, oleaster, English elm, willow, and quince. Shrubs was represented by pistachios, pomegranates, figs, and mulberries. These research showed opportunity for using on irrigation available drainage-waste waters, influence of forest strip for deflationary processes preventing and due to it increase of cotton yields (Mirzadzhanov K.M).

Researches on Subsoil irrigation of winter wheat were carried out In territory of Fergana branch of UzCGRI with the closed horizontal drainage, in conditions grassland and heavy mechanical texture. A mineralization of subsoil waters within the limits of 1-3 г/л. Due to

regulation of a drain flows, depth of a level of subsoil waters was supported in limits from 0,57 - 1,91 m, depending on the period of year and a phase of development of crops. Winter yields by subsoil irrigation were up to 0.58-0.63 t/ha more than in comparison with the control. The economy of irrigating water has made about 1000 m³ per ha (Mirzadzhanov K.M).

Within the framework of the given project crops irrigation regimes were scheduled by using the automatic mini meteorological station in which the evaporator class A is established with using standards of the USA Ministry of Agriculture. Crops root zone's soil moisture were predicted accordance to drawing up of daily balances of a soil moisture, and crop's irrigation were scheduled by adopting FAO CROPWAT-7.0 Model in Uzbekistan conditions.

Supervision over soaking up pressure of ground use тензиометров - иррометров supervised humidity of ground and approach of terms поливов.

Monitoring of Social and economic efficiency soil and water resources management on pilot sites in Parkent rayon of the Tashkent oblast and Sh .Rashidov rayon of Syr-Darya oblast have been carried out since November, 2001.

On the Component IV farmers of pilot objects, scientific employees of national institutes of Republic Uzbekistan who had participated in realization of the given project, have passed special training at the Training Courses, seminars and Farmer's Field Day, which had been organized for implementation of new technologies and management methods.