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DYNAMIC MODELING OF AGRICULTURAL COMPANY ASSET MANAGEMENT PROCESS

Abstract. The article is aimed at describing possibilities to use methodological tools of dynamic modeling to manage the assets of economic entities, and agricultural companies in particular.

Methods. The research uses the method of dynamic programming. All classes of dynamic programming problems are solved by the method of recurrence relations, which are made on the basis of the optimality principle. Strategic modeling and taxonomic analysis methods are also used to build a program-targeted model for asset management of agricultural companies.

Results. The article proposes to consider asset management of agricultural companies as a purposeful systematic influence on the factors and conditions that accompany the selection processes, combination and revitalization of economic resources, their productive use as assets of an economic entity to obtain economic benefits, sustainable development and competitiveness of the enterprise in the target market. Therefore, the asset management process of the enterprise U should be formalized as a set U = {u1, u2, u3, u4}, which can be detailed by distinguishing the influence of managing a particular asset type upon the value of the modified development factor d_i of the enterprise. Namely: u_1 (influence of intangible fixed asset management), u_2 (influence of tangible fixed asset management), u_3 (influence of tangible asset management), u_4 (influence of cash asset management). Consequently, the author has justified a program-targeted model of agricultural company asset management, which includes a strategic matrix, combinatorics of management decisions, taxonomic analysis and forecast of changes using strategic alternatives and proposed policies for managing individual asset types. The author also gives calculation of changes in the modified development ratio of the agricultural company-respondent of the study (d_i) and suggests a set of policies to manage fixed, tangible and cash assets of the research respondent within the identified strategic vector.

Conclusions. The method of dynamic programming is the most adapted to the solution of discrete problems, which in most cases are management and control tasks. The study concluded that the method can be used to describe and analyze dynamic objects within the time for efficient management. Therefore, the author offered a program-targeted asset management model for agricultural companies using this method. This gives the opportunity to stratify the choice of agricultural company asset management policies within the identified strategic outline.

Key words: assets, dynamic modeling, process approach, model of asset management, combinatorics of management decisions, taxonomic analysis, forecast.

Introduction. The activities of agricultural companies under dynamic market changes and intense global competition is determined by their economic potential and their correspondence to market opportunities. The dynamics of the enterprise and its ability to respond to everyday challenges depends on the quality of the available resources. The struggle between the subjects of economic relations for limited resources is transformed into a strategic interaction, which involves the synchronization of the pace of development and the trajectories of their evolution, but not their acquisition or merger. [1] Structural transformation of the economy should be aimed at maximizing the efficient use of all types of economic resources, assets, competences. It requires implementation of active and consistent innovative and investment policy, development of the national innovative system, improvement of the industrial complex directed to expansion of high-tech manufacturing industries, telecommunications, financial and business services, development of highly intellectual human capital. The modern prospects for innovative development of domestic agricultural production will be determined by the opportunities to use the benefits of its diversification both in terms of the commodity structure and in increasing its share that is currently in growing demand in the world.

Materials and research methods. Considering the fact that, in the general sense, business asset management should be considered as purposeful systematic impact on the factors and conditions that accompany the processes of selection, combination and revitalization of economic resources, as well as their productive use for economic benefit, sustainable development and competitiveness of the enterprise in a particular market, it is necessary to formalize the asset management model.

To formalize the model, the study uses a dynamic programming method that consists of a series of interrelated steps. The necessary conditions for applying this method are: the purpose function should consist of the sum of functions, each function depends only on the corresponding variable; the task must be interpreted as a multi-step decision-making process; the task must be defined for an arbitrary number of steps and have a structure that does not depend on their number. The state of the dynamic programming control system is given in figure 1, where u_k - is the managerial influence on kth step (k = 1, 2, 3… n); S_k - is the state of the system on step k - 1 (k = 1, 2, 3… n).

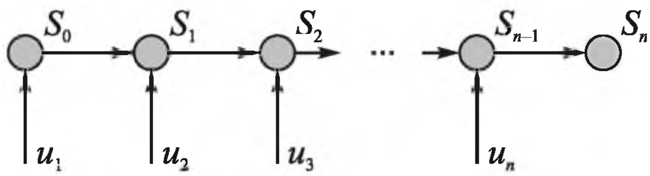

Figure 1 – State of the control system by the dynamic programming method

All classes of dynamic programming problems are solved by the method of recurrence relations, which are based on the principle of optimality, developed by American mathematician Richard Bellman in 1953 [1]: *"Whatever the state of the system before the next step, the management of this step should be chosen so that the efficiency of the step under consideration plus the optimum efficiency of all subsequent steps is maximized."*

Therefore, in the process of management optimization by the method of dynamic programming, the multi-step process must be "passed through" twice. Firstly - from the end to the beginning, as a result of which we find conditional optimal management decisions and conditional optimal benefits at all steps (periods). Secondly - from start to finish, which results in optimal management decisions at each step (stage) and, respectively, optimal management of the process as a whole. This requires the development and use of a unified model of enterprise asset management.

Research results. The basic ability of agricultural companies is the ability to predict the future and correlate their actions along with it, determine the direction of production for the enterprise; ability to learn and change; the ability to adopt long-term plans, attract the right specialists to the enterprise, build up partnerships; ability to generate cash flow, generate profits and increase capitalization. The abilities listed above represent the level of mechanisms aimed at developing new capabilities of the enterprise, which is certainly a prerequisite for the existence of the enterprise in the future.

Considering the use of dynamic modeling to describe the process of agricultural enterprise asset management we should define the economic category of "assets of the enterprise". In the context of our research, assets of the enterprise are the variable part of its economic resources that is selected by the entity to carry out business activities on the basis of the approved business model, taking into account its capability, time and risk factors with the aim to bring economic benefits and to ensure competitiveness of the enterprise on a specific market. Normally, assets of agricultural companies have a large proportion of fixed components in their structure. However, the desire of individual agricultural producers to increase productivity due to the use of better raw materials leads to an increase in the proportion of tangible assets.

As a result of a thorough taxonomic analysis of the nature and systemic qualities of the enterprise assets [2], structural-genetic analysis of models that manage them, the research proposes a program-targeted model for agricultural company asset management. Based on the mission and goals of the enterprise, the model consists of a strategic matrix, combinatorial management decisions, taxonomic analysis and forecast of twenty indicators of condition assessment, efficiency and financial security of the asset use (X1-X20) with the subsequent calculation of the modified development ratio of the respondent of the research *(d_i)*.

The first element of this model illustrates the dependence of its choice on the corporate strategy of the entity [3,4,5,6]. This, in turn, predetermines a set of tactical actions that are integrated into a particular asset management policy of the enterprise.

For the most part, the mission of a modern agricultural enterprise is to produce products to meet the needs of the consumer market and maximize profits. However, in our study, we emphasize the need for the society to proceed to the environmental economy, which, in turn, requires a clarified mission of the modern agricultural company. It is necessary to change the human attitude to the nature as a conqueror (he takes as much as he wants) to the position of an equal inhabitant of the planet, who cares for the reproduction of natural resources, to provide them for future generations. Therefore, when choosing an economic resource to transform into a company asset, one must keep in mind the resource constraint: "natural resources are never enough to meet all the needs at a given level of economic development." Therefore, in our opinion, the mission of a modern agribusiness is to produce products to meet the needs of the consumer market and to maximize profits through the harmonized use and reproduction of economic resources.

It should be noted that the relevance of strategic alternatives to the underlying strategy should not be seen as invariable: they may overlap. However, each and every of the basic corporate strategies has quite many alternatives for implementation. In turn, strategic alternatives are implemented through appropriate policies. In the context of our study, under the *company asset management policy* $П_{ac}$ we should imply the complex of economically weighted measures for transforming economic resources into assets of an entity and their further productive use in order to achieve strategic goals of the enterprise.

Figure 2 details the strategic matrix of the program-target model of enterprise asset management, a key element of which is the matrix of relevant management policies.

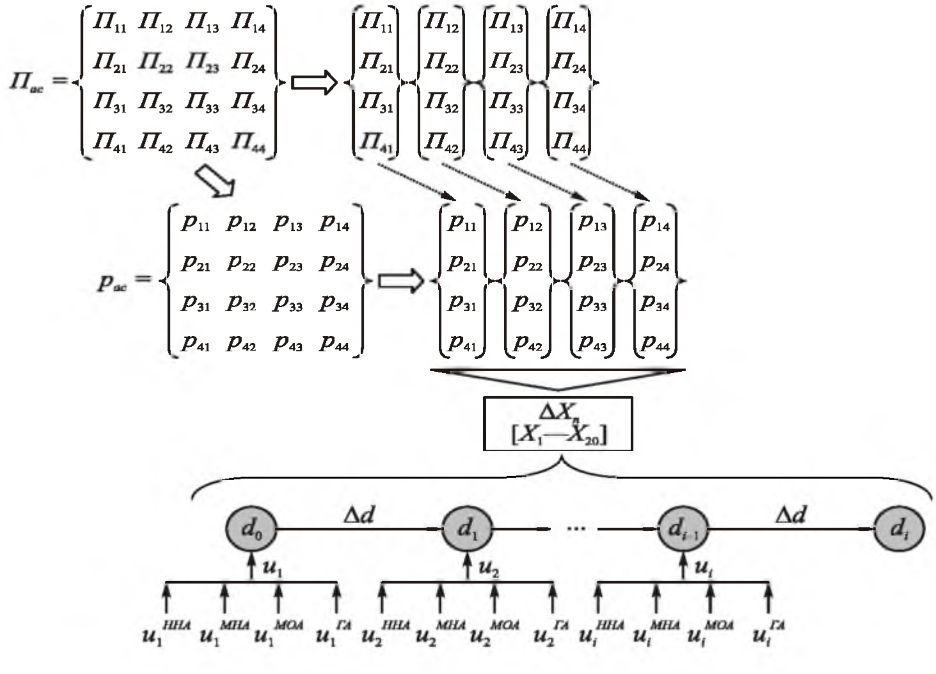

Figure 2 – Logic and combinatorics of decision making on enterprise asset management

The matrix for corporate asset management policy can be viewed both at the angle of the strategic vector set and at the angle of the cluster set of the respective type of asset. The strategic vector set characterizes a complex of policies for managing different types of assets within the framework of the implementation of one of the corporate strategies (growth, restructuring, stabilization, survival). In turn, the cluster set is a combination of asset management policies according to the asset type (intangible fixed assets, tangible fixed assets, tangible assets, cash assets).

Each cluster of agricultural company asset management policies considers a set of actions to locate, attract, and efficiently use a certain type of asset.

The first cluster is based on the results of a person's intellectual activity to obtain an intellectual product that may become an intangible asset of the entity. As a primary basis for product innovation, intellectual products are beneficial to businesses through their industrial suitability, cost-efficiency, profitability when used in manufacturing, and product sales (service delivery). That is why their value as an industrial property object - an intangible asset of an enterprise - is increasing.

The second is based on the probable ways of reproducing and updating fixed assets under existing depreciation models. The rational application of depreciation calculation method at the enterprise is an important element of its corporate governance and enables the management of the enterprise to expand production or create a new line of business.

The third policy cluster describes a set of measures to make use of current assets more efficiently - reducing inventory levels, reducing storage and transportation costs (many tenants who have found themselves less creditworthy due to decline in their business affairs are forced to look for inventory management models that aim to optimize their own costs), increase the efficiency of the business, and improve customer service.

The fourth cluster solves the issue of maintaining a minimum balance of funds for smooth running current calculations; taking into account the range of seasonal changes in cash balances; creating free cash reserve in case of possible expansion of the company activity; forming a reserve of cash assets to compensate for unforeseen expenses and possible losses in the course of financial and economic activities, etc.

In order to develop and implement the enterprise asset management policy, it is necessary to describe the isolated clusters and identify the impact factors using the above mentioned taxonomic efficiency analysis of formation and use of the company assets. It is clear that the stated management policy does not aim to change all factors of multidimensional analysis. It approaches management influence differentially depending on the strategic vector within the overall corporate strategy of the enterprise.

Table 1 outlines the author's vision for the contents of agricultural company asset management policies and identifies the impact factors that are to be changed in the implementation of the selected policy.

Table 1 – Company asset management policies*

Cluster	Policy	Description	Impact factors
1. Intangible fixed assets management policies	Π_{11}	*Breakthrough policy* aimed at generating ideas for the development / acquisition and use of fundamentally new intangible assets that may increase the potential of an agricultural company and create new competitive advantages	X_5, X_6, X_{14}, X_{20}
	Π_{12}	*Improvement policy* aims to develop a set of measures to search for intangible assets that can improve existing technologies and technical (organizational, etc.) decisions to ensure the competitiveness of the agricultural company in the target market	
	Π_{13}	*Savings policy* aims at developing / acquiring intangible assets that are capable of securing a gain in the cost of production and more complete using the potential of an agricultural company and protecting its goodwill	
	Π_{14}	*Opportunity revaluation policy* is aimed at finding such intangible assets that would be useful in the process of rehabilitation and search for new niches, markets for the presence of the agricultural company	
2. Tangible fixed assets management policies	Π_{21}	*The progressive (proactive) policy* of tangible fixed assets management is aimed at its rapid updating with radically new fixed assets, capable of providing the agricultural company with competitive advantages	$X_1, X_2, X_3, X_4, X_7, X_{14}, X_{20}$
	Π_{22}	*A reactive tangible asset management policy* aims to respond quickly to changes in the environment by reactively updating fixed tangible assets, i.e. it should be sensitive to scientific and technological progress	
	Π_{23}	*Adaptive tangible fixed asset management policy* is designed to adjust the process of reproduction of depreciation assets to the changes in the external environment and internal capabilities of the agricultural company, it is best suited to the type of such enterprises	
	Π_{24}	*Defensive tangible fixed asset management policy* focuses on finding tools to help reduce production costs	

Continuation of table 1			
3. Tangible asset management policies	П31	*Rebirth policy* is aimed at developing a complex of measures for finding, combining and attracting tangible assets, the use of which can improve the quality and competitiveness of goods (services) of the agricultural company	$X_8, X_9, X_{10}, X_{11}, X_{12}, X_{13}, X_{17}, X_{18}, X_{19}, X_{20}$
	П32	*Fast movement policy* focuses on accelerating the turnover of tangible assets and releasing tangible assets to finance other activities of the agricultural company	
	П33	*Prudent use policy* is aimed at optimizing the size of attracted tangible assets, regulating the size by their degree of importance, forming by an agricultural company a minimum allowable stock, or refusing to form a stock at all	
	П34	*Anti-entropy policy* involves the revaluation and sale of surplus tangible assets, the choice of a rational model to involve and use them in the course of rehabilitation or liquidation of the enterprise	
4. Cash asset management policies	П41	*Intensification policy* is directed to ensure profitable use of temporary free cash assets	$X_{14}, X_{15}, X_{16}, X_{17}, X_{18}, X_{19}, X_{20}$
	П42	*Long-term investment policy* with timely transformation of free cash into highly liquid financial instruments and its conversion to replenish the balance of agricultural company	
	П43	*The optimization policy* is based on the maintenance of a minimum balance of cash assets for smooth running of current calculations	
	П44	*Consideration policy* focuses on building efficient control systems over cash assets of an agricultural company, minimizing financial risk and ensuring economic security	
* Developed by the author.			

Due to the rational choice of asset management impact factors, agricultural companies are able to significantly increase the modified development index d_i. This indicator is calculated according to the classical taxonomic analysis algorithm [7, 8]:

1. Formation of the observation matrix of the research respondent:

$$X_{mn} = \begin{pmatrix} X_1 \\ X_2 \\ \dots \\ X_i \\ \dots \\ X_m \end{pmatrix} = \begin{pmatrix} x_{11} & x_{12} & \cdots & x_{1j} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2j} & \cdots & x_{2n} \\ \dots & \dots & \dots & \dots & \dots & \dots \\ x_{i1} & x_{i2} & \cdots & x_{ij} & \cdots & x_{in} \\ \dots & \dots & \dots & \dots & \dots & \dots \\ x_{m1} & x_{m2} & \cdots & x_{mj} & \cdots & x_{mn} \end{pmatrix}, \quad (1)$$

Performance indicators [$X_1, X_2, X_5, X_6, X_7, X_8$], of efficiency use [$X_3, X_4, X_9, X_{10}, X_{11}, X_{12}, X_{13}, X_{14}, X_{15}$] and financial security [$X_{16}, X_{17}, X_{18}, X_{19}, X_{20}$] of company assets.

where m - is the number of units of n-dimensional space that equals to the number of rows of the matrix; n - is the number of attributes of each unit that equals to the number of columns of the matrix; x_{ij} - the value of the attribute by the number j for the unit by the number i.

2. Standardization of values of the matrix elements under observations:

$$z_{ij} = \frac{x_{ij} - m_j}{\sigma_j}, \quad i = 1, \dots, m; \quad j = 1, \dots, n, \quad (2)$$

$$\bar{x}_j = m_j = \frac{1}{m} \sum_{i=1}^{m} x_{ij}; \quad (3)$$

$$\sigma_j = \sqrt{\frac{1}{m} \sum_{i=1}^{m} (x_{ij} - m_j)^2}, \quad (4)$$

$$Z_{mn} = \begin{pmatrix} Z_1 \\ Z_2 \\ \ldots \\ Z_m \end{pmatrix} = \begin{pmatrix} z_{11} & z_{12} & \cdots & z_{1n} \\ z_{21} & z_{22} & \cdots & z_{2n} \\ \ldots & \ldots & \ldots & \ldots \\ z_{m1} & z_{m2} & \cdots & z_{mn} \end{pmatrix}, \quad (5)$$

3. Formation of the vector-standard:

$$z_{0j} = \begin{cases} \max\limits_i \ z_{ij}, & \text{if} \quad j \in I_c; \\ \min\limits_i \ z_{ij}, & \text{if} \quad j \in I_д. \end{cases} \quad (6)$$

* stimulants [X_1, X_3, X_4, X_5, X_6, X_8, X_9, X_{11}, X_{13}, X_{14}, X_{15}, X_{16}, X_{17}, X_{18}, X_{19}, X_{20}],
** destimulants— [X_2, X_7, X_{10}, X_{12}].

$$Z_{mn} = (-)\begin{pmatrix} z_{11} & z_{12} & \cdots & z_{1n} \\ z_{21} & z_{22} & \cdots & z_{2n} \\ \ldots & \ldots & \ldots & \ldots \\ z_{m1} & z_{m2} & \cdots & z_{mn} \end{pmatrix}, \quad (7)$$

$$z_Э = (z_{01}, \ z_{02}, \ \cdots \ z_{0n}) \ .$$

$$Z_E = (Z_{01}, Z_{02}, \ldots, Z_{0n}) . \quad (8)$$

4. Determining the distance between the individual observations and the vector-standard

$$c_{i0} = \sqrt{\sum_{j=1}^{n} (z_{ij} - z_{0j})^2} \quad (i = 1, 2, \ldots, m); \quad (9)$$

$$\bar{c}_0 = \frac{1}{m} \sum_{i=1}^{m} c_{i0} \quad (10)$$

$$\sigma_0 = \sqrt{\frac{1}{m} \sum_{i=1}^{m} (c_{i0} - \bar{c}_0)^2}, \quad (11)$$

$$c_0 = \bar{c}_0 + 2\sigma_0, \quad (12)$$

5. Determining the taxonomic development ratio:

$$d_i^* = \frac{c_{i0}}{c_0}; \quad 0 \le d_i^* \le 1, \quad (13)$$

$$d_i = 1 - \frac{c_{i0}}{c_0}., \quad (14)$$

where d_i^* – direct development ratio, where d_i – modified development ratio.

Table 2 considers in more detail the technology of applying dynamic modeling of the asset management on the example of the agricultural company under research. The table summarizes the input data of the research respondent concerning the efficiency of its asset formation and asset use.

Table 2 – Observation matrix of the asset formation efficiency and asset use efficiency of an agricultural company (research respondent) (2013-2019)*

Factor	Indicator	Period						
		2013 p.	2014 p.	2015 p.	2016 p.	2017 p.	2018 p.	2019 p.
X_1	Fixed assets, thousand UAH	1897297	1900797	1555198	1300711	1111516	970051	864227
X_2	Wear ratio, UAH / UAH	0,49	0,49	0,58	0,65	0,70	0,74	0,77
X_3	Fund return, UAH / UAH	1,90	2,00	2,33	2,98	3,71	4,52	5,37
X_4	Return on fixed assets, %	6,30	9,18	11,90	16,99	22,42	28,81	35,72
X_5	Intangible assets, thousand UAH	10700	12200	10980	9882	8894	8004	7204
X_6	Fixed assets, thousand UAH	2089713	2105366	1770854	1527576	1349700	1219652	1125335
X_7	Index of fixed assets, UAH / UAH	2,28	2,36	1,98	1,71	1,51	1,37	1,26
X_8	Tangible assets, thousand UAH	1308136	1317460	1317155	1316850	1316545	1316240	1315935
X_9	Turnover ratio, UAH / UAH	3,07	2,90	3,06	3,23	3,40	3,57	3,75
X_{10}	Duration of one turnover, days	117	124	118	111	106	101	96
X_{11}	Receivables turnover ratio, number of turnovers	10,48	9,01	9,55	10,08	10,61	11,15	11,68
X_{12}	Duration of one receivables turnover, days	34	40	38	36	34	32	31
X_{13}	Return on tangible assets, %	10,2	13,3	15,6	18,4	20,5	22,8	24,9
X_{14}	Return on assets, %	3,49	5,09	6,65	8,52	10,13	11,81	13,41
X_{15}	Profitability ratio of financial activity, UAH / UAH	0,74	0,81	0,89	1,02	1,26	1,98	17,96
X_{16}	Absolute liquidity ratio, UAH / UAH	0,04	0,03	0,03	0,04	0,04	0,05	0,05
X_{17}	Intermediate liquidity ratio, UAH / UAH	0,29	0,22	0,23	0,26	0,28	0,31	0,32
X_{18}	Coverage ratio, UAH / UAH	0,74	0,58	0,60	0,67	0,74	0,80	0,85
X_{19}	Total solvency ratio, UAH / UAH	0,53	0,52	0,60	0,67	0,74	0,80	0,85
X_{20}	Z-ratio by R. Lis model	0,0716451	0,0750135	0,0876450	0,0999634	0,1117010	0,1226765	0,1327787

Using the data in table 2 according to the algorithm of taxonomic analysis, we bring the observation matrix to a standardized form (table 3) and by the formula (6) we determine the coordinates of the vector-standard.

Table 3 – Standardized observation matrix of agricultural company (research respondent) (2013-2019)

Factor	Forecasting period							Coordinates of the vector-standard
	2013p.	2014p.	2015p.	2016p.	2017p.	2018p.	2019p.	
X_1	1,338	1,347	0,468	-0,180	-0,661	-1,021	-1,290	1,347
X_2	-1,334	-1,334	-0,485	0,175	0,647	1,024	1,307	-1,334
X_3	-1,103	-1,022	-0,754	-0,226	0,366	1,024	1,714	1,714
X_4	-1,247	-0,959	-0,686	-0,177	0,366	1,006	1,697	1,697
X_5	0,615	1,534	0,787	0,115	-0,490	-1,035	-1,525	1,534
X_6	1,325	1,368	0,465	-0,191	-0,671	-1,021	-1,276	1,368
X_7	1,234	1,432	0,491	-0,177	-0,672	-1,018	-1,291	-1,291
X_8	-2,418	0,654	0,554	0,453	0,353	0,252	0,152	0,654
X_9	-0,753	-1,355	-0,789	-0,187	0,415	1,016	1,653	1,653
X_{10}	0,709	1,464	0,817	0,062	-0,478	-1,017	-1,556	-1,556
X_{11}	0,135	-1,604	-0,965	-0,338	0,289	0,928	1,555	1,555
X_{12}	-0,336	1,680	1,008	0,336	-0,336	-1,008	-1,344	-1,344
X_{13}	-1,594	-0,957	-0,484	0,091	0,523	0,995	1,427	1,427
X_{14}	-1,485	-1,005	-0,538	0,023	0,506	1,010	1,489	1,489
X_{15}	-0,471	-0,459	-0,446	-0,424	-0,383	-0,261	2,444	2,444
X_{16}	0,000	-1,323	-1,323	0,000	0,000	1,323	1,323	1,323
X_{17}	0,485	-1,496	-1,213	-0,364	0,202	1,051	1,334	1,334
X_{18}	0,308	-1,419	-1,203	-0,447	0,308	0,956	1,496	1,496
X_{19}	-1,188	-1,272	-0,606	-0,024	0,559	1,058	1,474	1,474
X_{20}	-1,314	-1,159	-0,578	-0,011	0,529	1,034	1,499	1,499
*X_1, X_3, X_4, X_5, X_6, X_8, X_9, X_{11}, X_{13}, X_{14}, X_{15}, X_{16}, X_{17}, X_{18}, X_{19}, X_{20} – stimulants, **X_2, X_7, X_{10}, X_{12} - destimulants								

According to the taxonomic analysis algorithm, the next step is to determine the distance c_{i0} from each i^{th} multidimensional point – a unit of the studied population to the point of the standard, the average value of the distance to the point of the standard, as well as the estimate of the standard deviation of this distance (formulae 9-12) and the results of calculations for the period 2013-2019 will be summarized in table 4.

Table 4 – Distances between individual observations and the vector-standard of the object under research

Indicator	2013 p.	2014 p.	2015 p.	2016 p.	2017 p.	2018 p.	2019 p.
c_{i0}	9,621	10,848	9,318	7,423	6,448	5,862	5,525
$\bar{c}_0$	7,864	7,864	7,864	7,864	7,864	7,864	7,864
σ_0	1,919	1,919	1,919	1,919	1,919	1,919	1,919
c_0	11,702	11,702	11,702	11,702	11,702	11,702	11,702

Observing the dynamics of changes in the distance between individual observations and the vector-standard c_{i0} in table 4, at this stage of calculations it is already possible to speak about improving the efficiency of asset formation and asset use of the research respondent, and therefore, the efficiency of asset management policies of the first strategic vector under growth strategy [9]. This statement is based on reducing the gap between the studied set of factors and their standard point. However, the calculation of the modified development ratio gives a more reliable estimate of the efficiency level of formation and use of fixed assets, tangible assets and cash assets of an agricultural company. The results of the calculation of direct and modified development ratio by formulae (13) and (14) of taxonomic analysis are presented in table 5 and figure 3.

Table 5 – Direct and modified development ratio of agricultural company (research respondent)

Indicator	2013 p.	2014 p.	2015 p.	2016 p.	2017 p.	2018 p.	2019 p.
d_i^*	0,822	0,927	0,796	0,634	0,551	0,501	0,472
d_i	0,178	0,073	0,204	0,366	0,449	0,499	0,528

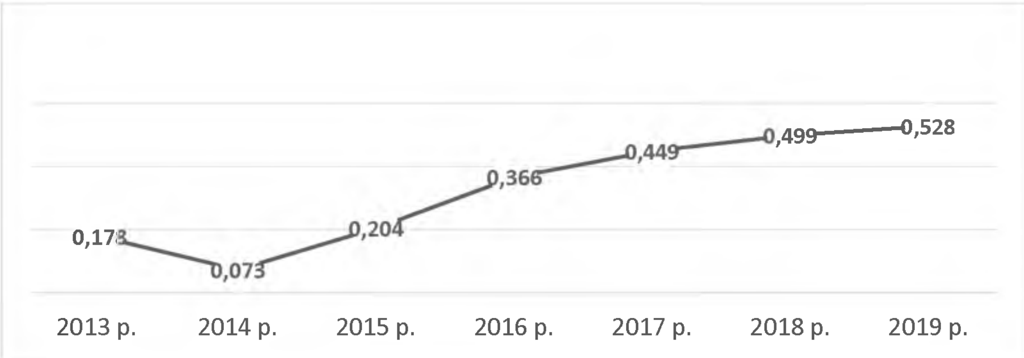

Figure 3 – Modified development ratio d_i of the research respondent 2013-2019

Based on the analysis of the change dynamics of the modified development ratio, the following assets are to be chosen for management to consolidate the growth trend: - intangible fixed assets breakthrough policy $П_{11}$; - tangible fixed assets progressive (proactive) policy $П_{21}$; - tangible assets rebirth policy $П_{31}$; - cash assets intensification policy $П_{41}$.

Conclusion. The method of dynamic programming is most adapted to discrete tasks, which in most cases are management and control tasks. It can be applied to any method of setting a target function and with any acceptable set of system states. The dynamic programming method can be used to describe and analyze dynamic management objects within the time for further identification and efficient management.

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АГРАРЛЫҚ КОМПАНИЯ АКТИВТЕРІН БАСҚАРУ ҮДЕРІСІНІҢ ДИНАМИКАЛЫҚ ҮЛГІСІ

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ДИНАМИЧЕСКОЕ МОДЕЛИРОВАНИЕ ПРОЦЕССА УПРАВЛЕНИЯ АКТИВАМИ АГРАРНЫХ КОМПАНИЙ

Аннотация. Цель. Описать возможности применения методического инструментария динамического моделирования для управления активами субъектов хозяйствования, в частности аграрных компаний.

Методы. В исследовании использован метод динамического программирования. Все классы задач динамического программирования решаются методом рекуррентных соотношений, которые составляются на основании принципа оптимальности. Также для построения программно-целевой модели управления активами аграрных компаний использованы методы стратегического моделирования и таксономического анализа.

Результаты. В статье предложено рассматривать управление активами аграрных компаний как целенаправленное систематическое влияние на факторы и условия, сопровождающие процессы отбора, комбинации и активации экономических ресурсов, их продуктивного использования в качестве активов субъекта хозяйствования для получения экономической выгоды, устойчивого развития и конкурентоспособности предприятия на целевом рынке. Следовательно, процесс управления активами предприятия U следует формализовать как множество $U = \{u_1, u_2, u_3, u_4\}$, которое может быть детализировано путем выделения влияния управления конкретным видом актива на величину модифицированного коэффициента развития предприятия d_i. А именно: u_1 (влияние управления нематериальными необоротными активами), u_2 (влияние управления материальными необоротными активами), u_3 (влияние управления материальными оборотными активами), u_4 (влияние управления денежными активами). Исходя из этого, обоснована программно-целевая модель управления активами аграрных компаний, которая включает стратегическую матрицу, комбинаторику управленческих решений, таксономический анализ и прогнозирование изменений с использованием стратегических альтернатив и предложенных политик управления отдельными видами активов. Приведен расчет изменений модифицированного коэффициента развития аграрной компании-респондента исследования (d_i) и предложен набор политик управления необоротными, оборотными и денежными активами респондента исследования в рамках идентифицированного стратегического вектора.

Выводы. Метод динамического программирования наиболее приспособлен к решению дискретных задач, которыми в большинстве являются задачи управления. В ходе исследования пришли к выводу, что его можно применять для описания и анализа динамических объектов управления во времени с целью эффективного управления. Поэтому предложили для аграрных компаний программно-целевую модель управления активами с использованием этого метода. Это дает возможность стратифицированного выбора политик управления активами аграрных компаний в рамках идентифицированного стратегического контура.

Ключевые слова: активы, динамическое моделирование, процессный подход, модель управления активами, комбинаторика управленческих решений, таксономический анализ, прогноз.

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