

Justification of the choice of units for mains-noah soil cultivation of sweet sorghum and their effectiveness

N F Kashapov¹ M M Nafikov¹ M X Gazetdinov² M M Nafikova² and
A R Nigmatzyanov³

¹Kazan (Volga region) federal university, Kazan, Russia

²Kazan state agrarian university, Kazan, Russia

³Tatar institute of retraining specialists agribusiness, Kazan, Russia

e-mail: Arnig76@yandex.ru

Abstract. The article is devoted to problems of improving the efficiency of tillage crops. Presents an approach that focuses on the application of resource-saving technologies. To investigate the relationship between the financial welfare of the management and selection of units for primary processing of the soil. Conducted economic evaluation and identified the energy efficiency of main processing of the soil under sweet sorghum.

A set of methods of mechanical impact on the soil before planting and during plant growth is called a system of soil treatment. The basic processing of soil are of great importance since it largely affects the water-physical, biological-physical and agrochemical properties of the soil, which in combination with other techniques ultimately determines the magnitude of crop yields. When processing of the soil improves the structure of the topsoil and as a result of tillage increases the total porosity and the reduction is the amount of capillary pores. Capillary decreases and increases convectiondiffusion evaporation of moisture, and also improves the heating of the soil. Conversely, compaction total soil porosity decreases, capillarity increases. In other words, the treatment of the soil creates favorable conditions for the inflow of moisture from the lower layers to the upper and reduction of aeration, which affects the intensity of aerobic processes.

Therefore, regulating the degree of compaction of the soil by means of processing, can in considerable extent, influence the preservation and accumulation of moisture, and the conditions of life-activity of the soil microflora. In very loose soil (usually this happens immediately after processing) mineralization of humus increases and decreases its content. When more raft by the addition of mineralization is reduced and created the best conditions for humification of organizational-technical substances. Loose topsoil that is created after processing, under the influence of gravity, precipitation and other factors samoletnaya to so-called equal-spring density.

Direct assignment technology in agricultural production is the execution of technological operations in the cultivation of crops that provide their biological-ecological requirements. As a result, should get cost-effective and Vysokyi prominent, environmentally friendly products [1, 2, 3].

At the present stage in the agricultural sector use a wide range of farm machinery Noah. In this regard, we have conducted field experiments on the study of various tools for primary soil cultivation of sweet sorghum and their effectiveness in the conditions of the Republic of Tatarstan.

To soil could contribute to the generation of possibly large harvests necessary to possess a certain structure. Bulk density of the soil in the SIG-nificant extent, shape water, air and nutrient regimes, as



well as the activity of soil biota. High bulk density of the soil increases the development denitrificatori and butyric acid bacteria prevents the accumulation in soil of mobile forms of nitrogen, phosphorus and potassium.

In our studies, in addition the density of the soil before sowing sorghum in the variants of tillage significant differences were not, however, before harvesting in the 10-30 cm layer of the soil was denser on the variants in the handling of APC-6, KPI-3.8 and CTS-10. (tab. 1).

Table 1 – Bulk density of the soil depending on processing systems, g/cm³

Basic soil	Before sowing				Before harvesting			
	0-10 cm	10-20 cm	20-30 cm	0-30 cm	0-10 cm	10-20 cm	20-30 cm	0-30 cm
Moldboard plowing PN-5-35	1,06	1,12	1,14	1,11	1,08	1,15	1,17	1,13
Plowing plows Maltseva	1,07	1,13	1,16	1,12	1,10	1,17	1,20	1,16
Treatment of APC-6	1,09	1,16	1,20	1,15	1,14	1,22	1,25	1,20
Processing KPI-3.8	1,08	1,14	1,18	1,13	1,12	1,20	1,23	1,18
Processing CTS-10	1,08	1,15	1,19	1,14	1,13	1,21	1,24	1,19

The tests showed that the hardness of the soil layers depended on the tillage systems and the degree of hydration (tab. 2). Table 2 shows that in the layer of 0-15 cm between the systems processing this indicator is not significantly different, and at a depth of 20 cm and lower it was higher on plots loosening by a subsurface cultivator.

Table 2 – Hardness of the soil depending on tillage systems g/cm³

Basic soil	At the beginning of the growing season					Before harvesting				
	5 cm	10 cm	15 cm	20 cm	25 cm	5 cm	10 cm	15 cm	20 cm	25 cm
Moldboard plowing PN-5-35	2,9	5,2	14,1	17,1	30,2	12,1	18,5	27,3	32,1	33,8
Plowing plows Maltseva	3,0	5,3	14,4	18,0	30,3	12,6	19,3	28,2	33,5	35,1
Treatment of APC-6	3,2	5,7	16,5	22,1	31,6	13,4	22,3	34,1	37,6	41,4
Processing KPI-3.8	3,0	5,4	15,6	20,1	30,5	12,9	21,2	31,8	36,3	38,2
Processing CTS-10	3,1	5,5	15,8	20,3	30,7	13,0	21,4	32,9	36,7	40,1

In experiments conducted systematic observation of the status of the nutrient regime of the soil. Three times during the growing season for three years on two layers of the arable layer in the two-times repeat activity conducted analyses to determine the content of each of the main elements of Pieting – N, P₂O₅ and K₂O in the soil, we have derived (15 definitions) average for 3 years by layers of 0-15, 15-30 and 0-30 cm In the result of the APC-6, KPI-3,8, CTS-10 under crops is clearly seen the differentiation of the parts of the arable layer on fertility. In the layer 0-15 cm, the content of P₂O₅ on the moldboard treatment was 164 mg/kg, with processing APC-6 – 176 and CTS-10 – 173 mg/kg, K₂O respectively 179,186 and 184 mg/kg. Excess options APC-6 P₂O₅ – 12, K₂O – 15 mg. of Alkali-hydrolyzable nitrogen by plowing contained 78, and when the soil treatment unit LDC-10 – 85 mg/kg of soil. In the underlying layer (15-30 cm) Pro-a pattern opposite signs. Plowing found 71 mg, and tillage CTS-10 – 55, P₂O₅ 150 and 133, respectively, K₂O – 161 and 150 mg/kg.

Therefore, the fertilizer applied, particularly phosphate and potash, when the flat by loosening trapped mainly in the upper (0-15 cm) layer and in lower layer (15-30 cm) penetrate in much smaller quantities than is the case in plow treatment.

The results of the research identified economic efficiency, which are presented in table 3.

Table 3 - Economic evaluation of the use of different tools for primary soil cultivation of sweet sorghum

Option experience	The yield of green mass, t/ha	The cost of the gross commodity, rub.	Tomorrow are you on 1 ha, rub.	Net income from 1 ha, rub.	Profitability level, %	The cost of 1 ton of green mass, rub.
Moldboard plowing PN-5-35	41,1	5014	3050	1964	64,3	74,2
Plowing plows Maltseva	35,9	4380	2954	1426	48,3	82,2
Treatment of APC-6	26,5	3233	2850	383	13,4	107,5
Processing KPI-3.8	31,4	3831	2872	959	33,4	91,6
Processing CTS-10	30,6	3733	2865	868	30,3	93,6

The greatest economic efficiency revealed in the cultivation of sweet sorghum in the application of moldboard plowing [4,5]. Net income in this embodiment, 1964 amounted to rub/ha, profitability level 64.3 per cent, the coefficient of energy efficiency of 6.7 vs. 383 - 1426 RUB./ha, the 13.4 - 48.3 percent and 4.4 to 5.7 obtained in other ways. Bioenergy until the indicator of agro-ecosystem in these variants was respectively 4.5 and 1.1.

However, in recent years more and more importance in international practice acquires bioenergy evaluation [6, 7]. It allows to compare different technologies of production of agricultural products (tab. 4).

Table 4 – Energy efficiency primary tillage in the cultivation of sorghum with various tools

Option experience	The yield of green mass, t/ha	Accumulated energy, GJ/ha	Energy, GJ/ha	Energy efficiency ratio	The PSU agroecosystem
Moldboard plowing PN-5-35	41,1	189,88	30,23	6,3	4,5
Plowing plows Maltseva	35,9	165,86	29,11	5,7	2,6
Treatment of APC-6	26,5	122,43	28,01	4,4	1,1
Processing KPI-3.8	31,4	145,07	27,91	5,2	1,7
Processing CTS-10	30,6	141,37	28,03	5,0	1,6

The highest (6,3) in the experiment the coefficient of energy efficiency obtained about the development of a soil as well plough PN-5-35, the lowest (4,4) – when tillage Agra-gat APC-6. Bioenergetic indicator of agroecosystem in these embodiments, amounted respectively to 4.5 and 1.1.

Conclusion

1. The lowest (16-24 PCs/m²) weediness was in the variant with conventional tillage and highest when conducting primary tillage aggregates KPI-3.8 (49-55 PCs./m²) and CTS-10 (49 to 56 pieces/m²).

2. When tillage plows Maltseva and KPI-3.8 before planting sweet sorghum accumulates more moisture than when plowing. The difference in favor of KPI-3.8, compared with tillage by year 4-5 mm. To harvest the moisture content is aligned from the greater clogged-ness of crops and the deterioration of the physical properties of the arable layer in other embodiments.

3. At the option of moldboard plowing in three years on the average of the maximum (of 41.1 t/ha) yield of sweet sorghum. Below are some (of 35.9 t/ha) yield of sorghum was under obra-design soil plows Maltsev. The lowest (of 26.5 t/ha) productivity of green mass of sorghum-La when the tillage unit of APC-6. When tillage KPI-3.8 and the CTS-10, it amounted to Vila respectively 31.4 and 30.6 t/ha.

4. Taking into account the multifactorial formation and to improve the financial blah-popoluca agricultural enterprises should implement measures to validate the aggregates of primary tillage for each crop taking into account biological, economic, and technological factors.

5. Under sweet sorghum cost-effective and energy efficient were ploughing on-lesnym the plow PN-5-35.

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