PLANTERS FOR RESOURCE-SAVING GRAIN CROPS CULTIVATION TECHNOLOGIES IN THE CONDITIONS OF NORTHERN KAZAKHSTAN

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Cultivation technology of spring wheat in northern Kazakhstan is dependent on the soil conditions, rainfall, farm equipment technical and financial means, and others. However, studies have shown that more significant results of efficiency improvement can be obtained by the development of new and original technologies and their base overriding principles are: protecting the soil from erosion, accumulation and preservation of moisture and fertility.

In world practice, the cultivation of crops is produced in three main types of technology: traditional, minimum and zero technology.

In recent years in Kazakhstan for sowing crops sowing complexes are increasingly used. The share of sown area in the country is 35% of the total grain wedge. The main advantage of these complexes compared with seeders, cultivators of AGP family (CTC) of similar width is that due to the higher specific capacity of grain silos their productivity makes up 20-40%.

Analysis of studies shows that the pneumatic grain drills with centralized dosing and pneumatic conveying seed to the coulters are most effective in wide-seeders. Using one centralized hopper significantly reduces the time for refueling and maintenance of the unit, which creates prerequisites for higher productivity on crops.

Pneumatic drills are manufactured by many firms in Canada, Europe, USA, Australia and Russia. In most drills original seeding system that differs in design and process flow scheme is used. Many firms abroad are also engaged in developing sowing units (complexes) (John Deree, Morris, Flexi, TehArtKom et al.).

However, it should be noted that the seeding machine has the following disadvantages. In foreign-wide-tillage seeders soil covering part is hinged on an individual-cell scheme and therefore they can be aggregated only with a certain class of tractor pulling. Not all foreign seeding systems can simultaneously perform secondary tillage and cropping weeds; seeding and subsoil fertilizer introduction; leveling the field surface after planting and postseeding compacting. For example, in the model of the seeding system Concept 2000 of the company «Morris» for postseeding soil packing it is joined by the machine spiral rollers.

The basis of the foreign planters has the scheme of pneumatic seed company “Accord” which can not provide the necessary uniformity of seed coulters between ± 3% and the fertilizers of ± 10%. Pneumatic transport and distribution of materials sown in drills by these openers are random processes and various physical, mechanical and aerodynamic properties of the seeds and the fertilizers, etc. The same sowing complexes with CMC were developed in Russia: "Uralets" - PAP-5.4, PAP-7.3; PPABM-14.7; "Jaroslavich" - PAP-7.2P; "Kuzbass" - PC-4.2. The cost of 1 metre of capture of foreign sowing unit is 10 ... 11 thousand euros, and it is used in the year 15-20 days.

According to the results of the review it was found that the model of planters with CMC foreign firms are not adapted to the conditions of Kazakhstan and do not meet the full agro-technical requirements and do not provide the necessary uniformity between seed coulters, in addition they have a high cost and low annual utilization and therefore are inaccessible to most small and medium-sized farmers.

In S.Seifullin Kazakh Agro Technical University at the department “Agricultural machines and grain processing” under the direction of Professor Aduov M.A. a number of drills for minimum and zero technology, providing technical, technological and economic competitiveness with foreign and domestic systems were developed.

This drill is for subsoil, broadcast seeding comprising a frame mounted on it with a hopper with group sowing machine for sowing cereal seeds and fertilizers, seed tubes and drive from packer rollers, Figure 1 [1].

On the frame of the planter central shovel ploughshare is set containing shank of curved shape in which the front, in the direction of motion sweep is fixed and behind the seeder guide is fixedly mounted at the front, in the shape of a hollow pentagon and also diffuser side surfaces of which are made in the shape of a parabola. The shape of the diffuser can evenly distribute the material sown in under sweep space of central paws [2].

The parameters of the shortest distance from the center of the diffusers to the sweeps shelves // 2 = 0.115 and the rate of descent of seeds 0.9 - 1,05m / s are grounded, rational parameters of the diffusers are set, where the height h = 65-70mm; the base circle radius R = 25-27,5mm; feeder diameter d = 18-20mm and installation height of the diffusers from the bottom of the furrow groove is not more than 23-25mm.

Such work of the drills with a group sowing machine equipped with the opener to the seed guide in the form of a hollow pentagon and diffuser with side surfaces in the shape of a parabola, can evenly distribute the seeds and fertilizers throughout the area treated with central sweep that provide good nutrition and development of plants.

A pneumatic drill, Figure 2 [3] containing the hopper 1, group 2 sowing machine, the sleeves 3, 4 material tubes, fan 5; air distributor 6, the horizontal distribution head 7 was developed.

Figure 1 – Planter for subsoil broadcast sowing

Figure 2 – Pneumatic drill
1 – hopper, 2 – sowing machine, 3 – sleeves, 4 – main material tubes, 5 – fan, 6 – air distributor, 7 – distribution head.
According to the results of the experimental results empirical correlations of second performance and the uneven seeding of structural and technological parameters of fertilizers distributing system are obtained.

The parameters meanings that provide the specified application rate and the permissible uneven seeding are set:
- For the central screw dispenser: the radius of the screw 25-26mm; screw pitch 62-65mm; screw groove width 7-10mm;
- For central coil unit: diameter of the coil is 70 mm; 50 mm-length of the coil; ribs dimensions are 50 * 2 mm; speed of 80-190 rev / min.

The air flow rate at the outlet of the fan is selected \( V = 28 - 35 \text{ m} / \text{s} \). When the performance of the fan \( Q = 12.3 \text{kg} / \text{c} \) and the total pressure \( H = 1.49 \text{kPa} \).

It should be noted that the established openers with distributors have a minimal effect on the soil. Screw fertilizers distributing machine has a very low non-uniformity of seed and allows the seed and granules by one unit, i.e. there is no need for additional fertilizer distributing machine. Diffuser surface is formed by a parabola and it distributes seeds and granules of the width more uniformly as compared with other valves.

Such work of drills allows more evenly dispense a predetermined amount and evenly distribute the seeded material (grain and fertilizers) over the entire area treated by paw cultivators with rational use of a feeding area of the soil and the installation of fertilizers distributing apparatus leads to a decrease in metal capacity device to 1.2 - 1.3 times.

Also direct seeding drill coulters with combined ploughshares installed on the drill at least in two rows, and, in one of the rows chisel ploughshare are set, and on the other disc coulters, Figure 3 [4] are developed. Direct seeding seeder consists of a frame - 1, and fertilizers box - 2 supporting wheel - 3, the press rollers - 4, chisel coulter - 5 and disc coulters – 6. On the drill coulters are installed in three rows. In the first and third rows chisel openers are set - 5, and in the middle row - disc coulters are placed - 6.

Reducing the number of disc coulters on the drill twice provides seed placement at the optimum depth, without increasing the weight of the drill, and the installation of rotating disks in the middle row prevents clogging of inter ploughshare space by soil, crop and plant residues contained on the surface of the field.

Application of the proposed drills allows 20-25% weight reduction of direct seeding drills, 30-40% increase in the coefficient of performance reliability of the process and to improve the work of the drill to 25-30%.

Stubble seeder was developed Figure 4 [5], aimed at ensuring optimal allocation of plants on the feed area to increase the yield of agricultural crops.

Seeder consists of a frame - 1, and fertilizers hopper - 2, supporting wheel - 3, the packer rollers – 4, arrow sweeps - 5 and disc coulters – 6. On the drill coulters are installed in three rows. In the first and third rows central shovels with distributors of seeds are set - 5, and in the middle row - disc openers are set - 6.

Installing the central shovels with distribution of seeds, together with disc coulters engaged in crop belt will ensure optimum distribution of plants on the feed area and the installation of disc coulters in the middle row will prevent clogging of inter ploughshare space by soil and crop residues that provide high throughput of drills. The seeder works as follows.

Chopped straw, crop residues and soil due to lack of deformation from the disk openers pass freely through inter share space, providing high throughput of drills [6].

It should be noted that the developed drills are adapted to local conditions and have high productivity, low power consumption and can be aggregated to a wide class of tractors from 1.4 ton to 8.0 tons. Simple structure, low cost and high flexibility with basic drills (SZTS-2) determine the simplest of its development in the industry and ensure the implementation of advanced technologies in large areas of northern Kazakhstan.

REFERENCES
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