INTEGRATED SYSTEM OF PROTECTION OF SOYBEANS FROM PESTS AND THE INNOVATIVE TECHNOLOGY OF CULTIVATION

Abstract. The article presents data on research on crops, LLP "Bayserke agro", LLC "Agropark Ontustik" in Almaty region. Developed an innovative scheme of soybean cultivation is introduced in the crops of LLP "Bayserke agro" on an area of 650 hectares, 2013-2016 and since 2018 all work is carried out in LLP "Ontustik Agropark".

The question of the best ways of sow soybeans in different soil and climatic zones, remained unresolved. This is a consequence of various natural and agrotechnical conditions, as well as varietal composition.

Keywords: soybean, innovative technology, integrated protection system, processing, method.

Introduction. In line with the strategic course of development of the Republic of Kazakhstan Strategy "Kazakhstan-2050", President's address, "the Third modernization of Kazakhstan: global competitiveness" (2017), the President's address "New opportunities of development in the context of the fourth industrial revolution" (2018), the State program of development of agriculture of the Republic of Kazakhstan for the years 2017-2021, a priority and an important direction of development of plant breeding is to increase productivity, production of competitive products to meet the domestic needs of the population and the development of the export potential of the country on the basis of increasing the knowledge intensity of agricultural technologies. It is emphasized that the agricultural sector of the country should become a new driver of the economy, the task of increasing the efficiency of land use, increasing the area of irrigated land by 40 %, thereby bringing them to 2 million hectares [1-4].

Methods of research. When implementing innovative technologies of soybean cultivation, an innovative patent was used [5, 6], which provides soil enrichment with trace elements in a natural way, that is, an increase in fertility due to the green mass of siderate crops of the upper soil layer. After the harvest of agricultural crops is carried out sealing of crop residues in the upper layer of the soil followed by sowing of beds sigaretty cultures and fueling intense irrigation for irrigation grooves. Once sprouted siderate culture and the weeds, gives the green weight of them crushed and buried in the upper layers to a depth of 12-15 cm with subsequent cutting of seed beds and irrigation furrows for the harvest of the following crops in the crop rotation [7], after the snow melts, spend a harrowing two tracks, followed by formation of raised beds with a width of 60-140 cm, depending on soil type and planting materials, and irrigation after cutting grooves with a depth of 12-15 cm early spring sowing is carried out with intensive nourishing irrigation, providing effective control of the surface crust as well as pests before leaving. Sowing and fertilization is carried out simultaneously.

This method increases the moisture storage and moisture-saving ability of the soil, effectively destroys weeds, increases the yield of soybeans, reduces the consumption of herbicides, contributes to the full germination of seeds. This ensures effective control of weeds and root rot [8], seeds and mineral
fertilizers are evenly distributed in the seed beds, and seed sowing and fertilization is carried out in one horizon while continuous processing also destroys sprouted weeds. Device for seeding and fertilizing comprises hoses made of metal pipes, and the tines united on the frame rigid bracket. The method contributes to an increase in yield due to the uniform distribution of seeds and fertilizers both on the field area and on the depth of incorporation, which leads to improved nutrition and illumination of plants [9]. Sowing is carried out in seed beds with a high seeding rate of soybean seeds 850-1000 thousand/ha, with a subsequent fueling of intense irrigation, and the sprouting is carried out processing of crops with herbicides on damp soil fertility. The method helps to increase yields regardless of weather conditions and save herbicide consumption.

**Research result.** The analysis showed that currently there are traditional methods of cultivation of soybeans that have significant disadvantages and costs. When the reservoir is rotated to a depth of 25-30 cm, there is a large fuel consumption of 25-32 l/ha, there are irregularities in the microrelief, which must be leveled and bear additional costs, also this treatment is accompanied by the destruction of the microbiota in the soil and the structure of the soil as well as rapid evaporation of moisture.

Traditional one-component fungicidal seed treatment with the proposed methods and preparations is not always accompanied by sufficient efficiency.

Wide-row sowing with a distance of 60 cm between paired rows (crowding of sown seeds in paired rows, which in turn is the cause of uneven feeding area of soybean plants).

There is no guarantee of obtaining a full uniform germination as spring presowing treatment of soil quickly dries the top layer of soil to a depth of seeding, and in the absence of spring rain creates a real threat of getting full of seedlings. That subsequently adversely affects the growth and further development of plants, and this in turn leads to low yields, low quality of products, with high cost.

The consequence of the above factors is the insufficient number of soybean plants per unit area. The herbicide treatment occurs mostly in dry agricultural conditions, which leads to ambiguous efficacy of herbicides. When watering by the usual method, water erosion of the soil occurs, namely fine-grained parts of the soil, organic substances, introduced mineral fertilizers are washed away by irrigation water and demolished in the direction of movement of irrigation water, and all this leads to environmental pollution.

Implementation of the developed innovative scheme of soybean cultivation eliminates all these shortcomings.

The use of minimal technology in basic tillage. The main advantage of minimum and zero technologies in the economic sense, is a significant increase in productivity, increase the profitability of grain production, and in the technological sense, the minimization of processing reduces the duration of work, making them the most optimal, which in turn has a positive impact on crop yields.

Continuous cultivation contributes to the significant destruction of weeds.

Pre-sowing tillage (spring).

Early spring harrowing in two tracks at the first opportunity to enter the field. Cultivation to a depth of 10-12 cm or disking in 2 tracks with harrowing, produce two-fold continuous cultivation of the field in order to destroy sprouted weeds. Herbicide with a tank mix combination products produced before and after shadowc depending on the monitoring and evaluation of the UAV. Edge processing fields, as on the roadside to reside and overwinter pests which spreads by new shoots.

Hack seed beds with a width of 90-140 cm (depending on soil type) and cutting lateral grooves ensures the implementation of the feed irrigation immediately after sowing and there is no fear of drying out the top layer of soil to a depth of seeding, because after sowing in the fields is fueling watering, which is calling and vegasredcasino at the same time. This ensures the production of uniform friendly shoots of soybean seeds and weeds in the "one wave".

Irrigated immediately after planting, providing for water loading irrigation and outdoor watering is no gap in time. Watering is done in the mode of feeding (feed watering) without slyvania, the minimum water soil erosion, as the bottom of irrigation furrows through the loosened layer of soil in the horizon untouched minimum tillage.
<table>
<thead>
<tr>
<th>Action</th>
<th>Timing</th>
<th>Purpose</th>
<th>Tools and equipment used</th>
</tr>
</thead>
<tbody>
<tr>
<td>The application of mineral fertilizers under the main processing of the soil</td>
<td>October-November</td>
<td>Enriching the soil and providing plants with basic nutrients, increasing resistance to a complex of diseases</td>
<td>P₂O₅ 90 kg / ha Spreaders of mineral fertilizers RUM-1200 LANDINI tractor</td>
</tr>
<tr>
<td>Application of organic fertilizers</td>
<td>October-November</td>
<td>Soil enrichment with nutrients of organic origin</td>
<td>Manure 60 tons / ha Spreaders of organic fertilizers ROWE – 6000 tractor LANDINI</td>
</tr>
<tr>
<td>Fidexperta and recovery of seeds protective-stimulating composition No. 28978</td>
<td>March-April</td>
<td>Improvement of seeds from the complex of fungal and bacterial infection, pests and stimulation of germination and growth of the root system.</td>
<td>The fungicide TMTD FAC. - 6-8 kg / ton, Extrasol 4-6 l / ton. Cruiser 2-4 l / ton Ekornost 4 l / ton of Etchingmachine PSM-25.</td>
</tr>
<tr>
<td>Tillage Innovation patent of RK No. 25383, No. 24791</td>
<td>March-April</td>
<td>Enrichment of soil by trace elements in a natural way, the activation of soil microflora, including macroorganizmovantagonists</td>
<td>Seeding of sidements into the soil, combined machine for soil tillage DANTE SPS-3. Tractor NEW HOLLAND</td>
</tr>
<tr>
<td>Application of innovative method of sowing soybean seeds</td>
<td>April-May</td>
<td>The increase in yield due to uniform distribution of seed and fertilizer in area fields and the seeding depth of soybeans, cost savings of herbicides</td>
<td>Combined pneumatic seed drill KAPPA SP 5 tractor LANDINI</td>
</tr>
<tr>
<td>The fight against a complex of weeds prior to emergence of soybeans</td>
<td>April-May</td>
<td>Suppression of growth of weeds in the early stages of development and as reservoirs of sucking pests and viral infection.</td>
<td>A tank mix of Zenkor Ultra 0.5-0.6 l/ha + Tornado 500 21/ha. Borey 0.1 l/ha, Bitoksbatsillin 2 kg / ha maximum flow 600 l/ha. Sprayer RICOSMA ATTILA EVO 24 tractor LANDINI</td>
</tr>
<tr>
<td>Struggle with the complex of weeds after emergence in the phase before the appearance of 5-6 real leaves</td>
<td>May-June</td>
<td>Suppression of growth of weeds in the early stages of development and as reservoirs of sucking pests and viral infection.</td>
<td>A tank mix of pulsar 0.8 l/ha + basagran 1.5 l/ha, Bitoksbatsillin 2 kg/ha rate of the working fluid 300 l/ha. Sprayer RICOSMA ATTILA EVO 24 tractor LANDINI</td>
</tr>
<tr>
<td>Cultivation of soil between rows</td>
<td>May-June</td>
<td>Loosening of the top layers of soil, improvement of soil aeration, pest population reduction and root rot damage</td>
<td>Spiky rotary harrow ROMPISTRA MTZ – 82.1 tractor</td>
</tr>
<tr>
<td>Subsoil Irrigation</td>
<td>June-August</td>
<td>Поддержание оптимального водного баланса почвы, снижение и поражения корневями гнилями</td>
<td>System of subsoil irrigation</td>
</tr>
<tr>
<td>Pest control</td>
<td>June</td>
<td>Pest population suppression and reducing the spread of viral diseases</td>
<td>Akarin 0.15 l/ha. Bitoksibatsillin 2 kg/ha or AK kobelek 2 kg/ha. Extrasol 4-6 l/ha. Northwind 0.1-0.2 l/ha rate of the working fluid 300 l/ha Sprayer RICOSMA ATTILA EVO 24 tractor LANDINI</td>
</tr>
<tr>
<td>Harvest</td>
<td>September-October</td>
<td>Timely harvesting, minimization of losses, minimal injury of soybeans in accordance with the characteristics of each variety</td>
<td>Combine harvester CASE 5040 with the system of threshing and separation of grain and harvest AXIAL FLOW part is equipped with a system TERRA FLEX</td>
</tr>
</tbody>
</table>
Feeding irrigation without a time gap between sowing and irrigation ensures the germination of soybeans and weeds in the "one wave". This is a guarantee of active vegetation at an early stage of plant growth and, accordingly, the key to increasing the average yield.

Processing of crops by herbicides in the early phase of development on damp soil fertility, and are actively vegetating plants almost ensures the complete elimination of weeds while reducing pesticide loads in 1.5-2 times.

By increasing the seeding rate of soybeans allows you to bring the density of standing plants before harvesting to 600 000 – 800 000 on one hectare. Sowing of soybeans is carried out by a specially designed seeder in the seed beds and seeds of cultivated plants are placed evenly, and this in turn provides the most rational area of nutrition for each plant, due to this significantly increases the productivity of each plant, and has a positive effect on increasing the yield of cultivated crops and improves product quality.

When feeding irrigation according to the proposed innovative solution, the length of the rut increases to 1000 meters (this depends on the type of soil and the slope of the field).

The use of rational irrigation increases the productivity of the irrigator up to 50-70 ha, conducted feed irrigation and good quality without blemishes and without water erosion of the soil.

Tillage with minimal technology preserves its natural structure, does not reduce its natural fertility and retains moisture. The innovative scheme of soybean cultivation is effective in the development of waste early irrigated land.

Rational science-based use of plant protection against weeds, diseases and pests. The decline and rejection of the use of massive chemical treatments (application of herbicides and other pesticides) and increased biological on organic products.

The proposed innovative scheme of soybean cultivation is effective in that it requires less labor per unit area compared to traditional methods (irrigators, handymen), which in modern conditions is important (table).

For the analysis of economic efficiency of applied innovations 3 variants of comparison of technological schemes were used (figures 1, 2).

– Option 1 on the background of natural soil fertility (without fertilizer) and monopoles soy for 3 years: Option 1 according to the traditional scheme, Option 1 innovative scheme.

– Option 2 against the background of the use of minimum doses of fertilizers, where the predecessor was winter cereals: Option 2 according to the traditional scheme, Option 2 according to the innovative scheme.

– Option 3 with application of macro and micronutrients and growth regulators on the predecessor of corn: Option 3 according to the traditional scheme, Option 3, innovative scheme.

Analysis of soybean yield depending on applied technologies (ton/ha)

Figure 1 – Soybean yield Analysis
As illustrated in the graphic format above, our innovative approach has resulted in a yield of 4 times more soybeans per 1 hectare compared to the traditional soybean cultivation technology widely used in this region. Despite the fact that the cost of growing soybeans by innovative technology was slightly higher than the traditional net profit per 1 hectare was 8 times more.

**Conclusion.** The results of field testing of our technology show the possibility of obtaining a high yield and a significant profit compared to the established technology of soybean cultivation in the South-East of Kazakhstan.

Research was conducted in the framework of the budget program 267 "Increasing availability of knowledge and scientific research", the routine 101 "program-oriented funding of research and activities", according to the specifics 156 "Payment of consulting services and research" on the scientific and technical program "Creation of innovative agro-technology Park for the implementation of precision farming". Research work continues.

---

A. O. Sagnetov¹, N. S. Mukanadin², G. J. Mendibaeva², M. A. Uzakbaeva³

¹"Agropark Ontustik" ЖШС, Алматы, Қазақстан.
²"Ж. Жиенбаев атындағы Қазақ ғылымы және қалыптағы зерттеу институты" ЖШС, Алматы, Қазақстан.
³Қазақ ұлттық аграрлық университеті, Алматы, Қазақстан

**МАЙБУРШАҚ ДАҚЫЛЫҢ ИННОВАЦИЯЛЬЫҚ ТЕХНОЛОГИЯМЕН ОСІРУ ЖӘНЕ ЗИЯНДЫ АҒЗАЛАРДАН БІРЕГЕЙ КОРГАУ ЖУЙЕСІ**

**Аннотация.** Макалада Алматы облысынан «Байсерке Агропарк» ЖШС және «Agropark Ontustik» ЖШС ерістігінде жүргізілген зерттеудерді нәтижелері көрсетілген.

Майбұршқадағы аймақтық технологиялық сыртындағы 2013-2016 жылдары қатысқан «Байсерке Агропарк» ЖШС-нің 650 га ерістігінен өңірлесіп, 2018 жылы бастап «Agropark Ontustik» ЖШС-де жүргізілді."[1]

Ор түрлі топырақ-кливматтық аймақтарда майбұршқа тәуелді сөзіңізді ең оңайлы аймақтарға қарсы жатады. Қазақ ұлттық аграрлық университеті, Алматы, Қазақстан

Түйін сөздер: майбұршқа, инновациялық технология, бірегей көрғау жүйесі, өңірлесу, өңд.
А. О. Сагитов1, Н. С. Мухамадиев2, Г. Ж. Мендибаева2, М. А. Узакбайева3

1TOO «Agropark Ontustik», Almaty, Kazakhstan,
2TOO «Казахский научно-исследовательский институт Захтии и Карантин растений им. Ж. Жиембаева», Алаты, Казахстан,
3Казахский национальный аграрный университет, Алаты, Казахстан

ИНТЕГРИРОВАННАЯ СИСТЕМА ЗАЩИТЫ СОИ ОТ ВРЕДИТЕЛЕЙ И ИННОВАЦИОННАЯ ТЕХНОЛОГИЯ ВОЗДЕЛЬВАНИЯ

Аннотация. В статье изложены данные о проведении экспериментов на посевах TOO «Байсерке Арго» и TOO «Agropark Ontustik» Алматинской области.
Разработанная инновационная схема возделывания сои внедрена на посевах TOO «Байсерке Арго» на площади 650 га, 2013-2016 гг. и начиная с 2018 г все работы проводятся в TOO «Agropark Ontustik».
Вопрос о лучших способах посева сои в различных почвенно-климатических зонах, остался не разрешенным. Это является следствием различных природных и агroteхнических условий, а также, сортового состава.
Ключевые слова: сои, инновационные технологии, интегрированной системы защиты, обработка, способ.

Information about authors:
Sagitov A. O., Academician of NAS RK, General Director of LLP "Agropark Ontustik", Almaty, Kazakhstan; a_sagitov@mail.ru; https://orcid.org/0000-0002-5137-979X
Mukhamadiev N. S., candidate of biological sciences, head of the sector protection of forest and tree plantations, LLP «Kazakh Research Institute for Plant Protection and Quarantine named after Zh. Zhiembaeva» Ministry of Agriculture of the RK, Almaty, Kazakhstan; nurszhan-80@mail.ru; https://orcid.org/0000-0003-3199-2447
Mengdibayeva G. Zh., PhD-doctor, Research Fellow, Forest and Tree Protection Sector, LLP «Kazakh Research Institute for Plant Protection and Quarantine named after Zh. Zhiembaeva» Ministry of Agriculture of the RK, Almaty, Kazakhstan; www.gulnaz87.kz@mail.ru; https://orcid.org/0000-0002-0929-061X
Uzaikbayeva M. A., PhD-doctoral student Faculty of Forest, Land Resources and Phytosanitary, of Kazakhstan National Agrarian University, Almaty, Kazakhstan; uzai_baeva-1992@mail.ru; https://orcid.org/0000-0002-1053-9566

REFERENCES
[8] Ageenko A.V., Sagitov A.O., etc. Innovative patent of RK No. 26825 from 15.05.2013 "Method of sowing and device for its implementation".