DOI: https://doi.org/10.5281/zenodo.13924700

TECHNIQUES AND TECHNOLOGIES OF DIGGING POTATOES GROWN IN SMALL PLOTS

A.A.Karimov, PhD.

Sh.Y.Boymurodov, Researcher

Abstract*. The article provides information on potato digging machines that are grown in small plots. Also, information on the justification of the parameters of potato digging machines is given.*

Keywords: *potato, oscillating rod, energy efficiency, small areas, techniques and technologies, potato varieties.*

1. Introduction

At the end of 2022 in the Republic of Uzbekistan, potatoes were planted on the main arable land by 67.9 thousand hectares, and as a recurring crop, 28.6 thousand hectares were planted in 3.0 million hectares. tons of potatoes were delivered. Potatoes are grown mainly in Andijan, Namangan, Samarkand, Surkhandarya, Tashkent and Fergana regions. According to the Food and Agriculture Organization of the United Nations (FAO), potatoes are grown on 22 million hectares in 150 countries around the world and it is planned to double its volume in the next 10 years. Based on this, it is required to develop and put into practice tools for digging up the harvest root crops with high quality work and productivity, as well as with the lowest fuel consumption.

The total area cultivation in the Kashkadarya region is 65,945 hectares, which the area planted by the landlords is 60.214 hectares and the area cultivated on peasant farms is 5,731 hectares. From this it can be seen that potatoes are mainly planted by the landlords in small arable land (Fig.1). Since 91.3 percent arable land is made up land for land owners, the cultivation potatoes is handled in an individual manner. Growing potatoes in small contours is mainly 0.4-0.5 hectares and even smaller areas.

It is important for the national economy of our republic to develop a small-sized potato digger improved from the above and justify its parameters.

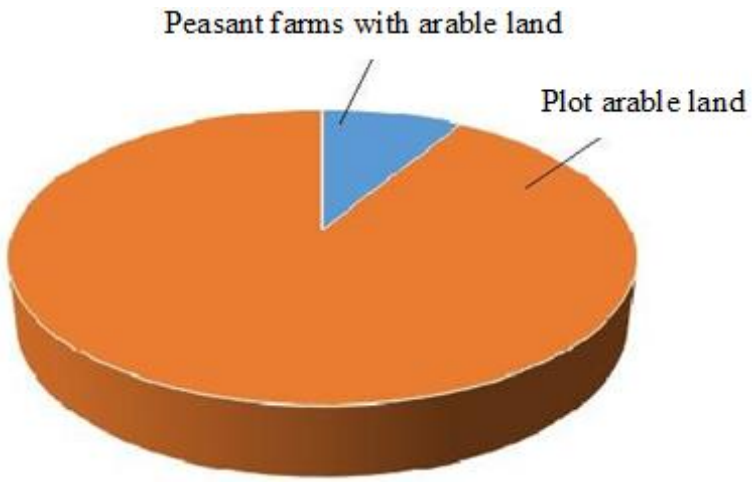

Figure 1. Total arable land in landholders and farmers ‘ farms

In vibratory-type potato diggers, trough-shaped ploughshares are mainly used. In elevator-type potato diggers, various types digging organs are used, which are divided according to the principle impact on the tuberous layer: passive, active and combined

However, these studies do not address the issues developing potato diggers with lattice ploughshares and forcibly oscillating working bodies for digging up the crop root crops and substantiating the technological processes their work and parameters. The purpose of the study is to substantiate the parameters lattice plowshare improved potato digger.

2. Materials and methods

The tasks of the research are as follows:

Regarding potato digging machines and their working bodies scientific and technical information and previously performed in this direction Analytical research of research works;

physico-mechanical properties of potato-planted field soil and egat study the terrain;

equipped with a grid plow and oscillating hivets construction and technological process of the potato digger justification;

A potato digger with an active working body with a grate and theoretical and experimental substantiation of the parameters and working mode of the khivs;

Experiments were carried out by aggregating a potato digger with a New Golland-110 tractor at a speed of 0.8-1.1 M/s aggregate. Experimental studies improved potato pickles were carried out in the summer season on farms Kashkadarya region Republic of Uzbekistan. The terrain field is flat, the soil experimental field is medium-light, sandy soil. The quality and energy indicators experimental potato digger

were evaluated according to the following indicators: the completeness potato digger; potato loss; damage to potatoes; drag resistance cowler. Drag resistance potato digger TST 63.03.2001 "Tests of agricultural machinery. Methods of energy assessment" was determined by using tenzometric fingers. One-factor experiments were carried out to determine the optimal parameters potato digger's lattice plowshare. Lattice ploughshares with different gripping widths and slots have been developed and manufactured for experimental studies. During the experiments, the degree damage and loss tuber, as well as the traction resistance potato digger were taken as evaluation criteria. The taxile transmitted literature [1, 5], an improved potato digger was developed based on early research as well as agrotechnical requirements poured into potato diggers (Fig.1).

The potato digger consists a frame 1 equipped with a suspension device, a main 2 and an intermediate coulter fixed to the frame, oscillating plows 3 attached to the main plows, and mechanisms that oscillate the plows. Oscillating motion to the tractor 3 is transmitted from the tractor power take-off shaft through a cardan shaft 4, a transmission box 5, a crankshaft 6, a drawbar 7, a bridle 8, a two-shouldered lever 9 and a lever 10. The technological process potato digger is as follows.

The main ploughshares 2 separate the soil layer from the bottom soil with the nodes, crush it and partially separate it from the main mass, and then direct it to the oscillating ferules 3. The harrows intensively separate the tubers from the soil and throw them on the surface field. The process separating potatoes from the soil and sieving the soil is improved under the influence oscillating feruls 3. The intermediate blade potato digger scoops up the potatoes that fall between the rows and transfers them to the harvesters.

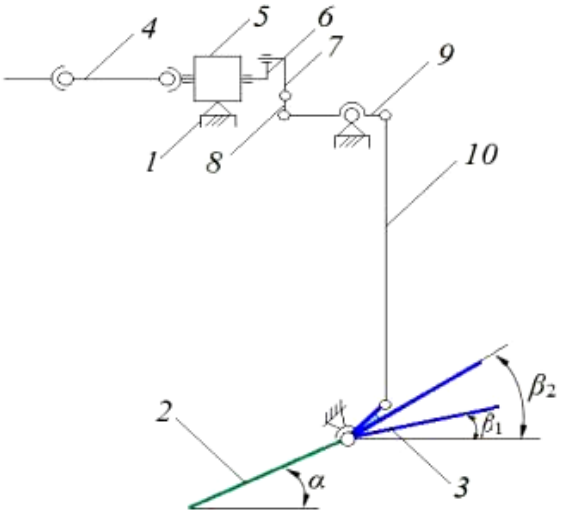

Figure 1. The scheme potato digger with a lattice ploughshare and oscillating rods: 1 – frame; 2 – ploughshare; 3 – rod; 4 – driveshaft; 5 – transmission; 6 – crankshaft; 7 – traction; 8 – leash; 9 – double–shoulder link; 10 – rod

Conducted studies on determining the angle deviation a plow relative to the horizon. According to their research, angle a should be between 22-30º. We take α=22º.

It is known that the length of the ploughshare potato digger affects whether the nodular mass accumulates in front ploughshare. As the length ploughshare increases, the speed movement nodular mass along the surface ploughshare decreases, which, in turn, causes the soil to accumulate in front ploughshare and disrupt the technological process. Under the influence plow, the nodular mass should move freely and disintegrate sufficiently on its surface. The length ploughshare was determined. We determine by the following expression

$$L_l \le ctg(\alpha+\varphi)\left\{\frac{\sigma_b}{\rho_x g}-\frac{2V_M^2}{g}\sin\tau[\cos\pi tg(\alpha+\varphi)-\sin\tau]\right\}, \quad (1)$$

where σ_b – is the temporary resistance to compression soil, Pa; ρ_x – volume density of soil, kg/m^3; τ – is the soil refraction angle, º; g – acceleration free fall, m/s^2; V_M – movement speed, m/s.

3. Results and discussion

The results experimental studies are shown in Figures. According to the results obtained with an increase in the angle inclination lattice plowshare, losses and damage to potatoes first decrease, and then increase according to the law concave parabola.

The influence width lattice plowshare on the quality and energy indicators potato digger. To justify the width lattice ploughshare, lattice ploughshares with widths of 35, 45, 55 and 65 cm were experimentally developed and manufactured. According to the results experiments, with an increase in the width lattice plowshare, potato losses first decrease and then increase according to the law concave parabola. Damage to potatoes decreases with an increase in the width ploughshare. This is due to the fact that with smaller values width ploughshare, the tuberous mass is not completely covered by them and the tubers are damaged by the blades of the ploughshares.

4. Conclusions

The most optimal design scheme an improved potato digger is a system consisting of transmission mechanisms, lattice ploughshares and forcibly oscillating rods. Potato digger parameters are based on

As a result theoretical studies carried out, analytical dependencies and mathematical models were obtained that allow determining the parameters and operating mode an improved potato digger with lattice ploughshares and oscillating rods. To destroy the tuberous formation to the required extent with minimal energy consumption, the width lattice ploughshare should be 55 cm, the angle ploughshare installation relative to the horizon is 22 °, the length ploughshare 38 cm.

REFERENCES

[1]. Karimov, A. (2023). Parameters justification of the improved potato digger. Innovative Development in Educational Activities, 2 (18), 256–263.

[2]. Mamatov F. M., Karimov A. A. Potato digger with latticed plowshares and oscillating rods. E3S Web of Conferences, 2023. 401, P. 04029.

[3]. Karimov, A. (2023). THEORETICAL JUSTIFICATION OF THE PARAMETERS OF AN IMPROVED POTATO DIGGER. Innovatsion Texnologiyalar,51(03),135–141.Retrievedfrom https://ojs.qmii.uz/index.php/it/article/view/537

[4]. Karimov, A. (2023). PARAMETERS JUSTIFICATION OF THE IMPROVED POTATO DIGGER. Innovative Development in Educational Activities, 2(18), 256–263. Retrieved from https://openidea.uz/index.php/idea/article/view/1655

[5]. Karimov A.A. Parameters of the working body of root crops // Prospects for the introduction of innovative technologies in the development of agriculture: International conference: – Fergana, 2021. –B.208-213. doi:10.47100/conferences.vlil.1335

[6]. Karimov, A. (2023). PARAMETERS JUSTIFICATION OF THE IMPROVED POTATO DIGGER. Innovative Development in Educational Activities, 2(18), 256–263. Retrieved from https://openidea.uz/index.php/idea/article/view/1655

[7]. Karimov, A. (2021, July). PARAMETERS OF THE WORKING BODY OF ROOT CROPS. In Конференции.

[8]. Каримов , А. А., & Кичкинаев, М. А. у. (2023). ПРИСАДКА ДЛЯ МОТОРНЫЕ МАСЛА. Educational Research in Universal Sciences, 2(3), 1021–1024.Retrieved from http://erus.uz/index.php/er/article/view/2512.

[9]. Karimov , A. A., & Zikriyoyev , S. U. o‘g‘li. (2023). QARSHI SHAHRI KO‘CHALARIDA HARAKAT XAVFSIZLIGINI ILMIY ASOSDA TADQIQ QILISH. Innovative Development in Educational Activities, 2(22), 190–199. Retrieved from https://openidea.uz/index.php/idea/article/view/1832

[10]. Karimov, A. A. (2023). INTELEKTUAL TIZIMLARNING HARAKAT XAVFSIZLIGIGA TA’SIRINING AHAMIYATI. *Educational Research in Universal Sciences*, *2*(18), 181-184.

[11]. Gill, W. R., & Berg, G. E. V. (1967). *Soil dynamics in tillage and traction* (No. 316). Agricultural Research Service, US Department of Agriculture.

[12]. Roul, A. K., & Raheman, H. (2017). Draft Prediction of Commonly Used Tillage Implements for Sandy Clay Loam Soil in India.

[13]. Raheman, H., Sarkar, P. (2024). Moldboard Plow. In: Tillage Machinery—Passive, Active and Combination. Springer, Singapore. https://doi.org/10.1007/978-981-99-6331-7_2

[14]. Karimov, A. (2023). THEORETICAL JUSTIFICATION OF THE PARAMETERS OF AN IMPROVED POTATO DIGGER. *Innovatsion Texnologiyalar* , *51*(03), 135–141. Retrieved from https://ojs.qmii.uz/index.php/it/article/view/537

[15]. Karimov, A. (2021, July). PARAMETERS OF THE WORKING BODY OF ROOT CROPS. In *Конференции*.
[16]. Karimov, A. (2023). PARAMETERS JUSTIFICATION OF THE IMPROVED POTATO DIGGER. *Innovative Development in Educational Activities*, *2*(18), 256–263. Retrieved from https://openidea.uz/index.php/idea/article/view/1655
[17]. Насиров, И. З., Косимов, И. С., & Каримов, А. А. (2017). Морфологик тахлил" методини қўллаб ўт олдириш свечасини такомиллаштириш. *Инновацион технологиялар*, *3*, 27-74.
[18]. Karimov, A. A. (2024). Organizing Management in the Transport Logistics System. *American Journal of Engineering, Mechanics and Architecture*, *2*(6), 66-68.
[19]. Akbarovich, K. A., & Uroqovich, X. H. (2024). The Importance of Goods and Material Flows and Warehouses in the Development of Logistics. *Excellencia: International Multi-disciplinary Journal of Education (2994-9521)*, *2*(6), 564-568.
[20]. Бойназаров, У. Р., & Каримов, А. А. (2013). Влияние предварительного окисления на процесс азотирования. In *СОВРЕМЕННЫЕ МАТЕРИАЛЫ, ТЕХНИКА И ТЕХНОЛОГИЯ* (pp. 90-92).
[21]. Karimov, A. A., & Rajabov, O. (2024). TIJORAT BANKLARIDA KASSA ISHINI TASHKIL ETISHNING AHAMIYATI VA UNI RIVOJLANISH BOSQICHLARI. *GOLDEN BRAIN*, *2*(15), 95-105.
[22]. Karimov, A. (2023). TAKOMILLASHTIRILGAN KARTOSHKA KOVLAGICHNING PARAMETRLARINI NAZARIY ASOSLASH. *Innovatsion texnologiyalar*, *51*(03), 135-141.
[23]. Каримов, А. А., & Азизов, Ш. А. (2022). ОБОСНОВАНИЯ СРОКОВ СЛУЖБЫ МОТОРНЫХ МАСЕЛ НА АВТОМОБИЛЯ «SHACMAN» УСЛОВИЯ ЭКСПЛУАТАЦИИ В УЗБЕКИСТАНЕ. *Conferencea*, 35-39.
[24]. Маматов, Ф. М., & Каримов, А. А. (2022). ИЛДИЗМЕВАЛИ ЭКИНЛАРНИ ЙИҒИБ-ТЕРИБ ОЛИШ ТЕХНИК ВОСИТАЛАРИ ВА ТЕХНОЛОГИК ЖАРАЁНЛАРИ. *Инновацион технологиялар*, *1*(1 (45)), 60-65.
[25]. Каримов, А. А. PARAMETERS OF THE WORKING BODY OF ROOT CROPS.
[26]. Бойназаров, У. Р., & Каримов, А. А. (2013). ВЛИЯНИЕ ПРЕДВАРИТЕЛЬНОГО ОКИСЛЕНИЯ НА ПРОЦЕСС АЗОТИРОВАНИЯ Бойназаров Урол Равшанович, к. т. н., доцент, Каримов Акмал Акбарович, ассистент. *Председатель организационного комитета-Куц Вадим Васильевич*, 90.
[27]. Сиромятников, Ю. М. ЗАСМІЧЕНІСТЬ ПОСІВІВ ГАРБУЗА В ЗАЛЕЖНОСТІ ВІД СПОСОБУ ОБРОБІТКУ ҐРУНТУ.
[28]. Mamatov, F., Karimov, A., & Shodmonov, G. (2023). Study on the parameters of bars of the potato digger ploughshare. In *E3S Web of Conferences* (Vol. 434, p. 03012). EDP Sciences.