Management Theory and Studies for Rural Business and Infrastructure Development
eISSN 2345-0355. 2018. Vol. 40. No. 3: 361–368.
Article DOI:https://doi.org/10.15544/mts.2018.34

ADDITIONAL OPPORTUNITIES FOR THE SYSTEMATIZATION OF THE MARKETING RESEARCH FOR RESOURCE CONSERVATION PRACTICE

Vitalii Nitsenko[1], Abbas Mardani[2], Kuksa Ihor[3], Sudarkina Lyudmila[4]
[1] *Assoc. Prof. Dr. Sc. Odessa I. I. Mechnikov National University. Dvoryanskaya str. 2, 65082. Odessa. Ukraine. Tel. +380939983073. E-mail vitaliinitsenko@gmail.com*
[2] *Prof. Dr. Senior Lecturer. Universiti Teknologi Malaysia. Skudai. 81310. Johor. Malaysia. Tel. +601127347432. E-mail abbas@management.utm.my*
[3] *Assoc. Prof. Dr Sc. (Ekon). Luhansk National Agrarian University. Alchevskih str. 44.61002. Kharkiv. Ukraine. Tel. +380506475207. E-mail Igor.kuksa.23@gmail.com*
[4] *Graduate student. Luhansk National Agrarian University. Alchevskih str. 44.61002. Kharkiv. Ukraine. Tel. +380660063639. E-mail sudarkina.lyuda@gmail.com*

Received 17 07 2018; accepted 26 09 2018

Economic development of agricultural enterprises can provide the implementation of measures aimed at industrial resources conservation. Apart from the need for significant one-time investments that accompany resources' economy at enterprises, there are no methodological grounds for assessing the effectiveness of the technology of rational resource use. The goal of the research is to develop methodical tools to determine technical and economic parameters for an advanced system of resource-saving measures. The period under investigation is 2014–2016, the number of enterprises under analysis is 96. To define the rules of choosing solutions on the base of games theory, taking into account information and expectations of agrarians, the analysis is performed based on the Laplas, Bayes, Sewidzh and Hurwitz criteria. Calculated values of the enterprises' potential advantages, represented as an attribute for analytical grouping, allowed to define optimal strategies for designing a policy of production resources conservation. The demonstration partition of the whole set of enterprises is performed according to the suggested methodology. The data obtained as a result of criteria estimation allows us to draw conclusions about the most probable actions of grain producers in the situation of uncertainty, which enables us to identify typical effectiveness parameters of the system and to assess the prospects of the resource conservation policy.

Keywords: resources use, optimal strategy, planning, limit values, efficiency.
JEL Codes: O10, Q32.

1. Introduction

Economic development of agricultural enterprises is ensured by the constant growth of their production and by the opportunities for sale. One of the most powerful means of such a growth is the introduction of measures aimed at industrial resource conservation. However, despite the efficiency of the measures for resources conservation, the practice of modern management indicates the low scale of their use.

The problem is not only in the lack of sufficient funding, but also in the absence of methodological guidelines available for the enterprises to assess the effectiveness of resource conservation technologies. The development of a concept for assessing the prospects and guidelines used for the development of measures for resource conservation system remains the main problem of the researches.

According to pervious researches, we can note, that modern scientific literature generally considers two types of the methods used for assessing measures of resource conservation technologies and justifying the feasibility of replacing the technologies of the enterprise. One of the most common criteria for the feasibility of such a substitution is the excess of the production costs associated with the old production technology over the value of the unit costs attributed to the new technology (Drahan, 2012; Kulakov, 2014; Nusinov, 2017; Protsenko, 2016). The problem of adopting such an approach in agriculture is its long duration due to almost one-year cycle of plant production. The aim of the study is to identify the typical and optimal behavior of market entities in order to determine the technical and economic guidelines for the resource saving programs.

In accordance with this goal, the following tasks are set (Stepanenko, 2015; Kolos, 2017; Zos-Kior, 2016):

- to develop methodological tools (principles, mechanism, etc.) for assessing the current economic activity and to determine the technical and economic parameters of a possible system of resource conservation measures;
- to determine the optimal strategy for the development of the resource conservation policy in accordance with the possible scenarios and typical behavior of economic entities;
- to verify the results obtained after comparative analysis of related economic and environmental information.

Under specific conditions of performing economic activities, including the fact that it functions in the natural environment with the management of biological processes of natural systems development, special tools are required to obtain scarce information to forecast the development (Amosov, 2012; Lozynska, 2015; Yershova, 2013). For this purpose, as a methodological tool, we consider it relevant to use the theory of statistical decisions, which can be interpreted as the theory of finding optimal indeterminate behavior under the conditions of uncertainty. The modern concept of the statistical decision was put forward by Wald (1955). According to his concept, the behavior is considered to be optimal if it minimizes the risk in successive experiments, that is, the mathematical expectation of losses in the statistical experiment. In such a statement, any problem of statistical decisions can be considered as a game of two players, one of which is a "nature" (Maskell, 2011; Pardy, 2010). Choosing the best solutions in situation with incomplete information is one of the main duties of managers.

eISSN 2345-0355. 2018. Vol. 40. No. 3: 361–368.
Article DOI:https://doi.org/10.15544/mts.2018.34

2. Research methods

To analyze the preconditions for the development of resource conservation programs in the production of winter wheat by agricultural enterprises in Kharkiv region, we use the results of the analysis of ensuring profitability under the influence of production costs per 1 hectare of winter wheat crops in different situations of crop yield capacity.

The output data for a task, solved with the means of statistical decisions, are represented in the form of a certain vector S = (S1, S2,..,Sn) describing the n states of the environment, and the vector X = (X1, X2,..,Xm) which describes the m number of valid solutions. We need to find the vector X* = (0, 0,..,0, Xi, 0,..,0), which ensures reaching the optimum of the utility function W(X, S) for some criterion K. Here a problem of choosing the optimality criterion arises, since the solution, being optimal under some conditions, is unacceptable under the other ones and a certain compromise has to be found. The state of nature can be given in the form of the corresponding values of winter wheat yield, while the set of strategies of activity in the form of corresponding levels of expenditures per 1 hectare of sown area. The average profit per 1 hectare will be the proxy for gain distribution. Thus, the payment matrix of the enterprises of the Kharkiv region is presented in Table 1. Describing the data, we should note that, under the current soil, climatic and market conditions of Kharkiv region. Most of agricultural enterprises have costs budget at 150–400 USD per 1 hectare.

Table 1. Matrix of Gains for Formulating the Optimal Strategy in Developing the Policy of Resource Conservation in Winter Wheat Production, USD

Groups by costs per 1 hectare of crop area (player strategy)	Groups by yield (state of "nature"), centers per 1 hectare						
	less than 20	20–30	30–40	40–50	50–60	60–70	over 70
less than 50	X	229.5	0	0	0	0	0
50–100	69.7	243.9	511.2	0	0	0	0
100–150	18.7	155.9	282.1	0	0	0	0
150–200	24.6	100.4	237.4	202.8	397.9	0	0
200–250	7.2	64.8	149.8	290.6	402.3	652.4	0
250–300	X	24.3	125.5	237.5	294.3	595.6	0
300–350	X	-0.4	97.5	181.4	312.3	607.5	599.8
350–400	X	-121.5	54.1	152.1	232.6	424.2	0
400–450	-265.2	X	54.0	160.7	224.7	X	597.0
450–500	X	-231.5	-25.2	1.1	167.5	255.2	483.1
500–550	-324.2	X	X	-230.4	297.9	253.2	0

About 14% of enterprises have different conditions and their economic models of production are characterized by significant variability. Taking into account the variability of the resource environment, we will carry out a criterion assessment of the

optimal actions of grain producers, which will serve as a benchmark in determining the technical/economic parameters of resource conservation activities.

3. Research results and discussion

To determine the rules of finding a solution, based on available information and players' expectations, there are several evaluation criteria that should be used, namely those of Laplace, Bayes, Wald, Sewidzh and Hurwitz criteria (Table 2). The classical statement of game theory in decision-making models under uncertainty is used in this study (Hamdy, 2007).

Table 2. Data for Determining the Optimal Strategy (by the criteria), USD

Groups by costs per 1 hectare of sown areas	Laplace Criterion (W)	Bayesian criterion (B)	Hurwitz Criterion with α=0,5
less than 50	32.8	45.2	114.77
50–100	117.8	270.5	255.61
100–150	65.2	152.9	141.07
150–200	137.6	204.0	198.97
200–250	223.9	196.2	326.22
250–300	182.5	154.3	297.81
300–350	299.7	135.8	303.53
350–400	123.6	66.3	151.37
400–450	128.5	78.5	165.88
450–500	108.3	-25.5	125.79
500–550	-0.7	-16.8	-13.16

Laplace criterion shows it's optimal to choosing a cost per 1 hectare at a level of 300–350 USD with an expected return of 299.7 USD per 1 hectare. It means that the overall efficiency of such activities for various variants of "nature" development reaches 100%. It is also worth noting that, if we exclude the influence of extreme values that are represented in individual cases, the choice of optimal strategy depends on the cost per 1 hectare at a level of 200–250 USD with the expected profit of 223.9 USD per 1 hectare.

The choice of the maximum gain based on the Bayes criterion, taking into account the available statistical data on the probability of the nature development (i.e. the forecast of the state of nature), determines the optimal variant of the production cost budget in the range from 50 USD to 100 USD per 1 hectare of sowing area with an expected profit value at 270.5 USD per 1 hectare (Table 2, column 3). The result indicates that enterprises should use technologically limited actions, while the yields are produced mainly due to the natural basis of the resource factor. That is, such an approach can lead to the exhaustion of natural resources. An increase in the costs above 450 USD per 1 hectare does not guarantee a sufficient level of yield and, as a consequence, earning a profit.

eISSN 2345-0355. 2018. Vol. 40. No. 3: 361–368.
Article DOI:https://doi.org/10.15544/mts.2018.34

The Hurwitz criterion offers a certain compromise which takes into account a factor of optimism. In such a way we can hereby assess the readiness of resource and technological support for the effective production of winter wheat under current farming conditions. In this particular case, the chances of success or failure are estimated as being equal and the coefficient of optimism is assumed to be (α=0.5) (Table 2, column 4). At α = 0.5 one should spend 200–250 USD per 1 hectare of wheat, and expected profit will be at 326.22 USD per 1 hectare. It should be noted that this option is optimal for most estimates of the optimism factor.

The list of criteria can be wider, depending on the problem set-up and the required level of detail in the results, but in our case we limit ourselves to three criteria. Summarizing the results, we note that under the conditions of Kharkiv region, the technical and economic reference point of resource conservation programs in the production of winter wheat is keeping the production costs within the range of 250–350 USD per 1 hectare while maintaining the yield of wheat at the level of 30–45 centners per 1 hectare.

According to the obtained result (Fig. 1), the following conclusions can be drawn regarding the boundary indicators of resource conservation:

- Group I (Yield < 35 centner/ha and Cost < 300 USD/ha) represents enterprises with the minimum technical capacity and resource adaptation;
- Group II (Yield < 35 centner/ha and Cost > 300U SD/ha) is a transitional mode and is characterized by increased costs of farming without a corresponding productive return (yield level);
- Group III (Yield > 35 centner/ha and Cost < 300 USD/ha) reflects the conditions for yields exceeding the boundary ones at relatively low costs per 1 hectare (below the established boundary costs);
- Group IV (Yield > 35 centner/ha and Cost > 300 USD/ha) represents enterprises focused on intensive farming.

The development of the resource conservation system can be described in the system of "deployment - curtailing" as follows: being in the initial state (group I), the enterprise is expanding its technical and technological capabilities, moving into a transitional state (group II), in which the transformation of the ecological systems into agroecological ones takes place up to the moment when stabilization of high productivity is reached and transition to a state of high intensification is perfomed. Continued functioning in high-intensity mode leads to an overload of the natural component of land resources, which requires the development of resource conservation measures. The next step is the reduction of the intensity of resources' use, including financial, labor and other resources, and shift to a high-performance state (Group III). This condition implies a balance of resource use at the economic, social and environmental levels.

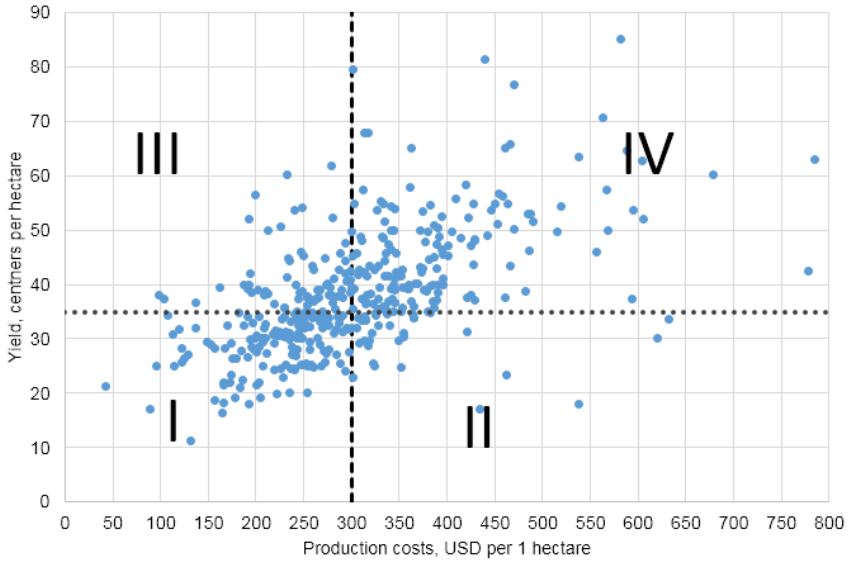
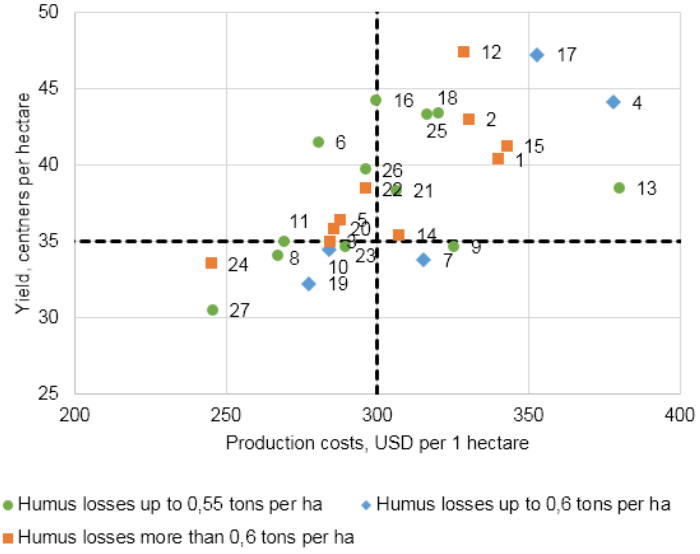


Fig. 1. Partitionof the Total Set of Agricultural Enterprises of Kharkiv region Relative to the Limits of Resource Conservation

Thus, the deployment of a resource conservation system in the crop production should be considered taking into account the environmental component within the framework of the presented system. One of the most important indicators of soil fertility is an organic matter, which is 85–90% made up of humus. To assess the environmental aspect of the above scheme of the resource conservation system deployment, we represent distribution of companies, grouped by administrative and territorial attributesand differentiated according to the consumption of humus, the scarce organic component (Fig. 2).



The numbers in the chart correspond to the following districts of Kharkiv region: 1 –Balakliiskyi, 2 – Barvinkivskyi, 3 – Blyzniukivskyi, 4 – Bohodukhivskyi, 5 – Borivskyi, 6 – Valkivskyi, 7 – Velykoburlutskyi, 8 – Vovchanskyi, 9 – Zmiivskyi, 10 – Dvorichanskyi, 11 – Derhachivskyi, 12 – Zachepylivskyi, 13 – Zolochivskyi, 14 – Iziumskyi, 15 – Kehychivskyi, 16 – Kolomatskyi, 17 – Krasnohradskyi, 18 – Krasnokutskyi, 19 – Kupianskyi, 20 – Lozivskyi, 21 – Novovodolazkyi, 22 – Pervomaiskyi, 23 – Pechenizkyi, 24 – Sakhnovshchynskyi, 25 – Kharkivskyi, 26 – Chuhuivskyi and 27 – Shevchenkivskyi.

Fig. 2. Distribution of Agricultural Enterprises of the Districts of Kharkiv Region according to Technical, Economic and Agro-Ecological Parameters

eISSN 2345-0355. 2018. Vol. 40. No. 3: 361–368.
Article DOI:https://doi.org/10.15544/mts.2018.34

According to the diagram in Fig. 2, one can conclude that the resource conservation issues are topic ones in the organization of modern grain production: the enterprises of Blyzniukivskyi, Borivskyi, Lozivskyi and Pervomaiskyi districts get yield in excess of the resource boundary parameters mainly due to more intensive use of natural component of the land resources.

4. Conclusion

1. The results of the study suggest that the economic result of most enterprises of the Kharkiv region is determined by the excessive intensity of the use of natural resources in general, and land resources in particular. This fact is confirmed by a significant accumulation of entities in the area characterized by maximum land use with limited financial investments.

2. For the analyzed region, the technical and economic reference point of resource conservation programs in the production of winter wheat is keeping the production costs within the range of 250–350 USD per 1 hectare while maintaining the yield of wheat at the level of 30–45 centners per 1 hectare.

3. The conformity of the results obtained to the assessments and results of environmental studies in the field of agricultural production regarding the optimal land use in the development of resource-saving programs allows us to draw conclusions about the effectiveness of the suggested mechanism for assessing the environment of the resource conservation management in agricultural enterprises.

4. The problem is stated from the standpoint of the theory of statistical decisions, so that to determine the optimal behavior of grain producers for achieving such a level of profitability, that is sufficient to regulate the processes of resource use. Technical and economic indicators will be obtained that will determine the proficiency of grain producers in ensuring the effectiveness of resource use.

References

Amosov, O. I., Havkalova, N. L. (2011). The problem of resource saving in Ukraine and ways to solve it // *Theory and practice of public administration: the collection of proceedings*. No. 3 (34): 1–5.

Drahan, I. V. (2012). Methodological basis of resource saving management as a direction of implementation of the state policy in the field of environmental management // *Bulletin ZhDTU. Series: Economics.* No. 1 (59): 100–102.

Hamdy, A. Taha. (2007). Operation Research. An Introduction, Eighth Edition. – New Jersey: Prentice Hall. 838 p.

Herasymchuk, N. A. (2013). The concept of resource saving in the system of bioeconomics // *Scientific Bulletin of the National University of bioresources and nature management of Ukraine: the collection of proceedings. Series: Economics, agricultural management, business*. No. 181(2): 72–77.

Kaliuk, A. (2011). *A* systematic approach to the management of resource saving in industry // *Resources, information, procurement, competition*. No. 2: 68–70.

Kolos, I. (2017). Material flow management of industrial enterprise on an principles // *Technology audit and production reserves.* No. 5/4(37): 19–23.

Kulakov, O. O. (2014). Methodical bases of an assessment of economic efficiency of investment in resource-saving technologies at the enterprises // *Scientific Bulletin: the collection of proceedings*. No. 1(209): 65–77.

Lozynska, I. V. (2015). Formation the complex of organizational components of the farm production system // *Technology audit and production reserves*. No. 1/6(21): 22–26.

Nusinov, V., Shura, N. O. (2017). Improvement the methodology of assessing the economic potential of the enterprise with the use of potential industry clusters. *Bulletin ZhDTU.* No. 3(81): 80–88. – https://doi.org/10.26642/jen-2017-3(81)-80-88.

Maskell, B. H., Baggaley, B., Grasso, L. (2011). Practical Lean Accounting: A Proven System for Measuring and Managing the Lean Enterprise, Second Edition. – New York: Productivity Press. 428 p.

Pardy, W. G., Andrews, T. (2010). Integrated management: leading strategies and solutions. – Plymouth: Government Institutes. 231 p.

Protsenko, N. B. (2016). Methodological aspects of a substantiation of resources for the creation the reserves of increasing the level of enterprises economic safety // *Bulletin ZhDTU*. No. 4(78): 185–191.

Stepanenko, T. O. (2015). The analysis of functional relationships of elements in integrated system of materials management // *Technology audit and production reserves.* No 2/6(22): 58–62. – https://doi.org/10.15587/2312-8372.2015.41753.

Yershova, O. O. (2013). Resource saving as an alternative way of management at agricultural enterprises // *Efficient economy.* No. 4: 51–57.

Zos-Kior, M., Kuksa, I., Ilyin, V., Chaicina, A. (2016). Land management prospects // *Economic-Annals-XXI.* No. 161(9–10): 43–46. – https://doi.org/10.21003/ea.V161-10.

RINKODAROS TYRIMŲ SISTEMINIMAS ĮMONIŲ IŠTEKLIŲ TAUSOJIMO PROGRAMŲ SUDARYMUI

Vitalii Nitsenko[1], Abbas Mardani[2], Kuksa Ihor[3], Sudarkina Lyudmila[4]

[1] I. I. Mechnikovo Odesos nacionalinis universitetas

[2] Malaizijos technologijos universitetas

[3, 4] Luhansko nacionalinis agrarinis universitetas

Gauta 2018 07 17; priimta 2018 09 26

Žemės ūkio įmonių ekonominę plėtrą gali užtikrinti išteklių tausojimo priemonių įgyvendinimas. Nepaisant to, kad yra būtinos didelės vienkartinės investicijos, kurios lydėtų išteklių ekonomiją įmonėse, nėra metodologinio pagrindo racionalaus išteklių naudojimo technologijos efektyvumui įvertinti. *Tyrimo tikslas* – sukurti metodinius instrumentus, skirtus techniniams ir ekonominiams perspektyvios išteklių tausojimo priemonių sistemos parametrams nustatyti. Tyrimo laikotarpis 2014–2016 m., analizuotų įmonių skaičius – 96. Siekiant nustatyti priimamų sprendimų pasirinkimo taisykles, remiantis žaidimo teorija, atsižvelgiant į informaciją apie ūkininkų lūkesčius, analizė atliekama remiantis Laplace, Bayes, Sevig ir Hurwitz kriterijais. Apskaičiuotos įmonių potencialios naudos, pateiktos kaip analitinio grupavimo požymis, leido nustatyti optimalias strategijas, projektuojant gamybos išteklių taupymo politiką. Demonstracinis viso įmonių komplekso suskirstymas atliktas pagal siūlomą metodologiją. Gauti duomenys leidžia daryti išvadas apie labiausiai tikėtinus grūdų augintojų veiksmus neapibrėžtumo situacijoje, kurie atitinkamai leidžia nustatyti tipinius sistemos efektyvumo parametrus ir įvertinti išteklių tausojimo politikos perspektyvas.

Raktiniai žodžiai: ištekliai, optimali strategija, planavimas, ribinės reikšmės, efektyvumas.

JEL kodai: O10, Q32.