ANALYSIS OF RESEARCH ON THE ESTABLISHMENT OF ENERGY SAVING DEEP DIGGER PLOUGH

Khasanov U.I
Olmasov S.X

E-mail: Ulugbek.hasanov.1989@mail.ru

[1]Bukhara Institute of Natural Resources Management of the National Research University of Tashkent Institute of Irrigation and Agricultural Mechanization Engineers

Abstract: *The article presents the results of scientific research on the development of a plough design equipped with an advanced deep softener, which allows to soften the subsoil without compaction, and the organization of the process of its introduction into agricultural production.*

This article describes the research on the creation of an improved pit in the form of a vertical ridge for the deep tillage of the subsoil in the main tillage, in particular plowing.

Key words: *plug, tier, blade-softener, sinker, housing, drive underlayment, secondary compaction, energy consumption., Berch layer, compensation layer, gypsum layer, drive layer, operational, energy consumption, flanges.*

Extensive measures are being taken to reduce labor and energy consumption in agricultural production, save resources, care for agricultural crops on the basis of advanced technologies and the development of high-efficiency agricultural machinery and their working bodies. The Action Strategy for the further development of the Republic of Uzbekistan for 2017-2021 sets out the tasks, including "... the introduction of intensive methods of agricultural production, first of all, modern water and resource-saving agro-technologies, widespread use of high-yield agricultural machinery." .In order to achieve the above objectives, the Action Strategy for the Development of the Republic of Uzbekistan for 2017-2021, including Section 3, Section 3.2, Paragraph 7, states “reduction of energy and resource consumption in the economy, widespread introduction of energy-saving technologies, expansion of renewable energy sources, Section 3, Section 3.3, which focuses entirely on “Modernization and Accelerated Development of Agriculture”, shows the positive work being done to further reform agriculture [1].

One of the distinctive aspects of agriculture in Uzbekistan is that it is based on the cultivation of crops using irrigated lands with a strong agro-irrigation system. Three-quarters of arable lands in the country are irrigated. Therefore, the development of agriculture is associated with the development of mechanized processes in order to increase the productivity of irrigated fields in the future. It is known that in Bukhara region there are more than 140,000 hectares of arable land with gypsum, gravel and sand in the subsoil. processing is required. According to the agro-technical requirements for plowing and deep loosening, the upper fertile part of the crop area should be turned upside down, the lower gypsum, gravel and sandy part should be loosened to a depth of 10-15 cm without overturning [2].

In order to reduce the gravitational force № 1055358 [3] the author's certificate recommended a soil softening working body. Its column has a wedge in the form of a sharp triangular wedge.

To prevent the wedge from getting clogged, one of its walls expands at an angle of 10-120 to the other or towards the point where the wedge exits.

1033018 [4] In the certificate of authorship it is recommended to prepare the sinker in the form of an S-shape in order to improve soil compaction and reduce gravity. The base of the elliptical intersecting cone-shaped expander is in a perpendicular horizontal position. The edge of the lower lateral surface of the elliptical cone has a hyperbolic shape.

Patent studies show that in order to reduce energy consumption, the activation of the submersible working body, the vibration must be transmitted from the tractor's PTS (power transmission shaft) or a separate engine to the working body.

Examples are the Italian company Falk's driller [5], the US's patented cracker № 4375836 [6], as well as the German company's Brenig device, the German company's patented TLG 12 Kelble-Gmainder softener [7].

In order to improve the quality of soil compaction at the depth of tillage, according to the author's certificate 1011061, a pit equipped with several moving rakes located on the tiers in the column was recommended [8].

In order to reduce gravity [9], the Italian company Agrotech has developed a rotary softener. Experiments show that a rotary softener has a 30 percent reduction in gravity compared to a passive working body softener.

According to the authorship certificate 783424 [10], a roller-shaped softener softens hard soils by means of magnetostructural radiation. The working body on the 1046436 copyright certificate is equipped with an additional magnetostructural vibrator [11], again here 949089 on the copyright certificate on percussion, cyclic

motion 960395 [47] and 977618 [13] on the copyright certificates) deep softeners can be cited as examples.

Japanese scientists K. Agaua and K. Kawanishi [14,15] published the results of his research on the supply of water and air under pressure at the softening boundary in order to reduce the gravitational force of the deep softener. However, no significant decrease in gravity was observed because the filled air force exceeded the gravitational force.

L. Martinovic [16] conducted research on the physical properties of soil and its effect on crop yields by pneumatic and mechanical methods of subsoil softening. It has been found that the pneumatic softener can be applied to special crops on sloping slopes and high mountain valleys, i.e. in places inconvenient for the tractor. The author proved by obtaining the patent GFR № 2742606 [17] that in return for pneumatic loosening of the soil, its softening quality is improved and a sufficient amount of air pressure in the soil is achieved.

The German company Deutche Witzemachinen Gesellschaft has introduced a special new design of the sinker [18]. There is no softener column in this construction. The connection of the scanner with the machine is made by electromagnetic force. It is mounted on the suspension of the electromagnetic tractor. Installed with a Gaussian electromagnetic hemisphere designed to direct the impact in the order of 150,000 magnetic fields. This shell is made of a special material. As the aggregate moves, the screed softens the subsoil without breaking its surface layer.

Scientists from the Russian State Agrarian University S.S.Kalaev, L.Kh.Chibirova and A.B.Tuaev conducted research on the Combined Plow.

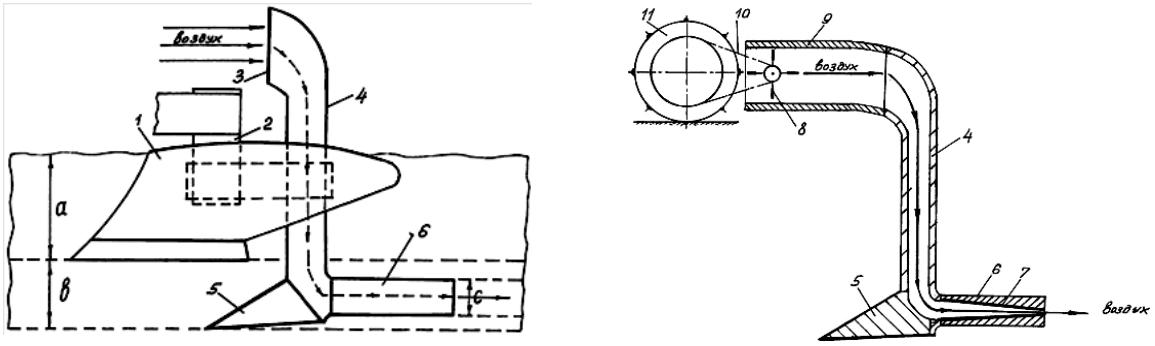


Figure 1. Combined sink plough

The combined plunger plug recommended by them consists of the following parts: plough housing (1), plough body rack (2), sink rack (3), tubular rack (4), sink rack (5), hole opener (6), ventilation consists of device (7), fan (8), air duct (9), chain drive (10)

The device works in the following order: Before starting work, the plug is adjusted to the driving depth, and the sump is adjusted to soften the drive layer. As the plug

body moves, the drive depth is created, simultaneously softening the drive depth and opening the hole and spraying air. [19]

The main advantage of the device is that it can perform deep loosening along with the plowing process. As a disadvantage, it leads to a proportional increase in traction resistance when performing the technological process.

Scientists of the Federal Higher Vocational Education Institution "Chuvash State Academy of Agriculture" of Russia V.P.Egorov, I.I.Maksimov, V.Maksimov, V. Ivanovich conducted research on the submersible plough.

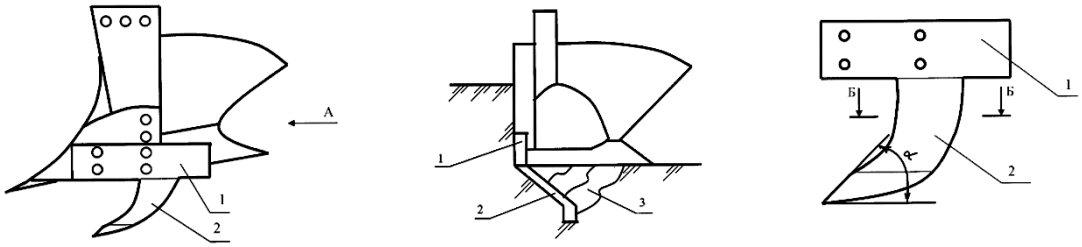


Figure 2. Field board mounted softener plough.

In this case, the field board is mounted on the body of the plug and a softener in the form of a cutting is installed to soften the plow layer at the same time as the plowing. The softener is mounted on the field board at an angle of 300 ° to the vertical plane to cover more of the subsoil layer towards the tilting side of the soil. The main advantage of the device is that it covers more of the plowed subsoil. As a disadvantage, the relative machining leads to an increase in tensile strength due to the increase in surface area. [20]

Scientists of the Federal State Budget Educational Institution of Higher Vocational Education of the Russian Volgograd State Academy of Agriculture, Limited Liability Company "YUGJELDORMASH" I.B.Borisenko, A.S.Ovchinnikov, Yu.N.Pleskachev, A.E.Dotsenko, V. Scientific work was carried out by N.Kiyaev, Yu.V.Makhnov.

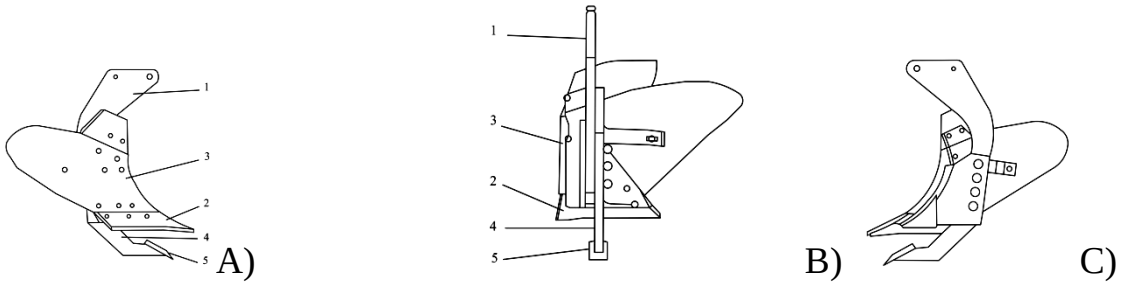


Figure 3. Views of the softener plug from the right (A), back (B), left (C) sides.

The softener plug consists of a frame-mounted housing, a stand, a lemex, a blade, a field board, and an bladeless softener, and the distance from the end of the softener to the transverse plane below the lemex is (0.3 to 0.5) V. The B-body is located

$\sqrt{H_2 - (0{,}1...0{,}2)B^2}$ at a distance relative to the coverage width and the longitudinal-horizontal plane. Longitudinal difference between H-softener and lemex. The main advantage of this device is that it softens the submerged birch layer along with plowing the land in one pass. The disadvantage of this device is that such placement of the working bodies in the plough frame leads to clogging with soil fragments and plant debris under certain soil-climatic conditions. This leads to a deterioration in the quality of work and an increase in the resistance of the unit to traction. [21]

Scientists of the Federal Higher Vocational Education Institution "Chuvash State Academy of Agriculture" of Russia V.P.Egorov, V.I.Maksimov, conducted research on improving the plow.

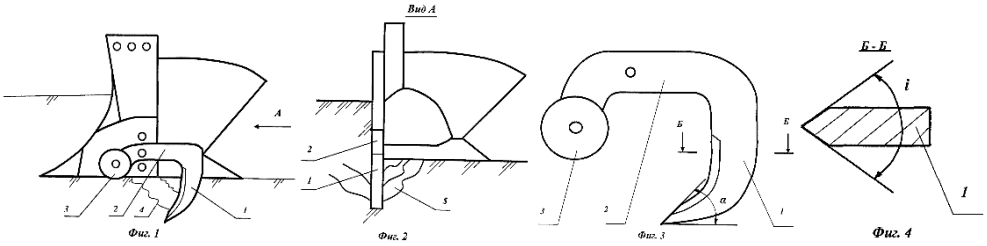


Figure 4. Deep digger mounted on the plug body.

Studies have mainly focused on loosening the dense layer of plowed soil. The device consists of a disk (3) firmly connected to the crankcase (2) of a single hollow-core softener (1) with a field board mounted on the ploug housing. Equipped with a plunger, the plug field board is made in the form of a softener-cutter as a whole as a whole. The plug is mounted on the body in a variable mode. The device was used to increase soil moisture and water permeability, as well as to reduce soil erosion, mainly by loosening the subsoil. [22]

Scientists of the Federal Higher Vocational Education Institution "Chuvash State Academy of Agriculture" of Russia V.P.Egorov, I.I.Maksimov, V.I.Maksimov conducted research on improving the plow.

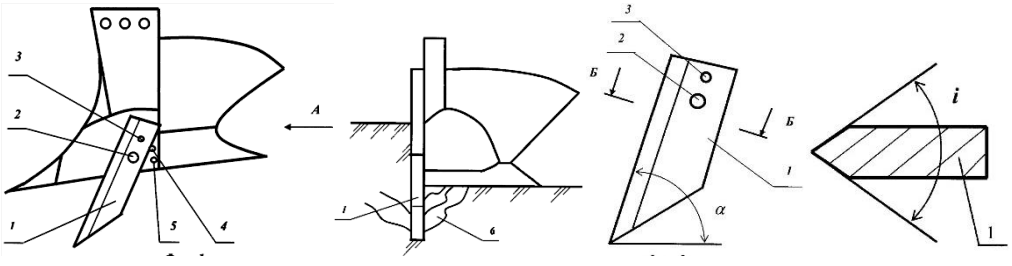


Figure 5. A cutting blade mounted on the plough body.

This device is a built-in cutting blade that softens the bottom layer of the field board plow, made in the form at an angle to the longitudinal plane of the plough body at the same time with the main tillage of the soil. This device has a hole (2) for mounting the softener field board (1) on the plough body and holes (3) for fastening so

that the softening depth varies depending on the softening depth given to the holes 4 and 5 of the plough body.

The purpose of the device is to soften the subsoil at a certain depth, increase the moisture capacity and water permeability of the subsoil, simplify the construction of the working body to soften the subsoil and reduce soil erosion during the main tillage. To achieve this, a field board in the form of a cutting blade is mounted on a vertical body at an angle in the longitudinal vertical plane (75 °; 40 ° - 10 cm; 20 ° - 5 cm to soften the subsoil to a depth of 15 cm) and a certain hole in the plow body is set to soften at depth.

Nizhne-Volzhsky Agricultural Research Institute of the Russian Academy of Agricultural Sciences (GNU NV NIISh) State Scientific Institution for Livestock Farms "Elansky Machine-Building Plant" Open Joint-Stock Company (OAO elanfermmash) conducted research work on the improved pitcher.

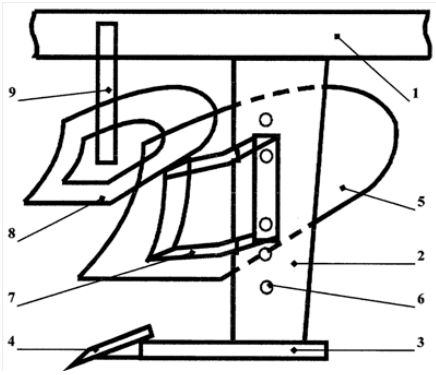


Figure 6. Advanced softener plough.

The main tillage equipment consists of plug frame (1), rack (2), shoe (3), blade (4), trough (5), hole for changing the depth of loosening (6), rack fastener (7), skimmer (8) , skimmer rack (9), the advantage of which is that in one pass, along with plowing the soil, the submerged birch layer softens to a depth of 15-20 cm. The disadvantage of such plugs is that due to the presence of two layers of tillage working bodies, the increased tensile strength and their inability to adapt to specific soil-climatic conditions limit their functional capabilities. [24]

A number of scientists of the Federal Vocational Education Budget of the Russian "Kazan State Agrarian University" I.S.Mukhametshin, P. I.Makarov, A. R.Valievs conducted research on the combined plough.

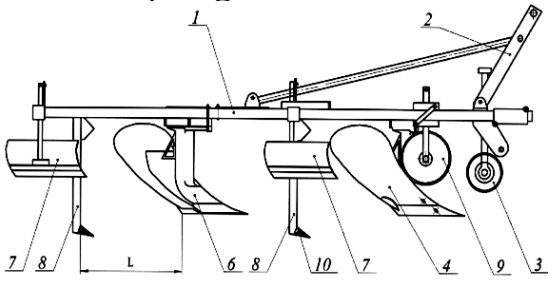
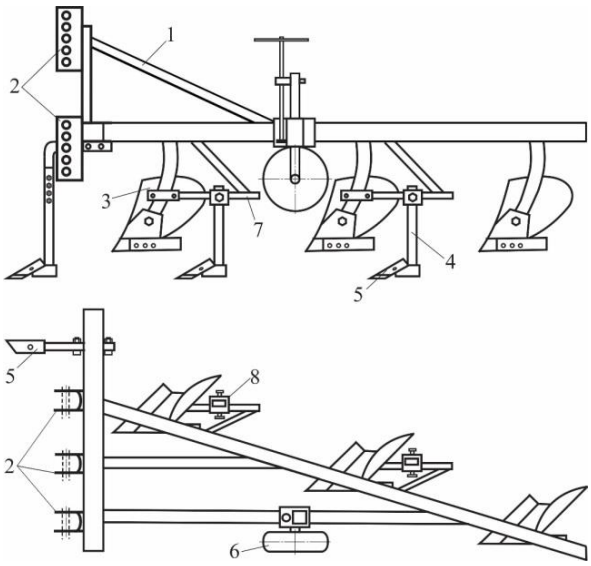


Figure 7. Combined deep digger plug.

Combined deep digger plough consists of frame (1), tie mechanism (2), disc blade (3), plow body (4), right (5) and (6) right and left hand bodies, respectively, two rows of push devices (7) plow (7) 8), a base wheel (9), and a conical rotating softener (10) mounted on bearings, the edges of which are mounted on the back of each housing in the form of a cone, which is able to rotate around its own axis. The main advantage of this device is that it performs all technological processes in one go. As a disadvantage, tillage in the form of a cone-shaped rotary softener leads to a relative increase in energy consumption and deterioration of its softening quality as a result of soil clogging between the screws and bearings. [25]

Based on the above, one of the most pressing issues in the agricultural sector is to reduce the energy consumption of this process by improving the basic process of tillage, ie the technological process of deepening the subsoil with plowing .

Advanced earthing plug frame 1, suspension device 2, overturner 3 and longitudinal beam 7 locks 8 are used to loosen the plow to a depth of 10-15 cm from the cutting line of the plow, depending on the location of the driving berch layer. (picture8).



1 frame, 2 suspension, 3 overturners, 4 columns, 5 softeners like gouge, 6 support wheels, 7 longitudinal beams, 8 locks.

Picture 8. Structural scheme of the improved soil-deepening plug

The proposed recesser is designed to be mounted on the back of the working body with a separate base and loosened to a depth of 10-15 cm from the cutting line of the plow, depending on the location of the gypsum layer under the drive. The design of this device is as follows.

The purpose of the proposed technical solution is to improve the reclamation condition of the soil by loosening the birch layer (plowing with simultaneous loosening of the subsoil) and to reduce the resistance of the plow during plowing. Scientific studies show that this device simultaneously achieves energy savings by softening the subsoil layer and improving the movement stability of the plough.

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