



THE UKRAINIAN AGRICULTURAL GROUPS STATE AND AGRO-MACHINERY ROVISION

Volodymyr IVANYSHYN*, Taras HUTSOL

STATE AGRARIAN AND ENGINEERING UNIVERSITY IN PODILLIA

*Corresponding author: e-mail:vvivanyshyn@gmail.com

KEYWORDS

*agricultural machinery,
technical provision,
agricultural production,
technical equipment,
intensive technologies,
tillage,
soil compaction,
vehicles,
machinery efficiency
enhancement*

ABSTRACT

The study is intended to examine the reproduction and efficient application of technical potential of the agricultural production. Analysis focuses on the activities of agricultural enterprises, and the influence of the machinery availability, its amount and quality on the economy results. The presented findings reveal the connection link existing between agricultural commodity producers and agro-machinery manufacturers, define technical and economic premises of establishment and development of the corporate technical servicing. The major strategies of the development of sustainable provision and efficient machinery application under the conditions of innovative technologies application, are circumscribed.

On the condition of provision of the agricultural production with the latest agricultural machinery and advanced technologies depend its further development, population welfare, working position and sustainable income security of the rural areas and their inhabitants. Therefore, the underlying problem, being quite relevant and profound, requires careful consideration and can be further developed in the scientific field.

As the result of detailed study, the explicit development plan of the provision of the agricultural enterprises with physical infrastructure, the development strategies of the rural areas, and specific business plans can be elaborated.

INTRODUCTION

The essential marketing levers of the equivalent exchange between the national economy sector and the agro-industrial complex (AIC), weren't defined under the entire period of economic reforms in this country, which predetermined, for its part, the unfavourable socio-economic and marketing environment of the agrarian sector, under the conditions of which, together with the price disparities of agricultural and industrial products, the husbandry has been functioning till nowadays. This is happening despite the fact that the legislative acts, a number of decrees of the President of Ukraine, and the resolutions of the government stipulate the equivalence of exchange as an obligatory condition for the free development of the agricultural enterprises economy.

Such circumstances created the marketing environment of the AIC, in which the agricultural producer with low income can't renew the equipment, being 80-90 % obsolete nowadays, and the agro-machinery manufacturer can't realize the equipment being produced,

and, consequently, cuts down the manufacturing output, destroying, at the same time, the industry of tractor and agro-machinery engineering.

Such a state of facts requires the fundamental analysis of the system of technical provision of agricultural producers and machinery manufacturers supply of machine-building enterprises. The factors and impulses, creating unsatisfactory condition in these areas are to be revealed. The study is also to develop and prove measures, and to set forth the ideas, considering this problem resolution.

MATERIALS AND METHODS

A number of domestic scholars' studies were dedicated to the definition of the place and the purpose of the technical provision of the AIC agrarian sector. Among them I. K. Bilousko, V. H. Bilskyi, L. M. Budniak, A. V. Burylko, M. I. Herun, M. I. Hrytsyshyn, P. A. Denysenko, T. S. Ivashkiv, A. P. Korzh, I. P. Masl, M. M. Mohylova, S. V. Petryk, V. O. Pytulko, H. M. Pidlisetskyi, L. V. Pohorilyi, V. L. Tovstopyat, V. M. Trehobchuk, V. P. Yakovenko. Among foreign scholars in this area H. Donaldson, E. Kain, O. Kantor, A. Koller also should be mentioned.

At the same time, despite the attention of science to the problems of technical provision of the agricultural sector, the actual state of affairs in this industry is still far from desirable in Ukraine. In particular, a lot of scientific developments, despite their theoretical correctness, cannot be applied in practice due to their inconsistency with the actual situation in the industry. Technologies and techniques of such a work are poor and imperfect. There are problems even at the level of the conceptual apparatus which urges the determination of the cause of an existing unsatisfactory condition, already at the stage of the development of methodological bases of the problem. Thus, conducting research towards improvement of technologies and techniques and methodological bases of development of the technical provision system of the AIC agrarian sector is quite relevant, which determined the subject of this study.

The following scientific methods shed light on the issue under study: historical, statistical, methods of comparison and analysis.

RESULTS

There is still a necessity of modern machinery being developed and produced in Ukraine, and it depends on the two main circumstances. At first, in the beginning of the nineties about the third part of all the technical equipment required by the agrarian sector of Ukraine was produced in the country. In the second place, the certain constitutional changes took place over the period of independency. In particular, the production of the

traditionally unprofitable products, requiring the expenditure of much labour – vegetables, potatoes, milk and beef – moved from large agricultural enterprises in the private farms. They require compact equipment, the respective manufacturing of which isn't organized yet. The current situation is peculiar due to that fact that innovative part is tightly interlaced with an ordinary supply of materials and machinery. However, the innovative role of technical equipment in the mechanisms of economic relations still can be identified in case of the purchase or the agro-technical servicing and also while analysing the efficiency of technology application.

The infrastructure-creating role of technical equipment is generated by the impartial necessity of arranging certain conditions for proper machinery application in the production sphere. As is generally known, the infrastructure (transport, connection, routes, etc.) is a totality of areas providing stable economy functioning. Likewise, there are a number of measures that are to be taken to ensure the efficient mechanisation means application at the agricultural enterprise. Of great importance is a personnel training. The personnel of mass professions –tractor-operators, and higher qualification – engineers and technicians are required. As far as, the following category of workers is enrolled into economy on an on going basis, the overwhelming majority of enterprises defray the expenses of their training at the corresponding educational establishments. The number of the machinery constantly increases, and the personnel-training costs have become the constant component of the enterprise outgoings. The dealer network also can be considered to be personnel assistance in technique. The personnel is not the only component of the agricultural enterprise service scheme being required for the efficient machinery application, the other one includes the following material and technical premises : establishing accommodations, or at least specially equipped areas for its maintenance, diagnostic centres and repair shops with the appropriate equipment, spare parts storehouses, and storage facilities for fuel and lubricants keeping and units fuelling, vehicles for fuel and spare parts delivery, and so on. This is a kind of service infrastructure that also has working positions of repairmen, security guards, vehicle drivers, etc. To accommodate the production facilities the land is needed and the facilities must meet certain technical, sanitary, and social requirements. A certain complex of means of production and workers that is to be rationally arranged is gradually being formed.

The technical equipment part is undoubtedly quit important and becomes apparent mainly through forming of economic results of the agrarian manufacturers affairs. At first, technical equipment ensure the receipt of the plant growing gross output, its post harvest handling, dispatch for storage, and in some cases – even the transportation to the place

of processing. Taking into account that fact that the technical equipment performs the most power-intensive operation of the plant growing production, the assertion that mechanization means have completely covered the whole technological cycle of the plant growing production, especially the one concerning large agricultural enterprises, can be made. The machinery also influences the process costs and the plant growing production cost. Suffice it to say that sum total of all the Ukrainian agricultural enterprises plant growing costs on petroleum products, electrical energy, spare parts and repairing materials account for about 40% of process costs sum total. The under study technologies of growing winter wheat differs in degree of intensity and yielding capacity, respectively – extensive 2-3 t/ha, conventional 3-4 t/ha, intensive 5-6 t/ha, and high 8-10 t/ha – show that in the extensive and conventional technologies (Appendix A) the major share in the total structure of expenses is the cost of tractor-implement unit (TIU) – 69.2 and 90.6% respectively. Therefore, the main reserve of profitability increase of these technologies is the reduction of costs for the TIU and fuel.

Under the intensive and high technologies the costs of process materials (fertilizers, means of plant and seed protection) run high with the increase of planned yielding capacity compared to TIU costs. Thus, process materials costs of the yield capacity amounting to 5 t/ha dominate TIU and fuel costs 1.3 times, while the yield capacity amounting to 10 t/ha – 3.1 times.

Thus, cutting down the process materials expenses, by means of improvement their application efficiency – precise agriculture, dosing fertilizers according to the stages of organogenesis, and so on – becomes the main reserve of the economic efficiency rise.

As a result of depiction of expenses scale dependency on the yield capacity, compared to price, the dependency on certain technology can be observed. As the Appendix A shows, extensive technology with the yield capacity amounting to 2 t/ha is unprofitable (-35.3%), because of heavy TIU expenses and low price on poor-quality corn. Though, the substitution of conventional tillage and sowing for the direct sowing under this technology cuts down the TIU expenses, but on the whole, it doesn't result in such a technology becoming a profitable one. The extensive and conventional technologies with the yield capacity amounting to 3 t/ha are characterized with the minor unprofitableness – 2.5%.

The efficiency of the technologies can be enhanced by means of:

- substitution of ploughing for shallow and medium tillage with multifunctional soil-cultivating units;
- substitution of conventional drill sowing for direct band sowing with the combined units;

- preference for direct combine-harvesting over separate collection, under favourable conditions of the grain crops harvesting;
- introduction of technological method of plants foliar feeding with urea solution to enhance the quality of the grain.

Conventional technology with the yield capacity amounting to 4 t/ha, and intensive with 5 t/ha respectively, under the zero tillage (no-till) and direct sowing conditions may both become the most efficient. This can be explained with the fact of their application of particular technological operations, combining pre-sowing tillage and band sowing, which, compared to conventional tillage and sowing, ensure cut down of TIU expenses, moisture keeping, contribute to uniformity of the plant nutrition area, and increase the yield capacity in the whole. The use of crushed plant residues and small doses of fertilizer ensures the effective maintenance of the natural fertility of the soil.

Intensive technologies with the yield capacity amounting to over 6 t/ha, and high technologies – 8-10 t/ha respectively, despite of the considerable total expenses, can be efficient, in case of guaranty that yield capacity amount is the same as it was planed, and high quality of the grain. Therefore, planning yield capacity amounting to over 8 t/ha with the predicted profitableness is only possible in a friendly to winter wheat cultivation soil-climate zones.

Technical equipment influences over the production output and the expenses of livestock sector through plant-growing production – the fodder, which is the key resource of the livestock. In the agricultural enterprises of Ukraine fodder accounts for over 70% of the pecuniary and about 30% of total process costs of livestock. Therefore, the contribution of technical equipment in the formation of the economic results of agricultural production can be considered as a decisive one.

The above mentioned can be confirmed with a data on the structure of process costs of agricultural enterprises. The share of the technical equipment related costs (petroleum products, electrical power, spare parts and repair materials, amortisation) in total sum of pecuniary process costs of Ukrainian agricultural enterprises accounts for about 30% and has been stable in recent years.

Environmental consequences of the technical equipment application in agriculture are better known, rather on qualitative than quantitative side, as negative. Basically they are evident in soil compaction, which may even extend to the full depth of the soil profile. In modern tillage technologies, the area of traces of tractors and machines accounts for 90% of the area of the field. A strong compaction can cause irreversible changes, namely

degradation of soil structure, as far as the depth of compaction exceeds the depth of the topsoil. The destruction of soil-covering can't be quantitatively measured in Ukraine, because this is a disaster. However, the negative effect of compaction is neutralized with the accumulation of stubble and root mass, the moist soil freezing, and also due to special systems of cultivation (minimum tillage). Thus, negative environmental consequences of the technical equipment application in agriculture aren't inevitable.

However, it should be taken into account that the minimum tillage put forward entirely new demands for the livestock technical equipment.

First of all, it should be mentioned, that the negative consequences of the total domination of ploughshare, as the main instrument of the fields tillage, are notorious since the 30-s – 40-s of the last century. World-wide known among the farmers E. Faulkner suggested tillage system under which the disks were used instead of plough. However, at the time, and in the next few decades there were not the main prerequisites of the plough less tillage switchover – highly effective herbicides. Gradually this problem was solved and, due to the wide use of chemical weeding in the industrial practice, it was possible to completely or partially abandon the mechanical tillage of the field, which threatened with erosion, structure deterioration, and reduced fertility. Modern tillage technologies can vary from the conventional ploughing to zero tillage (sowing in uncultivated soil). Methods, occupying an intermediate position, are called minimum tillage, that is, one that provides minimal mechanical effect on the soil-covering of the arable. It is believed that the minimum and zero tillage saves fuel and labour, it increases productivity, reduces soil compaction by tractors and agricultural machines.

Among numerous methods and techniques of minimum and zero tillage, the best four were selected: autumn chiselling (sub soiling), band sowing, regular ridge sowing, direct sowing in untilled soil. All of these methods simultaneously perform soil protection functions. Chiselling is performed with the help of previously-known machinery, and it slightly differs from conventional tillage in terms of erosion prevention. The new machinery was created for band sowing. The Kinse Mfq (USA) combined machine may serve as an example. It has a set of disks with a diameter of 45 cm, which pulverize nutrient residues and loosen the topsoil only within the band limits. Behind the disks the cultivator teeth are mounted, then – rotary tools for incorporation of herbicides in the soil, rod-shaped drums and the sowing coulters.

The production of machines for sowing in ridges in the United States began in the sixties of the last century, and in the mid-eighties the firm Fleisher and Hiniker

Manufacturing began to produce a full set of machines for this method. The stubble drillers for the direct sowing were created on the basis of the chiselling coulter [1, 2, 13, 4, 5].

The provision of agricultural production with modern advanced technical equipment at an optimal level, high efficiency of its application, timely updates, development of advanced technologies of agricultural production, reasonable forms of organization of repair and technical servicing and supply, availability of qualified technical and engineering personnel, is the guarantee of high- skilled, in fixed agro-technical terms, accomplishment of all the technological processes and operations and optimal cost of labour and means of obtaining agricultural products.

Ukraine has reached the highest level of the provision of agricultural production with technical equipment in the late eighties and early nineties. Thus, there were 511.5 thsd tractors, 103.4 thsd grain harvesters (105.2 thsd by the end of 1991), 15.3 thsd corn harvesters, 20.1 thsd beet harvesters, 75.4 thsd milking installations and units in the agricultural enterprises at the end of 1992. By that time, the provision of agricultural production with technical equipment, by different types of machinery, was approximating to technological demand [6,7].

In subsequent years, because of ill-conceived government policy concerning agriculture, the instability or absence of legislative support, the inconsistency and indecision of the executive bodies in the agricultural reform, the premature liberalization of prices of material and technical resources and mistaken pricing policy of state authorities concerning the products of agriculture, attempts of the state to solve financial and economic problems of national economic complex at the expense of the village, as it was in Soviet times, resulted in a sharp violation of the equivalence of inter-industry trade and the solvency decrease of rural producers. This caused a slowdown in the updating of technical facilities and, as a consequence, of the overall level of technical equipping of agricultural production with tractors, combines and other means of mechanization of technological processes and operations.

The lowering of the technical equipping level of the agricultural production started in the early nineties of the last century and continues till nowadays. Completely obsolete machinery is putting out of commission, and the agricultural producers have no money to replace it with the new one. The equipment of agricultural production with machinery has reached a critical point, which is foiled with the complete de-industrialization of agricultural production and the cessation of commercial production of different types of agricultural products. At present, the provision of the agricultural enterprises with the agro-machinery

accounts only for 30-60% of its technological demand. It is also should be mentioned, that the technical equipment that is used by peasants is 85-90% obsolete. It has already exceeded its depreciation period, and a great part of it is usually operated during 2-3 such terms. Because of the high obsolescence and lack of funds to agricultural producers for the full repair and service work each year from 25% to 40% of the available machinery do not participate in production. All this leads to a reduction in acreage, and in case of non-fulfilment or partial fulfilment, together with the violation of the agro-technical terms of conducting of technological processes and works, results in decreasing of agricultural cereals yielding capacity, and significant losses of already grown products because of harvesting deadlines prolongation. Annually, because of agricultural production being technically underequipped, Ukraine loses about a third of gross yield of agricultural products, representing in money value 15-18 billion UAH, and due to lack of grain-harvesting machinery, and consequently a significant increase in terms of cereals harvesting, the grain is lost in the amount of about 8-10 billion UAH [8].

Due to the reduction of agricultural producers solvency, the volume of production of agricultural machinery in the domestic machine-building factories is tenfold reduced, the agro-technical servicing companies are on the verge of bankruptcy.

The provision of Ukrainian agrarian sector of economy with machinery should be considered from the standpoint of functional sufficiency. The number and quality of technical equipment should be sufficient to perform its various functions, which were discussed earlier. Accordingly, the characteristic of the state of provision may be, firstly, a symptomatic one, and secondly, a direct one. Symptoms of poor provision, namely the variety of displays of insufficient mechanization means accomplishment of their tasks, are the following: delayed fulfilment of complex of agricultural works, their high labour intensity, and even unsatisfactory results of managing that find expression in unstable production volumes and sales, its low profitability or even losses, high cost, etc.

The direct characteristic of the condition or level of provision –is a variety of comparisons: availability of machines with technologically justified demand for technical equipment, availability of machines and mechanisms on a certain date with their actual number in previous years, the availability of mechanization means in Ukraine with the similar indicators in other countries etc. Of course, the symptomatic characteristic is less convincing than the direct one, as far as, between the machines availability and the economy results exists the factor of culture and level of their use. And they can be low even for such a reason as the low professional level or just an insufficient number of qualified mechanization personnel,

poor repair and diagnostic facilities, the irregular provision with fuel and spare parts and because of many other reasons.

Therefore, in the evaluating of the provision state of the Ukrainian agricultural sector of economy with technical equipment, the preference is shown to direct indicators based on the state statistical reporting data, in particular, to such statistical bulletins as " The Annual Availability and Traffic of Tractors and Agro-Machinery in Agriculture", "The Availability of Agro-Machinery and Power Capacities in Agriculture" [6,7,9,10,11,12,13].

Consequently, the number of harvesting machines reaches the critical point at which, if the trend of permanent reduction remains in the future, there will be nothing left to harvest the agrarian production with.

Already, due to a sharp harvesters decrease in the number, the cereals harvesting periods are prolonged up to 30 days or longer, although the optimum period lasts for 10-12 days. This prolongation of harvesting terms causes significant losses of grain being grown (Fig.1.). If on the 5th day after the full ripening of the grain, the losses of grain from its shedding reach 3 – 4%, than on the tenth day they increase up to 11%, and with prolongation of the harvesting period up to 30 days, they reach 30-33% and continue to increase during the following days [14].

On average, if, by the harvest storage, about 7% of the cultivated grain is lost in 10 days, and about 15% – in 20 days, than, under the prolongation of the harvesting period up to 30 days, average losses accounts for 21% of the cultivated crop.

The technology of agricultural production stipulates the execution of a great number of technological operations and processes during the period being optimal, in terms of agro-technical, climatic and weather conditions. The most advanced technology is only effective when all its parameters are unrestrictedly fulfilled. First and foremost, this is peculiarities of agro-technical methods application, their time constraints, and timely transition from the preceding stage of work to the following one.

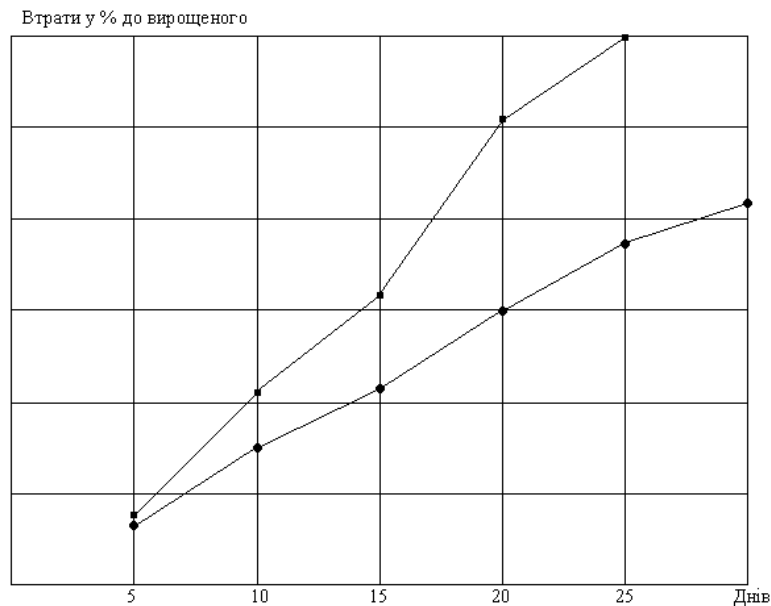


FIGURE1. Percentage losses of grain from its shedding compared to the percentage of the cultivated one, depending on the harvesting period from the moment of ripening [14].

- — grain losses on a certain day after the ripening;
- — grain losses, in a certain harvesting period, percentage per cultivated one.

Violation of these requirements may reduce to zero the benefits of even the most advanced technology. To satisfy these requirements is possible only with the necessary technical means in an amount that provides all the technological requirements. These requirements can only be satisfied if having required machinery in quantity being enough to meet the technological demand.

Under the current conditions of considerable deficiency of agricultural machinery, time constraints of the technological operations execution are often violated, and some of them are not executed at all. Even the violation of the time constraints of the commencement of the technological operations execution leads to a significant shortage of products (Table 1) [15].

The data, presented in the Table 1, considering the relative daily-average agricultural yield capacity losses as percentage of final results, in case of the deviation from the optimal commencement term of the basic technological operations in all the natural economic zones of Ukraine, shows that the execution of fieldwork, especially the optimal terms of their beginning are not bound to specific calendar dates or periods of time, but, to a large extent, dependent on climate and weather conditions and environmental phases of growth and development of plants.

Table 1. The relative daily-average losses of the agricultural yield capacity, considering the deviation from the optimal commencement term of technological operations (percentage) [14]

Crops	Zone	Technological operation					
		Ploughing	Pre-sowing cultivation	Sowing	Mowing in swath	Swath threshing	Direct combine harvesting
Winter Wheat	Polissia	1.30	0.70	0.90	1.65	1.55	1.70
	Forest-	0.90	0.60	0.80	1.70	1.50	1.90
	Steppe	1.00	0.40	0.90	1.80	1.60	2.00
Winter Rye	Polissia	1.10	0.55	0.80	1.60	1.70	1.70
	Forest-	0.80	0.55	0.70	1.81	1.60	1.90
	Steppe	1.00	0.55	0.80	1.90	1.70	2.00
Winter Barley	Polissia	1.20	0.56	0.82	1.70	1.65	1.80
	Forest-	0.80	0.56	0.75	1.73	1.52	1.95
	Steppe	0.90	0.56	0.83	1.85	1.65	2.10
Spring Wheat	Polissia	0.22	0.28	1.10	1.58	1.52	1.60
	Forest-	0.20	0.30	1.20	1.70	1.60	1.73
	Steppe	0.24	0.34	1.40	1.73	1.65	1.76
Spring Barley	Polissia	0.23	0.28	1.12	1.63	1.54	1.65
	Forest-	0.20	0.32	1.20	1.74	1.60	1.78
	Steppe	0.21	0.34	1.42	1.78	1.67	1.80
Oats	Polissia	0.23	0.28	1.18	1.63	1.50	1.67
	Forest-	0.18	0.32	1.22	1.67	1.53	1.69
	Steppe	0.21	0.34	1.26	1.69	1.59	1.71
Millet	Polissia	0.08	0.30	1.24	1.54	1.23	X
	Forest-	0.12	0.35	1.20	1.60	1.30	X
	Steppe	0.10	0.37	1.14	1.67	1.35	X
Buckwheat	Polissia	0.25	0.32	1.23	1.60	1.54	X
	Forest-	0.20	0.34	1.21	1.62	1.58	X
	Steppe	0.21	0.36	1.29	1.67	1.63	X
Pea	Polissia	0.22	0.28	1.16	1.40	2.30	X
	Forest-	0.21	0.33	1.18	1.45	2.40	X
	Steppe	0.20	0.34	1.22	1.49	2.57	X
Vetch for seeds	Polissia	0.22	0.27	1.15	1.39	2.29	X
	Forest-	0.21	0.32	1.17	1.44	2.39	X
	Steppe	0.20	0.33	1.21	1.48	2.56	X
Maize for corn	Polissia	0.08	0.40	1.60	X	X	1.80
	Forest-	0.07	0.32	1.29	X	X	1.60
	Steppe	0.01	0.25	1.10	X	X	1.30

Winter rape	Polissia	0.90	0.70	1.00	1.40	1.27	1.46
	Forest-	0.70	0.60	0.80	1.50	1.22	1.57
	Steppe	0.80	0.40	0.90	1.55	1.35	1.64
Spring rape	Polissia	0.25	0.18	1.09	X	X	1.60
	Forest-	0.20	0.20	1.13	X	X	1.98
	Steppe	0.23	0.22	1.19	X	X	2.21
Soya	Polissia	0.24	0.20	1.22	X	X	1.51
	Forest-	0.23	0.21	1.25	X	X	1.93
	Steppe	0.22	0.22	1.29	X	X	2.17
Sunflower	Polissia	0.26	0.37	1.50	X	X	1.80
	Forest-	0.22	0.35	1.36	X	X	1.90
	Steppe	0.22	0.30	1.10	X	X	2.00
Sugar beets	Polissia	0.30	0.38	0.86	X	X	0.25
	Forest-	0.25	0.36	1.14	X	X	0.25
	Steppe	0.25	0.35	0.56	X	X	0.35
Annual grasses forhay	Polissia	0.40	0.38	1.40	X	X	2.30
	Forest-	0.35	0.33	1.20	X	X	3.00
	Steppe	0.30	0.33	1.40	X		3.60

Taking into account the current state of technical equipment of agricultural production, while the technological demand for basic agro-machinery being 40-60 % met, it's almost impossible to avoid these losses. Thus, if the effective measures to provide the agricultural producers with technical equipment at the level of technological demand are not taken in the nearest future, then the question is not only in the enhancement of the efficiency of the agrarian sector of Ukrainian economy, but the point is whether it's possible to preserve the domestic commercial crop-farming at all.

CONCLUSION

Thus, according to the findings of the conducted research, it can be clearly argued that the provision of Ukrainian agriculture with agro-machinery is quite low and its condition is pretty neglected. This leads to significant losses during the agricultural production harvesting, violation of the crops cultivation technology, significant soil compaction, and deterioration of the ecological state of production in the agriculture.

Therefore, with a purpose of strengthening the agriculture physical infrastructure, the explicit action plan, which considers its substantial enhancement, should be developed. This takes its beginning with the agricultural groups proprietors providing of state incentives for their supply of machinery: state grant programs, rural areas development programs, grants

for agricultural producers, and concluding with the leasing, credit, financial, and investment incentives.

REFERENCES

Salnikov V.K. Minimization of soil cultivation in intensive farming. 1984. Moscow: VNIIEEH,48.

Alekseyenko LM Oleksiyenko VM Jurkiewicz A. 2000. Economic Dictionary, banking, stock market (Ukrainian-English-Russian Dictionary), K . Publishing house "Maximum"; Ternopil: "Economic Thought", 592.

Marshall A. 1993. Principles of Economic Science, vol. II.Per. With the English, M . Publishing group "Progress", 312.

Volodymyr Ivanyshyn, Taras Hutsol, Komarnitsky Sergiy. 2016. Obruntunuvannya parameter in the technical design of projects for the selection of early grain crops // Strategy of the balanced economy of economics, technology and resource potential of the territory. Compendium contains of science and education of the II international scientific and practical conference. TernopilKrok,27-30.

Yurii Kovalenko. 2003. Features agrarian reforms in CEE countries and Ukraine. Economics of Ukraine, №9. 72-79.

The availability of tractors, other agricultural machinery and energy capacity in the agricultural economy of Ukraine as of January 1. 1991. K . State Committee on Statistics of the Ukrainian SSR, 172 .

Availability and write-offs of tractors, agricultural machinery in agriculture Ukraine on January 1, 1991. 1997. K .State Statistics Committee of Ukraine. 180 .

Bilousko Y. K, Harun M. I, Denisenko P. A. etc. 2005. Market System Logistics Ukraine AIC: Scientific report. K .NNC IAE, 86 .

Availability and cancellation of tractors, agricultural machinery in agriculture Ukraine on January 1, 2003. 2003. - K . State Statistics Committee of Ukraine. 186.

Availability and cancellation of tractors, agricultural machinery in agriculture Ukraine on January 1, 2004. 2004. - K . State Statistics Committee of Ukraine. 12.

Availability and cancellation of tractors, agricultural machinery in agriculture Ukraine on January 1, 2005. 2005. - K . State Statistics Committee of Ukraine. 47.

Availability and cancellation of tractors, agricultural machinery in agriculture Ukraine on January 1, 2006. 2006. - K . State Statistics Committee of Ukraine. 25.

Availability and cancellation of tractors, agricultural machinery in agriculture Ukraine on January 1, 2007. 2004\7. - K . State Statistics Committee of Ukraine. 41.

Tykhonenko A. V. 2008. Zabespechenist harvesting equipment for agriculture as key to the efficiency of grain production. Economy AIC.№9. 36-41.

Skurta B.K. 1993. The use of personal computers in the organization of field work. K. "Vintage".240.

APPENDICES

The winter wheat costs and efficiency dependence on the yield capacity and quality level

