



International Journal of Innovative Technologies in Economy

e-ISSN: 2414-1305

Operating Publisher
SciFormat Publishing Inc.
ISNI: 0000 0005 1449 8214

2734 17 Avenue SW,
Calgary, Alberta, T3E0A7,
Canada
+15878858911
editorial-office@sciformat.ca

ARTICLE TITLE

ECONOMIC ASSESSMENT OF THE USE OF AGRICULTURAL
MACHINERY IN ACCORDANCE WITH THE GEORGIAN VEHICLE
AND TRACTOR FLEETS

DOI

[https://doi.org/10.31435/ijite.3\(55\).2026.5702](https://doi.org/10.31435/ijite.3(55).2026.5702)

RECEIVED

24 July 2026

ACCEPTED

25 September 2026

PUBLISHED

30 September 2026

LICENSE



The article is licensed under a **Creative Commons Attribution 4.0 International License**.

© The author(s) 2026.

This article is published as open access under the Creative Commons Attribution 4.0 International License (CC BY 4.0), allowing the author to retain copyright. The CC BY 4.0 License permits the content to be copied, adapted, displayed, distributed, republished, or reused for any purpose, including adaptation and commercial use, as long as proper attribution is provided.

ECONOMIC ASSESSMENT OF THE USE OF AGRICULTURAL MACHINERY IN ACCORDANCE WITH THE GEORGIAN VEHICLE AND TRACTOR FLEETS

Zaur Phutkaradze

Georgian Academy of Agricultural Sciences, Georgia

Merab Mamuladze (Corresponding Author, Email: Merab.mamuladze@bsu.edu.ge)

Department of Agrotechnology and Agroengineering, Batumi Shota Rustaveli State University, Batumi, Georgia

ABSTRACT

The relevance of the scientific research is that the agricultural machinery market in Georgia is mainly filled with agricultural machinery from China, India and other Asian manufacturers. In particular, the supply of agricultural tractors with 16-90 horsepower engines from China increased 3 times in 2022-25, while the supply of more expensive European-American tractors, on the contrary, decreased, as their cost differs sharply from that of Asian-made agricultural machinery. In recent years, mainly JINMA tractors have entered the Georgian market, followed by SADIN and FUGESEN, and then ARMATRAC and other manufacturers. The presented tractors have similar engine power ranges, are characterized by practically identical technical and economic indicators, and they differ from each other in operating weights and fuel consumption.

The scientific article describes the operation of 80-horsepower tractors under various conditions, determining the productivity of the tractor at different densities, the ability to increase traction, the productivity of the working speed and the minimum fuel consumption per cultivated area. The research showed that the JINMA tractor shows the best performance, with up to 30% higher productivity and up to 15% lower specific fuel consumption than other Chinese-made tractors.

KEYWORDS

Tractors, Fuel, Productivity

CITATION

Phutkaradze, Z., & Mamuladze, M. (2026). Economic assessment of the use of agricultural machinery in accordance with the Georgian vehicle and tractor fleets. *International Journal of Innovative Technologies in Economy*, 3(55). [https://doi.org/10.31435/ijite.3\(55\).2026.5702](https://doi.org/10.31435/ijite.3(55).2026.5702)

COPYRIGHT

© The author(s) 2026. This article is published as open access under the **Creative Commons Attribution 4.0 International License (CC BY 4.0)**, allowing the author to retain copyright. The CC BY 4.0 License permits the content to be copied, adapted, displayed, distributed, republished, or reused for any purpose, including adaptation and commercial use, as long as proper attribution is provided.

Introduction

Tractors manufactured by European and American corporations are relatively expensive in the Georgian market and consumers are focusing on purchasing cheaper tractors, so there are actually very few tractors of this type in techno parks and commercial enterprises. As a result, Asian manufacturers (China, India) have actively begun to enter the Georgian market. Also, a certain percentage of the market may be imported from second or third countries.

Chinese-made agricultural tractors are of various brands, and agricultural machinery is produced in China by both state corporations and private organizations, where dozens of models of harvesting machines and trailer-mounted agricultural machinery are produced. The technologies produced have a wide range of technical and economic indicators, reliability and performance characteristics. Chinese manufacturers produce tractors with low-power engines and small-scale high-power tractors. Belarusian-made tractors have also appeared on the Georgian market, which are competitors of Chinese tractors, and the issue of their selection is on the agenda.

Methodology

The main essence of the study was the formation of the agricultural tractor market and statistical data, previous studies conducted to determine the technical characteristics of tractors manufactured in China and the operational properties of tractors, as well as the use of statistical, computational, comparative, programmatically targeted, economic-mathematical modeling methods.

Results and Discussion

Today, well-known Chinese agricultural machinery and tractor manufacturing companies include: Foton Lovol International Heavy Industry, Changzhou Dongfeng Agricultural Machinery Group, YTO Group Corporation; Zoomlion Agriculture Machinery, Shifeng Group, Weichai Power, and others.

The Georgian market is mainly represented by JINMA, SADIN, ARMATRAC, and the supply of manufactured tractors has increased 2.1 times over the past three years, while parallel imports through Georgia have increased 2.6 times (Fig. 2) [3]. In recent years, China has produced tractors of all power ranges, as shown in Fig. 1.

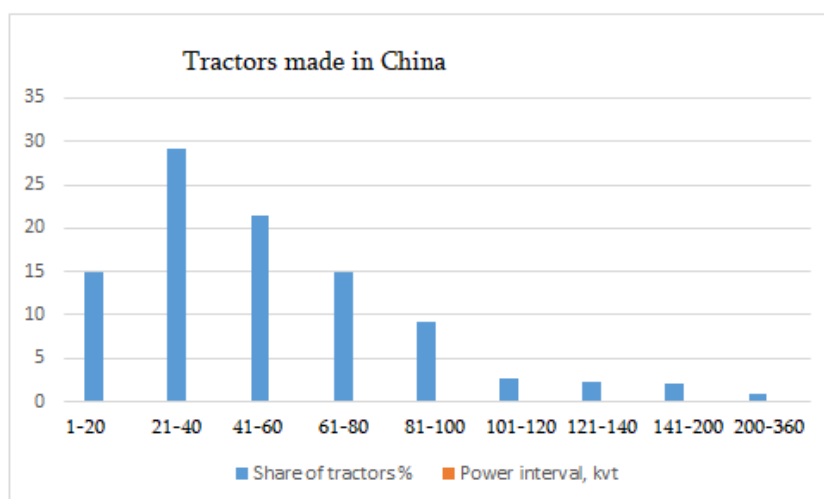


Fig. 1. Tractor production in China according to recent data

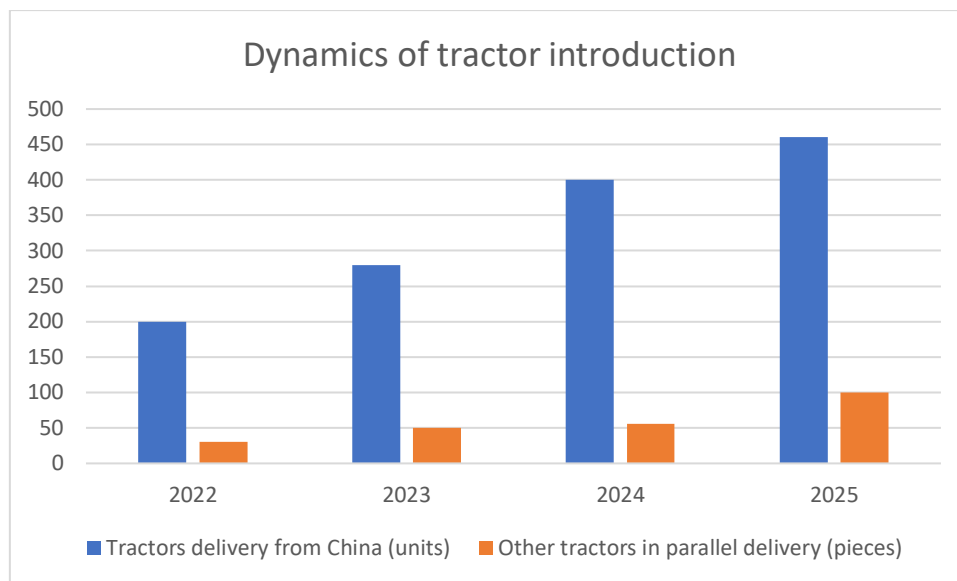


Fig. 2. Dynamics of tractors imported into Georgi

We have presented the technical characteristics of 80 horsepower tractors in the form of tab. 1.

Table 1. Technical characteristics of 80 horsepower tractors

Engine	Stamp	Nominal power kw	Engine capacity	Fuel consumption, gr/kwt.h
LRC4108T79/R4105T19	JINMA 804 tractor 80HP	80	4.94 4.67	230
Laidong KM4100ZT4-105	SADIN SD804 80HP 4W Diesel	80	8.3	240
Mahindra HCE STAGE V	ArmaTrac 804.4 FG	80	4,6	245
4WD	FUGESSEN-804	80	4,8	240

All tractors are available with either a 12- or 16-speed transmission, with a speed range from 1.5 km/h to 36.01 km/h. The ArmaTrac 804.4 FG tractor is available with an 8-speed or 16-speed transmission [4], [5].

To get acquainted with the JINMA 804 tractor, we present its technical indicators in the form of Table 2. To compare it with other Chinese-made tractors and determine their working characteristics, we analyzed various options, in particular for additional loading of the tractor's ballast weights, taking into account the weight distribution between the axles.

For JINMA 804 tractor

Loading options.

Option 1 – No additional weight; Option 2 – 2 rear weights, 45 kg per tire; Option 3 – 2 front weights, 40 kg + 2 rear weights, 45 kg per tire; Option 4 – 4 front weights, 40 kg + 2 rear weights, 45 kg per tire; Option 5 – 4 front weights, each 40 kg + 4 rear weights, each 45 kg per tire; Option 6 – 6 front weights, each 40 kg + 4 rear weights, each 45 kg per tire; Option 7 – 8 front weights, each 40 kg + 4 rear weights, each 45 kg per tire; Option 8 – 8 front weights, each 40 kg + 6 rear weights, each 45 kg per tire; Option 9 – 10 front weights, each 40 kg + 6 rear weights, each 45 kg per tire.

Table 2. We presented the main operational characteristics of the JINMA brand tractor.

Tractor brand	Technical specifications			
	Operating mass, kg	Engine power, kw	Energy saturation kw/kN	Balance load kg
Jinma 804	3215	59	1,3	10x40 3, 6*45 on the tire
Jinma -850B	3620	62	1,4	10x40 3, 6*45 on the tire
Jinma -950	3620	69	1,42	10x40 3, 6x45 on the tire
Jinma -1004B	4500	73,5	1,80	12x40, 3. 6x50 on the tire
Jinma -1254	4600	92	1,87	12x40, 3. 6x50 on the tire

The results of calculations to determine the working weight, energy saturation, and nominal traction force are presented in Table 3.

Table 3. Report of operating weight, energy saturation and nominal traction force.

Option number	Front axle, kg		Rear axle, kg		Weight, kg	Energy saturation, kw/kn	Nominal traction force
	Meaning	%	Meaning	%			
1	1400	45,2	1830	54,3	3215	1,3	14,6
2	1400	45,3	1834	55,1	3350	1,4	15,5
3	1499	43,2	1834	54,2	3380	1,3	15,7
4	1530	44,1	1870	54,3	3390	1,3	16,1
5	1535	43,8	1920	55,3	3410	1,45	16,8
5	1570	44,6	1943	54,8	3516	1,42	17,2
7	1585	45,1	1986	55,6	3670	1,25	17,8
8	1593	44,2	2010	53,9	3810	1,21	18,1
9	1600	44,8	2021	54,7	4020	1, 20	18,9

We present the tractor's traction force according to the speed of movement in the form of Table 4.

Table 4. Tractor traction force depending on travel speed

Working speed km/h	Traction force k.n								
4,2	12,9	12,3	12,3	13,1	13,4	13,9	14,2	14,7	15,3
5,6	12,1	11,3	12,1	12,4	12,8	13,3	13,8	14,2	14,9
6,8	11,0	10,2	10,1	11,2	11,7	12,5	12,7	13,7	13,9
9,6	8,7	9,6	9,2	9,8	10,3	12,2	11,9	12,4	13,6
11,3	7,1	8,3	8,76	8,6	9,2	11,6	10,5	11,8	12,5
14,2	6,09	7,4	7,2	7,2	8,7	9,4	9,3	10,6	11,7
16,3	5,2	5,4	5,1	5,2	5,4	6,2	6,5	7,9	8,3

We evaluated the dependence of ballasting on the operational impact of the machine by determining the productivity and fuel consumption of the tractor unit during the technological process of cultivation.

Based on initial data, resistance 11.2 kn/m, rolling coefficient 0.12, traction reserve 7.3%

The traction resistance of the aggregate is determined by the formula [1]:

$$R_a = R_M + R_f$$

Where R_M -is the traction resistance force of agricultural machinery, in kn;

R_f - Rolling resistance force of agricultural machinery, kN

Hourly production of the unit:

$$W_{cl} = eB_{wor}V_{wor} = e\epsilon_B\epsilon_V\tau B_a V_T$$

Where e - Movement speed measurement coefficient (0.1)

ϵ_B - Modal coefficient (0.9)

V_{wor} - Working speed of the unit m/s

ϵ_V - Speed utilization coefficient (0.7)

τ - Time utilization coefficient (0.7)

Fuel consumption

$$g = \frac{G_1 + G_2 + G_3 + G_4}{W_{cl}}$$

$G_1 + G_2 + G_3 + G_4$ - Average fuel consumption in working hours kg/h

Average hourly fuel consumption is determined from reference data or calculated using specific fuel consumption based on effective horsepower and engine load.

For the cultivator ANIZ CM-05 - $R_a = 7,9$ k.n, ANIZ CM-06 - $R_a = 10,3$ k.n, ANIZ CM-07- $R_a = 12,2$ k.n,

Cultivator ANIZ CM-05 at a speed of 13 km/h and a resistance of 9 kN

$$W_{cl} = 0,1 \times 0,955 \times 4 \times 0,77 \times 13,24 \times 0,75 = 2,92 \text{ ha/h}$$

$$g = \frac{9 \cdot 0,75 \cdot 5 \cdot 0,25}{2,8} = 2,8 \text{ kg/h}$$

We have presented the hourly productivity and fuel consumption report at 10 km/h and various resistances in the form of 5 tables.

Table 5. Hourly productivity and fuel consumption report at 10 km/h and various resistances

N	Stamp	Travel speed, km/h	R_a Resistance force, kn	W_{cl} Hourly productivity ha/h	g Fuel consumption kg/ha
1	Cultivator ANIZ CM-05	10	11,5	2,92	2,94
2	Cultivator ANIZ CM-05	10	11,9	2,92	2,97
3	Cultivator ANIZ CM-06	10	12,0	2,92	2,97
4	Cultivator ANIZ CM-06	10	12,6	2,92	3,16
5	Cultivator ANIZ CM-06	10	12,8	2,92	3,27
6	Cultivator ANIZ CM-06	10	13,0	2,92	3,23
7	Cultivator ANIZ CM-07	10	13,5	4,43	2,17
8	Cultivator ANIZ CM-07	10	13,5	4,43	2,21
9	Cultivator ANIZ CM-07	10	14	4,45	2,22

The analysis of observations by tractor brand showed the following data, which we present in the form of a table:

Table 6. Analysis of observations by tractor brand.

Tractor brand	Cultivator brand	Indicators	
		Aggregate productivity ha/h	Fuel consumption kg/ha
Jinma 804	ANIZ CM-07	3,4	2,4
Jinma -850B	ANIZ CM-07	3,2	2,7
Jinma -950	ANIZ CM-06	3,0	2,8
Jinma -1004B	ANIZ CM-05	3,18	2,6
Jinma -1254	ANIZ CM-05	3,2	2,2

The optimal option can be considered a tractor with the brand Jinma -1254 in aggregation with the cultivator ANIZ CM-05. It was shown that the hourly productivity during the work process was 3.2 ha/h and the fuel consumption was 2.55 kg/ha.

It is also possible to perform a comparison analysis with other brands of tractors available on the Georgian market. For comparison, we chose similar Chinese-made tractors - BELARUS 1221.2 and BELARUS-1523.

We have presented the analysis of the operational composition in the form of 7 tables.

Table 7. Operational composition analysis

Tractor brand	Cultivator brand	Indicators	
		Aggregate productivity ha/h	Fuel consumption kg/ha
BELARUS-1523.	ANIZ CM-05	3,0	2,9
BELARUS 1221.2	ANIZ CM-05	2,9	2,8
Jinma -1254	ANIZ CM-05	3,4	2,1

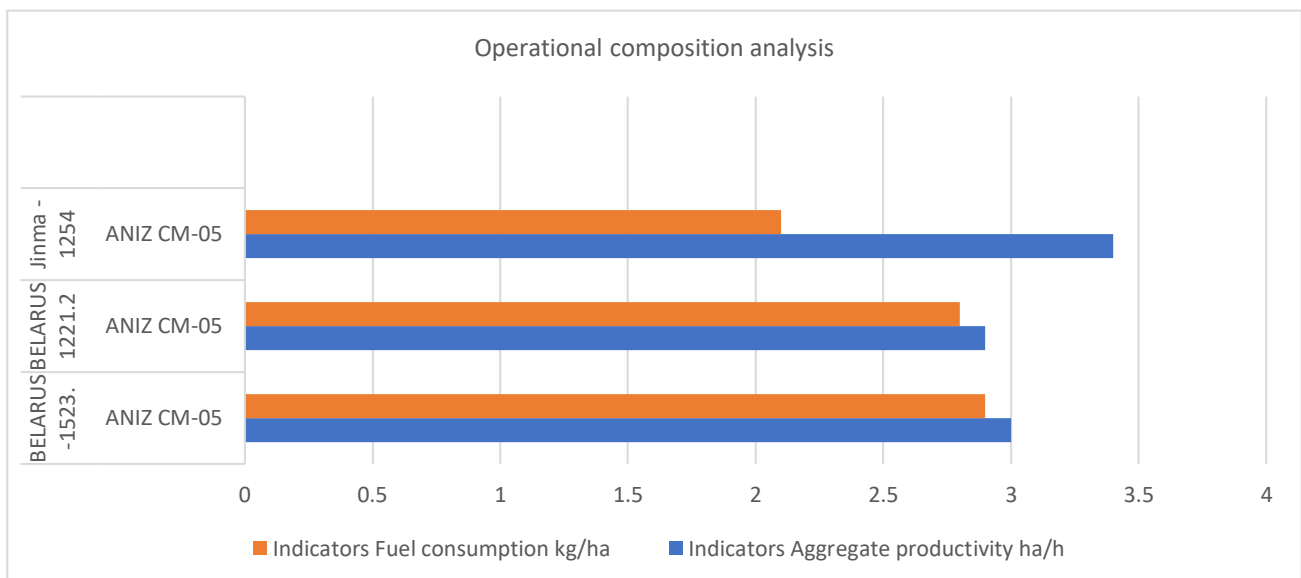


Fig. 3. Operational composition analysis schedule.

Conclusions

The supply of tractors manufactured in China to the Georgian market has doubled over the past three years due to its popularity, and parallel imports will also increase, therefore, it is crucial for agricultural producers to make the right choice in terms of high-quality and reliable agricultural tractors. The scientific paper evaluates the characteristics of the unit and the amount of specific fuel consumption. Among tractors with an 80-horsepower engine, the Jinma -1254 has better characteristics than tractors from other Chinese manufacturers and the BELARUS 1221.2 tractor. Although Chinese-made tractors are significantly inferior in productivity and fuel consumption. The BELARUS 1221.2 is practically equal to the Jinma -1254 in productivity, but lags behind in fuel consumption. However, it should be noted that Belarusian tractors are represented by two brands: BELARUS-1523 and BELARUS 1221.2 and have better performance, due to their higher weight and wider gear range, namely the Belarusian-made tractor has a 10-speed gearbox, while the Jinma -1254 has an 8-speed gearbox, but in terms of price and economy, the Chinese-made tractor is absolutely acceptable in Georgia for surface tillage and other agricultural work.

REFERENCES

1. Reyes-Valenzuela, M., et al. (2022). Economic evaluation of fuel cell-powered off-road machinery using stochastic analysis. *International Journal of Hydrogen Energy*, 47(5), 2771–2782.
2. Malakhov, A. V., & Borisov, A. A. (2021). Efficiency of agricultural machinery: How to integrate traditional and alternative methods of economic evaluation? In *The challenge of sustainability in agricultural systems: Volume 2* (pp. 885–895). Springer International Publishing.
3. Lazarus, W., & Selley, R. (2005). *Farm machinery economic cost estimates for late 2005*. Univ. of Minnesota Ext. Serv.
4. Lazarus, W. F., & Selley, R. (2002). *Farm machinery economic cost estimates for 2002*. University of Minnesota Extension Service, College of Agricultural, Food and Environmental Sciences.
5. Subaeva, A. K., & AA, Z. (2015). Improvement of agricultural machinery economic efficiency. *Int Bus Manag.*, 9(7), 1770–1774.
6. Dovlatova, G., et al. (2022). Calculation of the economic efficiency of technological machines in the transition to continuous automated processes. *Transportation Research Procedia*, 63, 495–501.
7. Katsitadze, J., et al. (2017). Improving the reliability of agricultural machinery, using the method of restoration of parts under submerged arc welding, and its technical and economic evaluation. *Machines. Technologies. Materials*, 11(6), 307–310.
8. Rodríguez, C. M. T., de la Rosa Jiménez, Y., & Rodríguez, H. V. (2021). Farm machinery for the “Mores Food Program”. Financial economic evaluation of an investment project. *Revista Ciencias Técnicas Agropecuarias*, 30(2), 95–103.