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THE STUDY OF THE SENSITIVITY OF RESOURCE POTENTIAL MANAGEMENT TO CHANGES IN UNCONTROLLED PRODUCTION PARAMETERS

ДОСЛІДЖЕННЯ ЧУТЛИВОСТІ УПРАВЛІННЯ РЕСУРСНИМ ПОТЕНЦІАЛОМ ДО ЗМІНИ НЕРЕГУЛЮВАНИХ ПАРАМЕТРІВ ВИРОБНИЦТВА

The sensibility of the economic model of the optimal resource potential management plan to changes of the uncontrolled parameters of the economic model of the agricultural enterprise was analyzed; significant of which are the yield of crops as an indicator of the favorable environment; sales prices as an indicator of the favorable market situation; starting conditions as an indicator of the rational location of the productive forces of the agricultural enterprise. It is established that the predicting of probable changes makes possible to program the measures for support of the accepted mode of resource use with the help of investment conditions creation to support the economic model of the agrarian enterprise. Moreover, the use of the model of effective changes in dynamic programming in the course of resource potential management allows us to assess both quantitative and qualitative changes. It is substantiated that the system of resource potential management should be based on the principles of adaptive technology solutions taking into account the extensive financial stability, and the main tool for ensuring of constant performance should be technological policy. The conditions for the basic performance maintaining as well as the stability of the model in macroeconomic conditions are determined. It is proposed to use the sensibility analysis of the economic model of the optimal plan to determine the effectiveness of the resource potential management system.
Key words: management, resource potential, sensitivity analysis, economic model.

Проаналізовано чутливість економічної моделі плану управління оптимальним ресурсним потенціалом до зміни неконтрольованих параметрів економічної моделі сільськогосподарського підприємства; значимими у тому числі є врожайність сільськогосподарських культур як показник сприятливості довкілля; ціни реалізації як показник сприятливої кон'юнктури ринку; вихідні умови як показник раціонального розміщення продуктивних сил сільськогосподарського підприємства. становлено, що прогнозування можливих змін дозволяє визначити заходи щодо підтримки прийнятого режиму використання ресурсів за допомогою створення інвестиційних умов для підтримки економічної моделі аграрного підприємства. У цьому використання моделі ефективних змін динамічного програмування у процесі управління ресурсним потенціалом дозволяє оцінити як кількісні, так і якісні зміни. Проведено моделювання поведінки регульованих та нерегульованих факторів для прогнозування стабільності оптимальних моделей реалізації ресурсного потенціалу сільськогосподарських угідь у сталих умовах. Визначено, що відповідно до показників фінансово-економічної діяльності при роздільній реалізації продукції, зберігається ефективність

управління ресурсами за рахунок зниження облікової ставки. Так як розвиток ринкових відносин формує значну залежність ефективності управління ресурсним потенціалом в залежності від цінового фактору нами було проаналізовано переведення технологічної моделі на ресурсозберігаючу при збільшенні ціни реалізації продукції. Обґрунтовано ефективність моделі управління ресурсами, що базується на прогнозуванні можливих змін в порівнянні з фінансовою звітністю, що відбиває ретроспективу та відображає сталість на майбутні прогнози. Обґрунтовано, що система управління ресурсним потенціалом має будуватися на принципах адаптивних технологічних рішень з урахуванням екстенсивної фінансової стійкості, а основним інструментом забезпечення постійної результативності має бути технологічна політика. Визначено умови збереження основних характеристик, а також стійкість моделі у макроекономічних умовах. Пропонується використовувати аналіз чутливості економічної моделі оптимального плану визначення ефективності системи управління ресурсним потенціалом.

Ключові слова: управління, ресурсний потенціал, аналіз чутливості, економічна модель.

The setting of the problem in general. We want to note that the rationale for an effective resource management model is based on likely changes predicting. Compared to the financial statements, reflecting the retrospective, they are kept for the future.

When substantiating an effective model of resource potential management, all initial data are predicted. The predicted values are determined: the dynamics of resource potential, income, fixed and variable costs, etc. The initial result of the project efficiency (discounted and undiscounted indicators) depends on how precisely these values are determined. In this regard, even before implementing the resource management mechanism, it is necessary to understand as clearly as possible what will happen to the project if, for example, the level of variable costs changes for some reason.

Thus, the sensitivity analysis helps assess the impact of changes in the initial parameters of the project on its final characteristics, such as the internal rate of return, which is usually used in this case. That is, to determine how to maintain the planned performance, the resource, and the financial and economic.

Analysis of recent research and publications. The problem of forming the ways to effectively manage the enterprise's resources in the process of economic activity organization has been studied by such well-known economists as Andriichuk V. H., Haidutskyi P. I., Krystalnyi O. V., Mesel-Veseliak V. Ya., Paskhaver B. Y., Sabluk P. T., Stelmashchuk A. M., Trehobchuk V. M., and others.

The influence of the environmental factors on the efficiency of resource potential management was investigated by Vyshnevska O. M. [1], Yermakov O. Yu. [3], Pidlisetskyi H. M. [4], Piniaha N. O. [5], Sakun A. Zh. [6], Tarasiuk H. M. [8], Shebanin V. S. [9], Shchyhol T. P. [10]. However, the dynamics of financial, economic, and natural environmental factors must be additionally researched due to the complexity of long-term predicting.

The purpose of the article. The article aims to study the sensitivity of the optimal resource potential management plan to changes in uncontrolled economy management parameters.

The presentation of the primary material. Given the conclusions on the presence of regulated and unregulated factors in the shaping of the agricultural resources use efficiency, it will be appropriate to model the behavior of these factors to predict the sustainability of optimal models for implementing the resource potential of agricultural land in the current economic management.

The basis makes up the availability of circumstances within the influence of agricultural enterprises, i.e., the study of performance factors will be considered both favorable and unfavorable trends of microeconomic conditions. We will pay attention to the change in the factors that counteraction can influence. For example, developing a negative trend and decreasing prices for agricultural products will lead to losses in the agricultural enterprise. The issue is only in the severity of the damage. However, the research on the possibility of costs increasing in case of a negative trend is more valuable because it determines the impact of sales policy on the sustainability of resource use of the agricultural enterprises. Therefore, assessing the vehicle of change in the optimal land-use plan in counteraction is expedient [11].

An important specific feature of agricultural production is the dependence on natural factors, as well as the ability to implement the agroclimatic resource in the system of resource potential of the agricultural enterprise. The favorable factor in the agricultural system can be assessed through a specific performance indicator – agricultural yield. Therefore, the following parameter of the simulation experiment is the agricultural yield, the change of which is proposed to be analyzed within 10%.

Fig. 1 demonstrates the results of a two-parameter sensitivity analysis of the resource potential management model with a probable increase of yield by 10%.

Thus, the basic optimal plan for using technological solutions will be stable to increase the agricultural yield by 10% in the case of a
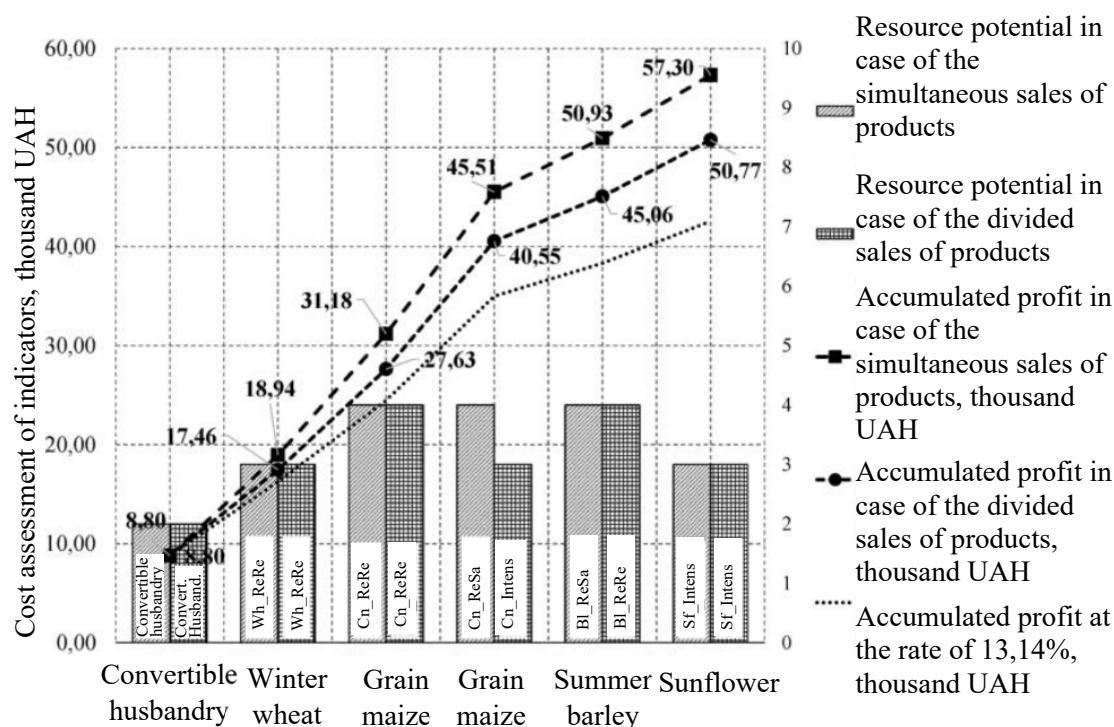
**Fig. 1. Diagram of the change modeling of the optimal plan
for managing the resource potential of the agricultural enterprise
in terms of the increase of major crops yield by 10%**

Source: developed by the author

divided principle of sales of products. In the case of the simultaneous principle of sales of products, there are some changes in the plan at the stage of the second cultivation of grain maize as well as at the stage of cultivation of summer barley. These changes are similar to the situation of direct production costs decreasing by 10%, which shows the presence of a hidden "pocket" of efficiency in the basic optimal plan, which becomes available at the first opportunity. These changes lead to increased financial and economic performance as an indicator of potential implementation effectiveness. Thus, an increase in the yield of major crops by 10% will increase profits by 18.17% in terms of simultaneous sales of products and by 19.32% – in the case of the divided principle.

We would also like to note that, guided by indicators of financial and economic performance in case of a divided sales of products, these conditions can be considered as basic for increasing the financial stability of the optimal plan, i.e., in terms of increasing agricultural yield by 10%, an optimal plan (its effectiveness) can comprise an increase of the discount rate of 5.14 %, or up to 13.14%. In this case, the rate of maintaining the effectiveness of the basic plan is 13.14%.

Thus, the basic optimal plan for the use of technological solutions will be stable to yield a decrease of 10%, both in the case of simultaneous and in the case of divided sales of products. However, these changes lead to a loss of financial and economic performance as an indicator of potential implementation effectiveness. Thus, a decrease in yield by 10% will reduce profits by 18.17% in terms of simultaneous sales of products and by 19.3% – in the case of the divided principle.

We would also like to note that, guided by indicators of financial and economic performance in case of a divided sales of products, it is possible to maintain the efficiency of resource management is possible by decreasing the discount rate to 2.66%, which is 5.34% less than the current (8%).

In case of productivity decrease by 10%, maintaining the profitability of the accepted plan of management of resource potential is possible under conditions of a discount rate decrease by 5,34%, or to 2,66%.

The development of market relations forms a significant dependence on resource potential management effectiveness on the price factor. Thus, the following parameter of the simulation experiment is the price level for agricultural products, the change of which is proposed to be analyzed within 25%.

Fig. 3 demonstrates the results of a two-parameter sensitivity analysis of the resource potential management model with a probable increase in the selling price by 25%.
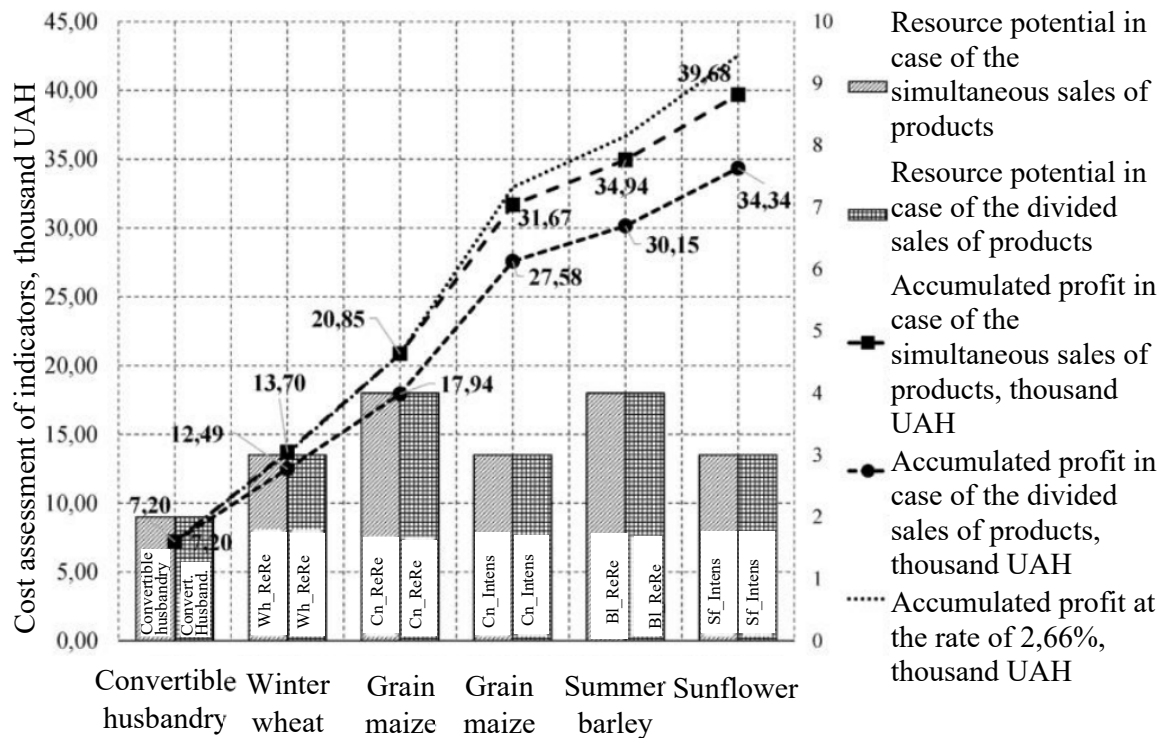
Fig. 2. Diagram of the change modeling of the optimal plan for managing the resource potential of the agricultural enterprise in terms of the decrease of major crops yield by 10%
Source: developed by the author
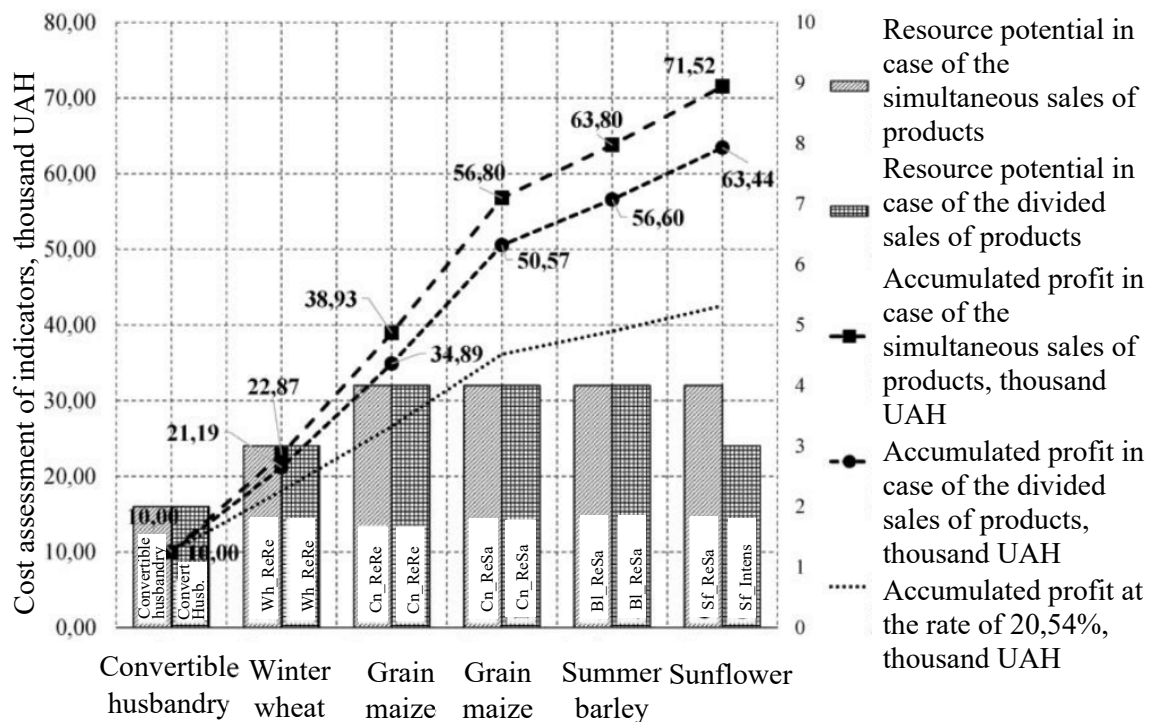
Fig. 3. Diagram of the change modeling of the optimal plan for managing the resource potential of the agricultural enterprise in terms of the increase of selling price for major crops products by 25%
Source: developed by the author

Thus, a finding opportunity to increase the selling price of basic products by 25% makes it possible to naturally transfer the technological model to a resource-saving model. Taking into account the obtained data, we would like to note that in the case of the simultaneous principle of sales of products at all stages, the resource-restoration types of resource use prevail; in the case of the divided principle of sales of products, the exception applies only to the cultivation of sunflower, whose nature of agriculture remains intensive.

The mentioned changes lead to increased financial and economic performance as an indicator of potential implementation effectiveness. Thus, an increase in selling price for products by 25% will increase profits by 47.49% in terms of simultaneous sales of products and by 49.1% – in the case of the divided principle. These conditions can be considered basic for increasing the financial stability of the optimal plan, i.e., in terms of increasing the selling price by 25%, an optimal plan (its effectiveness) can comprise an increase of the discount rate by 12.54%. In this case, the rate of maintaining the effectiveness of the basic plan is 20.54%.

Fig. 4 demonstrates the results of a two-parameter sensitivity analysis of the resource potential management model with a probable decrease in the selling price by 25%

Summarizing the results, we would like to note that the loss of price advantages for various reasons will lead to a crisis. The mentioned changes lead to a loss of financial and economic performance as an indicator of the potential implementation effectiveness: decreasing the selling price by 25% will reduce profits by 45.41% in terms of simultaneous sales of products and by 48.25% – in the case of the divided principle.

These circumstances form a situation of the inability of the basic model of resource management to maintain the basic level of financial and economic performance. The marginal profitability of the model at a discount rate of 0% is 31.71 thousand UAH, which is 25.48% less than the profit of the basic optimal plan. We would also like to note that despite the critical loss of effectiveness, the structure of the optimal plan is preserved, which indicates its stability.

An important condition for the effective implementation of the resource potential of an agricultural enterprise is the formation of the starting conditions for resource provision, both in quantitative and qualitative terms. For example, enterprises with more productive land resources have a greater potential to develop expanded production to form a stable and efficient economy. Therefore, the following parameter of the simulation experiment is the starting conditions of the resource
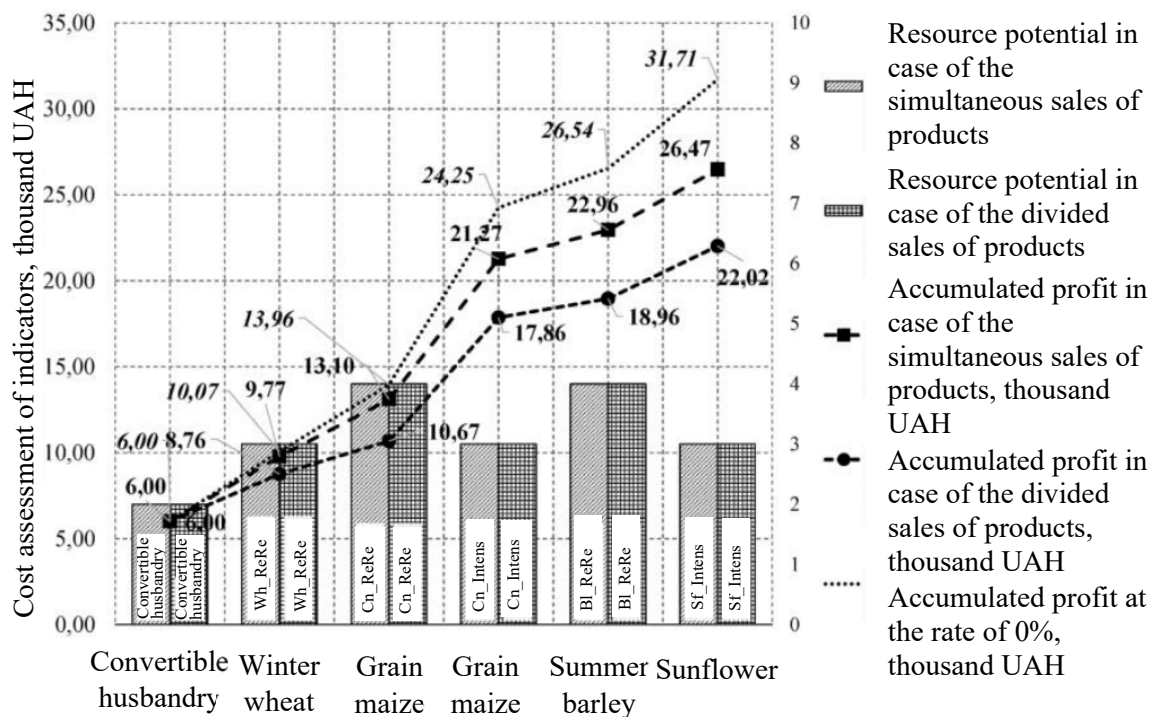
**Fig. 4. Diagram of the change modeling of the optimal plan
for managing the resource potential of the agricultural enterprise
in terms of the decrease of selling price for major crops products by 25%**

Source: developed by the author
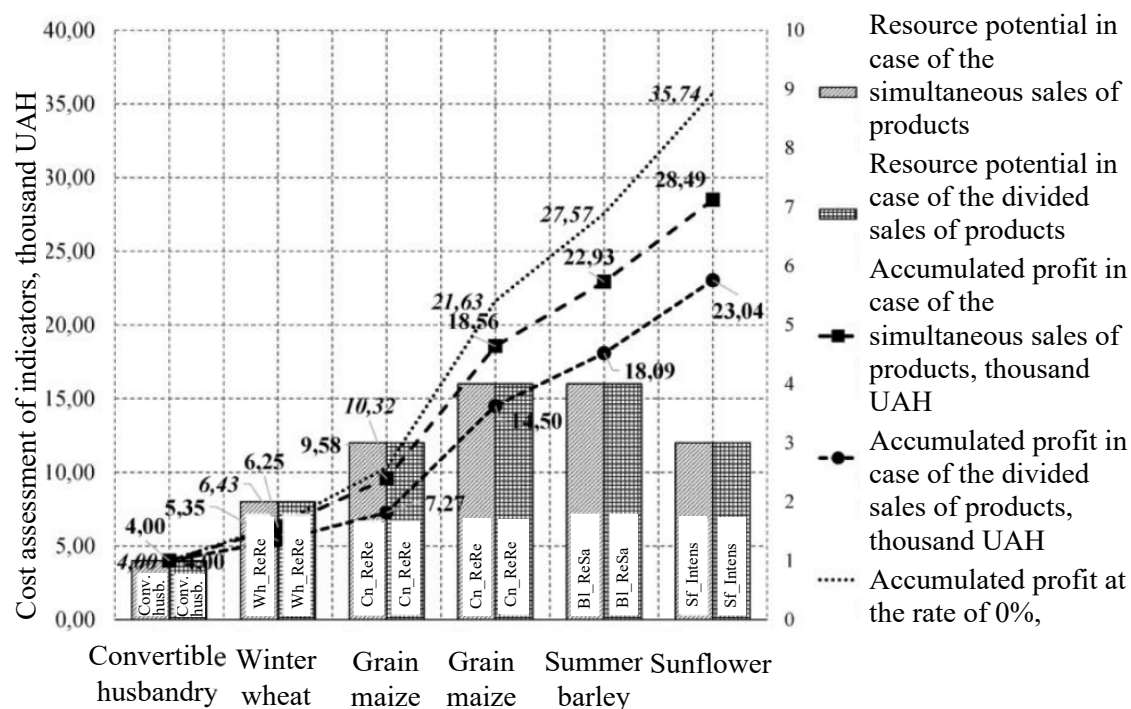
**Fig. 5. Diagram of the change modeling of the optimal plan
for managing the resource potential of the agricultural enterprise
in terms of the worst initial state of the production resources**

Source: developed by the author

potential, the change of which is proposed to be analyzed in alternatives with the worst and good conditions of resource provision.

Fig. 5 demonstrates the results of a two-parameter sensitivity analysis of the resource potential management model at the probable worst initial state of the resource potential

Based on the results of the worst initial conditions modeling, we can conclude that significant resources of the enterprise should be aimed at forming an acceptable level of resource potential to ensure the effectiveness of crops of the adopted crop rotation. This plan differs from the basic use in both types of resource-restoration type of technologies during the second cultivation of grain maize and resource-saving technologies during the cultivation of summer barley.

This combination of technological solutions provides an increase in resource potential to the highest level.

These circumstances form a situation of the inability of the basic model of resource management to maintain the basic level of financial and economic performance: the worst conditions for the initial state of the resource potential will lead to reducing profits by 41.25% in terms of simultaneous sales of products, and by 45.85% – in case of the divided principle. These circumstances form a situation of the inability of the basic model of

resource management to maintain the basic level of financial and economic performance. The marginal profitability of the model at a discount rate of 0% is 35.74 thousand UAH, which is 16.00% less than the profit of the basic optimal plan.

Fig. 6 demonstrates the results of a two-parameter sensitivity analysis of the resource potential management model at the probable good initial state of the resource potential.

According to the results of modeling the optimal plan in the conditions of the good initial state of resource potential, the type of models changes at the 3rd stage during the first cultivation of grain maize with their replacement to resource-saving. This resulted in the soonest achievement of the highest level of resource potential. Other stages repeat the structure of the optimal plan. The mentioned changes lead to an increase in financial and economic performance as an indicator of the potential implementation effectiveness: the good initial state of the resource potential will lead to an increase of profits by 27.43% in terms of simultaneous sales of products and by 30.20% – in case of the divided principle.

The mentioned conditions can be considered as basic for increasing the financial stability of the optimal plan, i.e., in terms of the good initial state of the resource potential obtaining, an optimal plan (its effectiveness) can comprise an increase of the
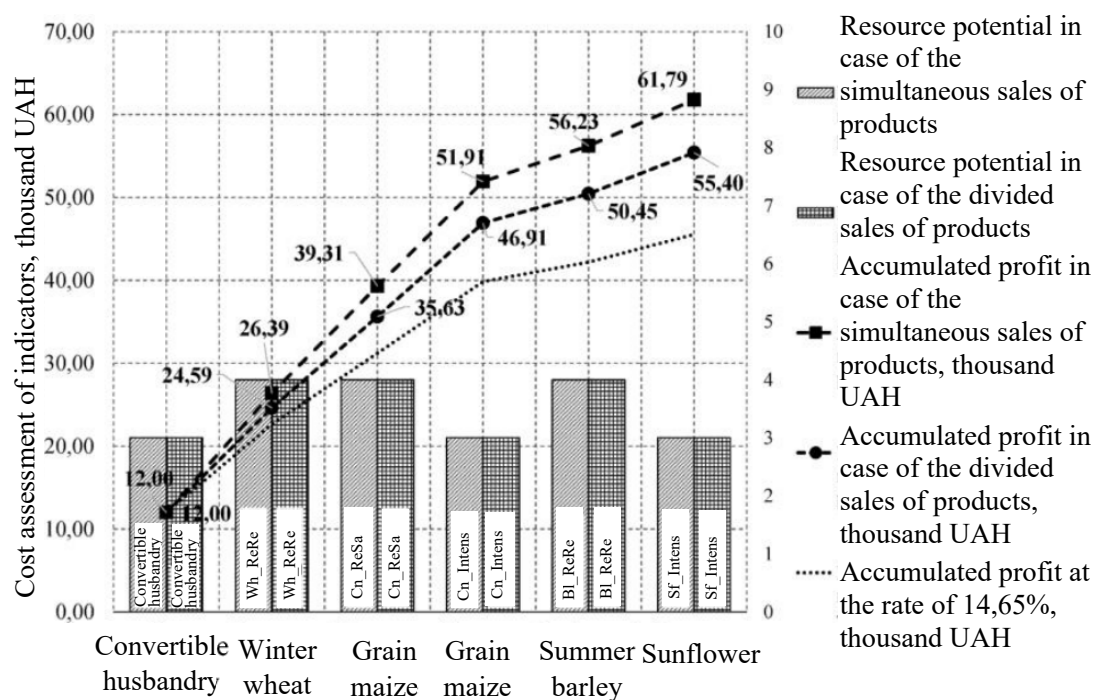
**Fig. 6. Diagram of the change modeling of the optimal plan
for managing the resource potential of the agricultural enterprise
in terms of the best initial state of the production resources**

Source: developed by the author

discount rate of 12.54%. In this case, the rate of maintaining the effectiveness of the basic plan is 14.65%.

The obtained results of modeling the optimal plan with good starting conditions make up a continuation of the basic plan; that is, using the obtained parameters, you can construct an optimal resource management plan for 2 production cycles (2 crop rotations), i.e., for 12 years.

Summarizing the obtained results of the simulation modeling, we would like to demonstrate the priority of tasks following the impact on the efficiency of resource management (by the descending principle):

1. Solving the problem of technological pressure reducing the resource potential of the agricultural enterprise.

2. Determining the means of identifying the resource potential basic state.

3. Ensuring the conditions for obtaining price advantages in the sale of products of accepted crops, including the use of cooperation and integration means.

4. Identify means to increase the efficiency of available natural and agroclimatic resources.

5. Determining the directions for reducing the resource intensity of technologies for agricultural crop production.

Conclusions and suggestions. The sensibility of the economic model of the optimal resource potential management plan to changes of the uncontrolled parameters of the economic model of the agricultural enterprise was analyzed; significant of which are the yield of crops as an indicator of the favorable environment; sales prices as an indicator of the favorable market situation; starting conditions as an indicator of the rational location of the productive forces of the agricultural enterprise.

It is established that predicting probable changes makes it possible to program the measures for support of the accepted mode of resource use with the help of investment conditions creation to support the economic model of the agrarian enterprise. Moreover, using the model of effective changes in dynamic programming in the course of resource potential management allows us to assess both quantitative and qualitative changes.

It is substantiated that the system of resource potential management should be based on the principles of adaptive technology solutions taking into account the extensive financial stability, and the main tool for ensuring constant performance should be technological policy.

The conditions for the basic performance maintenance as well as the stability of the model in macroeconomic conditions are determined.

It is proposed to use the sensibility analysis of the economic model of the optimal plan to determine the effectiveness of the resource potential management system.

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