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of the Institute of Plant Biology and Biotechnology

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RICE CULTURE IN KAZAKHSTAN

Abstract. Rice is very important crop having profound effect on food security of Eurasia and even of the whole world and is and will be the main food product for 4.6 billion of people of the world over the period of 2030-2050. This crop is cultivated in the controlled agrotechnical conditions and, therefore, the crop yield capacity may be significantly improved. Current historical, archeological, paleobotanical and linguistic studies' results show that rice is very ancient crop cultivated 20 and more thousand age in Indo-China. From Indo-China region, rice cultivation spread to China and from there - to Manchukuo, Korea, Japan and other countries. According to the results of the archeological excavations and written sources, the connection between India and the Central Asia occurred in the 3rd century b.c.; connection with China occurred since the 2nd century b.c. after the trip of Chzhan Tzyan and building the Silk Way. Central Asia is the most ancient region of rice cultivation in the Eurasia (since 7th century b.c.). Rice came to the other regions, including Aral Sea area (Kyzylorda region) from Central Asia. Historic way of rice cultivation development in Kazakhstan (Kyzylorda region) may be conditionally subdivided into 5 periods. Rice cultivation transfers to the new qualitative level every 25-30 years.

Keywords: rice, rice cultivation origin, rice spreading to Central Asia and Kazakhstan (Kyzylorda region). Rice cultivation development backdating and problems.

Rice is a very ancient agricultural crop of the Asia and is among the most important food crop of the world. This crop is cultivated in 112 countries over the area of more than 147 mln. hectares and the gross croppage in 1990 was 426.6 mln. tons, 433.2 mln. tons in 1995, and over the last decades an average rice croppage exceeded 700 mln. tons. According to the forecasts of the UN specialists, the gross croppage of rice will increase by 7% by 2020 and will reach 750 mln. tons. Therefore, rice will become the main food product for 4.6-5.0 billion people of the world whose well-being and sustainable demographic development depends on increase in rice cropping capacity. Rice is cultivated under the controlled agrotechnical conditions and, therefore, it is possible to increase the rice cropping capacity significantly. As a result of rice selection and genetics support by governments of many countries, high-yielding and intensive varieties have been bred and introduced into production.

Thanks to implementation of the packaged integrated rice cropping technology and subject to strict adherence to such technologies provisions, an average cropping capacity in the conditions of Australia and Egypt was 97-91 hundreds kilograms per hectare, in Japan - 67 hundreds kilograms per hectare, in Korea - 66 h.kg./hect. and in China - 62 h.kg./hect. Nevertheless, it is not that easy to ensure such a high crop yield in many countries, including Aral Sea area of Kazakhstan [1-4].

In Kazakhstan, rice plantations are located along the Syr-Darya River banks and banks of Ili and Karatal Rivers. Soil reclamation conditions and agricultural state of those areas are favorable for getting heavy crops of rice. According to scientists, photosynthetically active radiation (PAR) intensity within the area between the 40-500 latitudes is within the range of 3.2-2.0 bln. kcal/ha, which is sufficient for formation of biomass of 400-250 h.kg./ha. The main rice cultivation area of Kazakhstan - lower reaches of Syr-Darya River, is located within this latitude ($43\text{-}46^0$). Therefore, the solar radiation intensity is sufficient for production of heavy crops of biomass and grain [1, 3, 5-8].

Rice Cultivation Origin and Its Distribution in the Central Asia Area. Current historical, archeological, paleobotanical and linguistic studies' results show that rice is a very ancient crop of the world [1, 3, 6, 8-12].

Thus, according to the results of research conducted by Y.P. Aleshin [9] and N.I. Vavilov [10], wild rice domestication, i.e. turning into cultivated (cereal) one, happened more than 20 thousand years ago in the Indo-China area. This area covers Burma, Laos, Thailand, Northern Vietnam and southern parts of Yunnan. From that region, rice cultivation spread all over the Indo-China region. In IV millennium B.C., rice cultivation was developing in this region. From Indo-China region, rice cultivation spread to China and from there - to Manchukuo, Korea and Japan. Turning the wild species of rice into cultivated ones was carried out in the south-west of India at the same time and irrespective of the above-specified regions. According to the China chronicles, rice was cultivated on the banks of Huang He (Yellow, Sary Ozen) River during the period of the mythical emperor Yui reign (22nd century b.c.).

Rice grain in clay jars and rice pictures were found during the archeological excavations carried out within the area of Nong Nah Tkha populated locality at the Khorat valley of Thailand. According to the results of radiocarbon and thermoluminescent analyses of these grains and substances, the age of these grains and substances is 5370±320 b.c. [9, 11, 12].

Based on the rice specimen found in the course of archeological excavations carried out in Viet Nam and the neighboring countries, scientists came to conclusion that rice was cultivated in the Asian countries as early as 50 centuries ago. Since wild rice species and ancient cultivated ones are available in the South-East Asia.

In opinion of many scientists (M.V. Brzhezitski, 1934, G.G. Guschin, 1938, Dao The Tuan, 1960, V.B. Zaitsev, 1971, 1980, I.I. Sokolova, 1975), rice has been cultivated since 111 millennium b.c. De Candol (1883, 1885) put forward an assumption that India and Southern China are the countries of rice origin [1, 3, 9, 11, 12].

Having generalized archeological, linguistic and folklore data, Dao Tkhe Tuan [11] believes that rice originates from South-East Asia (SEA). Thereat, there are three rice origin areas, namely: South China (rice cultivation since 3rd millennium b.c.), India (since 2nd millennium b.c.) and Indo-China region (since 1st millennium b.c.). Rice cultivation spread from India to the west and to the north and from China and Indo-China to the east and south. In the opinion of Y.P. Aleshin [9], rice cultivation was well developed in Indo-China region 5000 - 4000 years b.c. Water buffalo specially trained to work at the water-logged areas played an important part in rice cultivation and its further development. Buffalo's hoofs are wide and strong and while they buffalos walk, they work the wet soil well. Later on, they began to use buffalos for rice cultivation in China and Malaysia-and-Philippines area.

Wild forms and the first cultivated species of rice grew and developed in monsoon climate conditions. Correspondingly, rice is a hygrophytic plant and its properties such as growth and development in water-logged conditions developed under the effect of monsoon rains [13]. Nevertheless, there are no heavy monsoon rains in the Central Asia and south of Kazakhstan. Therefore, rice cultivation in these regions is possible only in the form of irrigated cropping. According to V.B. Zaitsev [14], complex irrigation systems occurred only in slave-owning societies since it was possible to involve a numerous workforce - slaves, in the necessary work. Slave-owing countries first occurred in the Central Asia region in the 7th century b.c. Those countries were as follows: Baktriya (part of Afghanistan, south of Tajikistan and Uzbekistan), Khoresm (south of Uzbekistan, and south-west of Kazakhstan) and Parphia (south of Turkmenistan and north of Iran). Scientists think that it was exactly that time when rice cultivation occurred in the Central Asia. Before that period (up to the 7th century b.c.), rice cultivation could not be possible in that region. According to the results of the archeological excavations and written sources, the connection between India and the Central Asia occurred in the 3rd century b.c.; connection with China occurred since the 2nd century b.c. after the trip of Chzhan Tzyan and building the Silk Way. Rice was brought to the Central Asia and Kazakhstan from Hindu Kush and Baktria (Afghanistan) [1, 3, 9, 12].

Ancient rice culture in the Central Asia is solely of Indian origin. Thereat, small-grain varieties are more adaptive and could acclimatize in the continental climate. Central-Asian small-kernel rice variety with semi-rigid awns originated from those forms. After establishing trading connections with China in the 1st century b.c., short-season varieties were delivered to the region. Under the Central Asia conditions, awns become more rigid, ears and grains become bigger. Central Asian large-kerneled rice varieties were

developed based on those original varieties. Therefore, Central Asia is the most ancient region of rice cultivation in the Eurasia (since 7th century b.c.). To the other regions, including the lower reaches of Syr Darya River (Kyzylorda region), rice came from Central Asia [1, 3, 12].

Rice Cultivation Development in Kazakhstan, Stages and Problems. Rice is cultivated in Kazakhstan mainly in the following two oases: in the lower reaches of Syr Darya River (in the territory of Kyzylorda and South Kazakhstan regions) and in the valleys of Ily and Karatal Rivers [1, 3]. Aral Sea region (lower reaches of Syr Darya and Amu-Darya Rivers) is one of the most ancient areas of irrigated agriculture. Due to the climatic conditions (desert and semi-desert area) and soil fertility, the lower reaches of Syr Darya River have been the irrigated agriculture area since the most ancient time. Nevertheless, as compared to the valleys of the rivers Nile, Tigris and Euphrates, where there are monsoon climatic conditions, the weather conditions in the Syr-Darya River area are more severe and soil is more argillaceous. Therefore, irrigated agriculture and soil processing is necessary in this area to cultivate agricultural crops (including rice). Therefore, agriculture development in this area was rather slow. Nevertheless, historical research, archeological expeditions and records of scientists is indicative of the fact that small and relatively large channels were made in VI century b.c. from Syr-Darya River for irrigation purpose [3, 15].

Over the period of VIII-IV centuries b.c., Syr-Darya River and Aral Sea River and the great Kazakh steppe was inhabited by the union of tribes called by the father of history - *Herodotus,* as **Scyfthians**, and according to the sources of the Achaemenid dynasty Iran and the Greek historian - Strabon, they were called **Saks**.

Saks inhabited the area with Yaksart (Syr-Darya) and Oxus (Amu-Darya) Rivers. During the first millennium b.c., Syr-Darya Saks culture reached its peak. There were fortified towns and more than 500 thousand hectares of irrigated land in the lower reaches of Syr-Darya River [15, 16].

There were no wild forms of rice within the water-logged and irrigated lands of the Syr-Darya River lower reaches. In VII-VI b.c., inhabitants of Fergana and lower reaches of Amu-Darya River cultivated wheat, millet, barley and cucurbits crops as well as rice (on small areas). Resulting from cultural and economic connections of Aral Sea area Saks with the Fergana inhabitants contributed to development of farming agriculture, partial transfer of the nomadic system to the agricultural one [15].

According to the findings of the Khoresm expedition of the Ethnography Institute under the USSR Science Academy, irrigated agriculture was well developed along both banks of Syr-Darya River. In the antique (ancient) time (over the period of the 3rd century b.c. all the way through the 2nd century a.c.) there were approximately 2.2-2.5 mln. hectares of cultivated land [8, 17]. Irrigated agriculture was developing in the lower reaches of Syr-Darya River and also along the banks of Talas, Chu Rivers and in Semirechye area. Ruins of settlements with remains of ancient irrigations systems in the Syr-Darya River estuary are indicative of the fact. Settled people of the South Kazakhstan were growing wheat, barley, millet, oats and other crops [15, 16]. History of the area is the history of endless feuds between the tribes and families, hit-run raids and conquests of different conquerors. All that resulted in degradation of agriculture. Invasion of Mongols brought destruction, devastation and affected the sedentary life in this area the most. Irrigation systems were destroyed and irrigated agriculture was completely dilapidated. Obviously, there was no information on occurrence and spread of rice culture in this area post Mongols invasion and up to the XIX century [1, 3, 12, 15]. Thus, in opinion of some scientists [18], there were no rice crops in the second half of XIX century, while others believe that they began to cultivate rice in this area after the Great October Socialist Revolution. According to the data provided by some scientists [19], experience of rice cultivation in Kyzylorda region (Kazakhstan) came with the Korean migrants in 1928-1929 from the Far East. According to I.I. Sokolova [20], first they began to cultivate rice in the Ily River estuary and then rice cultivation spread to the lower reaches of Syr-Darya River (Kyzylorda region).

In opinion of I.V. Ovod [21], rice cultivation came from the Central Asia. By means of the comparative study of the specimen from the global collection of the All-Union Research Institute of Plant Breeding taken at the Tashkent rice cultivation area and those taken by the first expeditions of the institute in the territory of the present-day Kyzylorda region, direct genetic connection of both varieties by morphological and biological properties was established [22]. Origin and development of rice cultivation in the south of Kazakhstan is one of the links of the general historical process of rice cultivation spreading and irrigated agriculture development. There were no wild forms and ancient cultivated varieties of rice

selected by local inhabitants rice were absent in the marshy delta plains of the Kazakhstan Aral sea region; the first farmers brought not only rice seeds with them but also irrigation systems construction experience from the other sources of irrigated agriculture [1, 3, 12].

In 1853, after accession by the lower reaches of Syr-Darya River and south of Kazakhstan to Russian Empire after severe winter and wide-scale loss of cattle, the irrigated agriculture products became the only source of food for population of this area. Nevertheless, competition for the irrigation water happened between the cotton plant and rice farmers due to the increase in the cultivated area in 80s of the XIX century in Central Asia. The need arose of new irrigated land for rice cultivation. Therefore, research was conducted over the period of 1894-1895 to find new irrigated land on the left bank of Syr-Darya River in the desert steppe (Betpakdala) and all the way to the dry bed of Zhana Darya River. Resulting from development of new irrigated land, rice cultivation area moved to the northern regions. These regions included the lower reaches of Syr-Darya (present-day Kyzylorda region). The first rice plantings occurred in the Shiyeli area and at the Akmeshit town in 1895-1896; in 1897, rice planting area was 300 hectares [1, 3, 12].

Currently, rice cultivation area is mainly located in the Kyzylorda and South Kazakhstan regions (Shardarinskiy massif) and in the Almaty region and in the area of Ily and Karatal Rivers. Irrigation systems were built in the above areas and the commercial rice grain production is being developed there. Due to diversification of agriculture, the main task of rice cultivation in these regions is not only to increase production of rice grain but also improvement of yield of grain crops (wheat, barley, oats, millet) and vegetables. Additionally, the tasks were set for development of fodder production, introduction and increase in the area under lucerne, sweet clover and other crops (soy, carthamus, coleseed, etc.) in the rice crop rotations, to improve soil fertility, destruction of harmful weeds, such as: common bunting, clubroot, common reed grass, etc. using agrotechnical and biological methods [1, 3, 12, 23]. Historic way of rice cultivation development in Kazakhstan (Kyzylorda region) may be conditionally subdivided into 5 periods [1, 3, 12].

First Period (1896-1920): first rice was planted in Kyzylorda region. In 1895, they began to develop new land in the area of Shiyeli village and in the area of the reed lacustrine plains of Syr-Darya and Karauzek Rivers and along the banks of the dry beds of ancient small rivers of Shirkeily and Kuandariya under the conditions of Kazakhstan Aral Sea area. Rice was cultivated on non-saline and relatively level areas within 1-2 years. Nevertheless, mass flooding of all plots due to the absence of drainage and divert systems, rice fields became marshy, salined and obstruct with hydrophilous harmful irrigable land weeds (common bunting, clubroot, common reed grass, etc.). Therefore, rice farmers abandoned these plots for 3-5 and sometimes 10 years. This resulted in formation of nomadic rice farming. Despite this, the total area under rice in the Aral Sea conditions increased. Nevertheless, resulting from effect of the First World War followed by the civil war and the drought in 1917-1918, agriculture, including rice cultivation fell to decay over the period of 1914-1920. Thus total area under rice was 800 ha in 1913 and it reduced by 320ha by 1920; irrigation systems were destroyed and previously developed land remained unused [1, 3, 12].

On May 17, 1918, the Council of People's Commissars of the RSFSR passed a decree on development and irrigation of the Turkestan region lands and allotted 500 mln. roubles. In 1920, a Decree on Restoration of Irrigation Systems in Turkestan Republic was passed. In the course of this Decree, irrigation systems were restored and instead of small irrigation channels new larger channels were built and irrigated land condition was improved.

The Second Period (1921-1935) - period of the national economy restoration. Decree “On Drought Control” passed by the Labour and Defense Council in 1921 played an important part in development of irrigated land in the south of Kazakhstan. Thus, over the period of 1921-1925 they began and conducted work on reclamation of old and development of new irrigation areas in Kazalinskiy region and new channels and irrigation systems were built in Shiyeli area. Along with that, serious measures were taken for transfer from nomadic to the sedentary lifestyle. As a result, all irrigation systems were restored by 1927 and areas under the agricultural corps were increased to 69.4 thousand ha by 1928 including 3.5 thousand ha under rice [1, 3, 12].

In December 1927, all the issues related to the national economy were considered by the XV congress of All-Union Communist Party and collectivization campaign was commenced. This decision was made as a result of ignoring traditions, cultural and household, religious and agrarian particular features

(nomadic lifestyle) of the people of Kazakhstan. Nomadic tribes of Kazakhs were forced to transfer to sedentary lifestyle. Tribes engaged in livestock breeding could not quickly adapt to the sedentary lifestyle and to farming. On top of that, agricultural in-kind tax was introduced. Government levied the tax of 5% on 12 puds (192 kg) of wheat and 5% on 14 puds (224kg) of barley. As a result of the "Small October" and "Rich men Destruction as a Class" policy pursued by F. Goloschekin, "activists" confiscated all livestock and property from people of average means and poor people. The confiscated livestock was butchered and that resulted in devastating disaster, impoverishment of people and especially Kazakhs. Along with the food tax, horses, cattle, camels, goats and sheep were confiscated from livestock breeding farmers for the purpose of collectivization for the common use. Nevertheless, the confiscated livestock was uncontrolled and, as a result, was stolen and butchered. In order to pull through such tyranny and violence, people secretly migrated (fled) to Uzbekistan, Karakalpakstan, Russia, China, Iran, Mongolia and that resulted in reduction of population of Kazakhstan by 1mln. 700 thousand people. Additionally, over the period of 1931-1932 there was a serious drought in the territory of the republic and it resulted in the loss of 33 million animals within 2 years. As a result, there was a terrible famine in Kazakhstan over the period of 1932-1933. According to historical data, back then approximately 2 million people, i.e. 49% of the local population died. Correspondingly, every second person died in the steppe of Kazakhstan because of severe famine [3, 15, 16, 24, 25].

Nomadic peasants of the Kazakhstan Aral Sea area were combined into the collective farms and work associations by 1932. Over the period of 1933-1935, there were 74.2 thousand hectares of agricultural crops including 50.7 thousand ha under the cereal crops, 16.5 thousand ha under rice and 10.3 thousand ha under cotton [12, 15].

Back then, the local rice cultivation was based on unequipped rice systems with small paddy-fields made by rice growers. Most agrotechnical work was performed manually using ketmens (grub hoes). Zhakayevskoye movement headed by Ibrai Zhakayev and his followers made the main driving (organizational) force in this field back then. They summarized agricultural achievements, innovations and shortcomings and made conclusions based on which they implemented the best agritechnical methods and processes into practice [3, 24].

Construction of Kyzylorda dam in the Aral Sea area commenced in 1945 and completed in 1956 was the main project of the post-war period. The total cost of the project was 15.7 million roubles. Construction of the first stage of the left bank trunk channel and its two branches of the total length of 200km was completed during that period [12, 24].

Fourth Period (1966-1990) Based on the decisions made by the March (1965) and May (1966) Plenums of the Central Committee of the Soviet Union Communist Party, 4 trusts were founded in the Kyzylorda region and were equipped with powerful machines and equipment for control of new lands development. Large-scale projects were implemented for the overall development of Kyzylorda and other lands, extensive rice cultivation engineering systems and cooperative farm complexes were deployed. In the period of 1966-1970, RUB 230 mln. was invested in the construction of rice cultivation engineering systems and hydraulic engineering structures. This allowed introducing 46.5 thousand ha of new land plots provided with access to utilities and systems and 2.2 thousand ha of reclaimed irrigated land plots. During the eighth five-year period (1966-1970), as compared with the seventh five-year period, area under the rice increased by 14.2 thousand ha; crop yield increased by 15.9 hundreds kilograms per hectare; up to 129.7 thousand tons of grain (on average) was harvested and provided to the state reserves vs. 41.4 thousand tons, i.e. more than 3 times. Kyzylorda dam was built again on Syr-Darya River resulting in the increase in the irrigated land area by 60 thousand ha more. In 1971-1975, irrigation construction and rice cultivation were further developed. The main line in all efforts aimed at increase in rice yield was extension of the area under rice through introduction and commissioning of new engineering rice systems. Along with that cooperative farm complexes were constructed. Reconstruction of old irrigation systems was carried out on a large scale along with the simultaneous development of new large irrigated areas, namely: Togusken, Shiyeli-Zhana-Korgan, Right bank and Kazalinsk areas. Kazalinsks waterworks facility construction was completed back then. Length of irrigation channels increased 7.6 thousand kilometers; there were 1,200km of water supply channels, approximately 2000km of discharge and collecting network. Approximately 4600 hydraulic engineering facilities were built allowing for timely and proper control of irrigation water to the engineering systems. Thanks to that fact and dedicated service

of agricultural workers of the region, in the 9th five-year period (1971-1975) rice production in the region increased on average 1.5 times as compared to the 8th.

In 1976-1980, rice cultivating farms of Kyzylorda region considerably increased profitability of rice production thanks to intensification, large-scale application of chemical substances, integrated mechanization and increase of labour productivity. More than RUB 430 million was spent on irrigation systems construction. More than 60 thousand hectares of new irrigated land with access to all the necessary systems were introduced in agriculture. Average crop yield for the five-year period increased by 8.1 hundred kilo per hectare as compared to the period of 1971-1975; average rice production reached 340-370 thousand tons. Along with that, plant growing products share was growing steadily: in 1965 it was equal to 39.2% and in the second part of 70s it exceeded 61% and kept on growing.

During that period (1975-1982), using scientific achievements and advanced experience, management of the Kyzylorda region introduced integrated mechanized groups. Members of the groups acquired a profession of agrotechnologist and mastered the skills of control of machines, became tractor operators and harvester operators and specialists of agricultural machines repair and maintenance. As a result, they processed soil, sowed seeds and harvested rice in due time and course. It was a progressive organizational way of agricultural work execution and rice cultivation of that time [3, 26]. In the semi-desert and desert regions of the south of Kazakhstan, the main line of activity included establishment of new specialized rice cultivation state farms. Large amounts were invested in the complex construction projects. According to the data provided by the project organizations, total amount of investment in rice cultivation state farm with all waterworks and agricultural facilities, land area of 7 thousand hectares and an annual production capacity of 20 thousand tones of rice was RUB 40-45 mln. Event the powerful construction organizations can cope with this task for the period no less than 4-6 years. Therefore, new land development for rice cultivation purposes was performed by the following two ways: 1st stage - development of plant growing segments and establishment and development of collective farms: 2nd stage - development of the livestock segments. During the 11th five-year period, material base of rice cultivation was significantly strengthened; the existing irrigation systems were retrofitted. Management transferred to the intensive technology: mineral fertilizers, machines, equipment, material and labour resources were effectively used and, as a result, labour efficiency was improved. Development of Toguskek, Shiely-Zhanakorgan, Left-bank, Right-bank, Kazaly lands continued; new agricultural centers were built along with waterworks facilities [1, 3].

Fifth Period (since 1991 till the present time - 2017) In 1991, the former USSR was separated into separate, independent states - republics. As a result, close economic relations were broken. This resulted in economic crisis in the CIS countries. Kazakhstan transferred to the market economy and introduced private property and carried out grabitization. This resulted in occurrence of new forms of economic entities: farms, small-scale and mid-scale private companies, collective farms, joint stock companies, associations. These companies have different floating assets, economic level and level of income. Therefore, they have different ability to buy machines, equipment, mineral fertilizers, seeds, new technologies. Due to the fact that these farm enterprises and companies have different abilities to introduce and use new, innovative technologies and intensive varieties, their different economic level should be taken into account [1, 3]. Therefore, rice cultivation sphere transfers to the new level every 25-30 years. This is connected with the change in the political and economic situation in the country, development of science and technology, improved skills of the new generation of rice cultivation specialists.

Under the climatic conditions of the Aral Sea area, intensive agricultural systems and varietal technology of rice cultivation were developed and introduced based on the leading-edge experience [1-4]. Agrotechnical procedures of rice cultivation are closely interrelated. Production operations were performed in due time and course yielding good results since rice cultivation is a complex process requiring high professionalism of rice cultivating farmers.

High farming standards consist of effective and fast crop rotation. Correct crop rotation forms the basis of every farming enterprise operation and contributes to the stabilization of area under crops, improves soil fertility and efficiency of agroecological ways of weeds control [3, 27].

In the Aral Sea climatic conditions (Kyzylorda region), rice cultivation was developing intensively over the period of 1965-1966; rice was cultivated intensively on an annual basis on the area of 90-110 thousand ha of the period of 1980-1990 and average rice yield reached 49-52 hundreds kilograms per

hectare while that of wheat and corn was 22-30.8 hundreds kilograms per hectare. At such high-yielding crops, rice, wheat and cord consume the main nutritious elements (NPK) in large amounts, which remain in the crops (grain, straw). As a result, biogeochemical turnover of the main nutritious elements is violated in the crop rotation soils. In the event of long-term water flooding of the rice fields, oxygen access along with air is prevented and restoration process goes on in the soil, mineralogical composition and that of nutritious elements is changed. Such changes happen faster in the soils with closer occurrence of ground-water and in the saline soils [2, 3, 27, 28]. In order to change and improve the above named unfavorable ecological conditions, to improve yielding capacity of soil and to ensure high and quality rice crop, early cereal and other crops, it is necessary to master rice crop rotation and increase the area under the perennial herbs (lucerne and sweet clover). Additionally, it is necessary to introduce optimum dosages of mineral and organic fertilizers. Perennial herbs (lucerne, sweet clover) cultivated in the rice crop rotation enrich soil with organic substances (12-15 t./ha). As a result, nutritious substances consumed by the biological cereal crop (grain, straw) are returned to the soil and preserved in accordance with the law of nutritious substances return. Correspondingly, production of heavy-yielding crops, preservation of soil fertility and improvement of its physical and chemical properties is possible in rice crop rotation only [1-3, 27, 28].

Good meliorative condition of rice systems is the main precondition for high crops of rice and other crops of rice crop rotation. Thereat, accurate leveling of rice field surface is paramount condition for rice cultivation. Therefore, level of agrotechnical efforts, water level control and successful control of harmful weeds, efficiency of mineral fertilizers application and production of high-yielding rice crops and other crops are connected with quality of field surface leveling (table).

Field surface leveling effect on germinating ability of seeds, plant population and cropping capacity

Field relief, ± cm	Number of plants, pcs./m^2		Germinating ability of seeds, %	Survivorship rate of sprouts, %	Fields infestation with weeds, points	Grain crop, hundreds kilograms per hectare
	by Sprouts	before cropping				
3	391	332	43.7	84.8	0 - 3	81,3-106,6
5, control	295	237	32.7	80.3	1 - 5	55.0-66.4
8	255	190	28.3	74.4	1 - 7	48.5-52.6
12	205	146	22.8	71.4	5 - 9	40.1-47.6
15	168	108	18.6	64.2	7 - 11	35.8-37.5

Once a field's surface is leveled to the level of ±3 cm, rice sprouts are thick and level and preserved till the complete ripening. Control of harmful weeds (common bunting, clubroot, common reed grass, etc.) is effective as well as treatment with mineral fertilizers in the optimum dosage (N120-180P90-120 kg/ha). Thus, field relief has material effect on the field germination rate of the seeds, survival of sprouts and crop. The maximum quantity of sprouts, their even distribution over the area and high crop yield are ensured at the permissible tolerance of ±3 cm. Grain yield increase is 10-19.2 h.kg./ha. In the event of level quality deterioration, i.e. at the tolerance of ±12, ±15 cm, rice field yielding capacity reduced by 13.8-27.6 h.kg/ha, i.e. deterioration of surface leveling quality affects rice yielding capacity (table).

For the purpose of rice yielding capacity improvement, introduction of highly yielding varieties and application of optimum doses, methods and time of mineral fertilizers treatment is of importance. Application of agrotechnical methods with due account for biological particular features of rice varieties improves mineral fertilizers efficiency. For those who are involved in rice cultivation, instruction by the twice hero of socialist labour, rice cultivation academician - I. Zhakayev, "Only ongoing study of scientific achievements and the leading edge production experience makes a rice grower a true specialist." Therefore, managers and specialists of enterprises and companies, agrotechnologists and farmers should systematically study particular features of varietal technology of rice cropping, methods of irrigated land yielding capacity improvement and irrigation water saving, improvement of agroecological conditions of Aral Sea area as well as condition of rice cultivation engineering systems [3, 27, 28].

REFERENCES

[1] Zhailybai K.N. Photosynthetic and Agroecological Basics of High Rice Crop Yield. Almaty: Bastau, 2001. P. 256.
[2] Zhailybai K.N. Kurish Yeginshiligi Zhene Ecology. Almaty: Arna, 2006. P. 182.
[3] Zhailybai K.N. Kurish: monography. Almaty: Fylym, 2015. P. 351.
[4] Umurzakov S.I. Innovative Way of Rice Cultivation Development in Kazakhstan: Problems and Prospects // Materials of the International Practical Scientific Conference. Scientific Innovative Basics of Rice Cultivation Development in Kazakhstan and Foreign Countries. Kyzylorda, 2012. P. 17-20.
[5] Zhailybai K.N. Kurysh Yegisinen Mol Onim Aludy Programmalau. Almaty: Kainar, 1985. P. 27.
[6] Aleshin Y.P., Rudenko V.F., Stovba L.I. High Rice Crops Programming. Krasnodar, 1977. P. 96.
[7] Kayumov M.K. Field Crops Yielding Capacity Programming: Guide. M.: Rosagropromizdat, 1989. P. 368.
[8] Zhappasbayev M. Agroclimatic conditions of rice growing in continental climate. L.: Gidrometeoizdat, 1969. P. 168.
[9] Aleshin Y.P., Aleshin N.Y. M., 1993. P. 504.
[10] Vavilov V.I. Cultivated Plants Origin Centers // Papers on applied Botanics, Genetics and Selection. 1926. Vol. 16, issue 2.
[11] Dao The Tuan. Origin, systematics and ecology of rice. Tashkent: Gosizdat, 1960. P. 84.
[12] Zhailybai K.N. Kazakstanda Kurish Yeginshiliginin Paida Boluy Damuy Zhene Kazirgi Zhagdaiy // Zharshy. 1998. N 8. P. 55-67.
[13] Yerygin P.S. Rice Physiology // Agricultural Plants Physiology. Vol. 5. M.: MSU PH, 1969. P. 266-416.
[14] Zaitsev V.B. Rice Story. M.: Kolos, 1980. P. 192.
[15] Syr Oniri Tarihy (Kone Zamannan Buginge Deiyn). Almaty: Atamura, 1998. P. 288.
[16] Kazakhstan tarihy. Tort Tomdyk. Vol. 1. Almaty: Atamura, 1996.
[17] Tolstov S.P. Ancient Irrigation Network and Prospects of the Modern Irrigation (Based on Research of Syr-Darya River Ancient Deltas) // USSR Science Academy Bulletin. M., 1961, N 11. P. 59-65.
[18] Levshin A. Geographical and Historical Information on Yaksart or Syr-Darya River and Adjacent Areas // Description of Kyrgyz and Cossack or Kyrgyz Kaisay Hordes and Steppes. St. Petersburg, 1832.
[19] Deshevykh G.D. Kazakh Rice // Seed Production. M., 1930. N 12. P. 32.
[20] Sokolova I.I. Rice // Cultivated Flora. Cereal Crops Section. L.: Kolos, 1975. P. 237-355.
[21] Ovod I.V. Prospects of Rice Cultivation in the USSR in 1930 and 1931 // Plant Growing in the USSR. L., 1930. P. 127-147.
[22] Vereschagin G.A. Raw Materials for Rice Selection in the Conditions of Kyzylorda Region. Synopsis of a thesis of an agricultural science candidate. Leningrad, 1978. P. 24.
[23] Zhailybai K.N., Myrzabek K.A. Tuiezhonyshka: Monography. Kyzylorda, 2014. P. 166.
[24] Zhailybai K.N., Y. Zhakayev zhene Kurish Yeginshiliginin Kazirgi Zhagdayi Men Bolashagy // Zharshy. 2010. N 10. P. 7-13.
[25] Musin C. Kazakhstan Tarihy. Almaty, 2003. P. 463.
[26] Alimbetov K., Undirbayev Z.Z., Zhailybayev K.N. Complex Mechanized Teams in Rice Cultivation. Almaty: Kainar, 1980. P. 16.
[27] Shermagambetov K., Zhailybai K.N., Myrzabek K.A., Toktamyssov O.M. Kurish Auyspaly Yegissin Igeru - Topyrak Kunarlylygyn Arttyru Zhene Aramsheptermen Kuresudin Agroecologiyalyk Tosili // Zharshy. 2004. N 4. P. 34.
[28] Tautenov I.A., Zhailybai K.N., Baimbetov K.S. Agroecological and Morphophysiological Basics of Mineral Fertilization and Rice Crop Yield. Almaty: Fylym, 2003. P. 180.

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ҚАЗАҚСТАНДАҒЫ КҮРІШ ЕГІНШІЛІГІ

Аннотация. Күріш өте маңызды дақыл, 2030–2050 жылдары Евразия, тіпті 4,6 млрд әлем халықтарының азық-түлік қауіпсіздігін қамтамасыз ететін дақыл. Күріш реттелетін агротехникалық жағдайда өсірілетін болғандықтан өте мол дән өнімін алуға болады. Қазіргі заманғы тарихи, археологиялық, палеобатани-калық, лингвистикалық зерттеулер нәтижелеріне қарағанда, жабайы күрішті мәдени дақылға айналдыру 20 ғасыр және оданда көп уақыт бұрын Үндікытайда жүзеге асқан. Үндікытайдан күріш Қытайға, одан Манчжурияға, Кореяға, Жапонияға және басқа елдерге таралған. Археологиялық қазба жұмыстарының және жазба деректерге қарағанда, Индия мен Орталық Азия елдері арасында байланыс біздің эрамызға дейінгі (б.э.д.) 3-ші ғасырда, Қытаймен байланыс б.э.д. 2-ші ғасырда, ”жібек жолы” қалыптасқаннан кейін жүзеге асты. Евразия құрлығындағы ең көне күріш өсіруші аймақ – Орталық Азия. Басқа аймақтарға, соның ішінде Арал өңіріне (Қызылорда облысына) күріш Орталық Азиядан келген. Қазақстанда күріш өсірудің дамуын шартты түрде 5 кезеңге бөлуге болады. Әрбір 25-30 жыл сайын күріш шаруашылығы жаңа сапалы деңгейге көтеріледі екен.

Түйін сөздер: күріш, күріш егіншілігінің пайда болуы, күріштің Орталық Азияға және Қазақстанға (Қызылорда облысы) таралуы, күріш егіншілігінің дамуы, проблемалары.

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КУЛЬТУРА РИСА В КАЗАХСТАНЕ

Аннотация. Рис очень важная культура, оказывающее огромное влияние на продовольственной безопастности Евразий, даже всей планеты и является основным продуктом питания 4,6 млрд людей мира в 2030–2050 гг. Эта культура возделывается в регулируемых агротехнических условиях и поэтому урожайность зерна можно значительно повысить. Современные исторические, археологические, палеоботанические, лингвистические исследования показывают, что окультуривание риса осуществлены 20 и более тысячи лет назад в Индокитае. Из Индокитая рис распространился в Китай, оттуда в Манчжурию, Корею, Жапонию и в другие страны. По данным археологических раскопок и письменных источников связь между Индией и Средней Азией возникли в 3 веке до н.э., с Китаем со 2-го века до н.э. после установления ”шелкового пути”. Самый древний регион рисоводства в Евразий – это Средняя Азия. Другим регионам, в том числе в Приаралье (Кызылординская область) рис пришел из Средней Азии. Исторический путь развития рисосеяния в Казахстане (Кызылординская область) можно условно разделить на 5 периодов. Через каждые 25-30 лет рисоводство переходит на новый качественный уровень.

Ключевые слова: рис, возникновение рисосеяния, распространения риса в Среднюю Азию и Казахстан (Кызылординская область), периодизация развития рисосеяния и проблемы.

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