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Identification of system-products configurations of milk production development programs by domestic dairy farms

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Summary. The scientifically-methodical principles and method of identification of system-products configuration of milk production development programs by domestic dairy farms are worked out. The principles and methods are based on the system and factor approach to the determination of their value, they take into account cause-and-effect relation among the separate objects of configuration and project environment of these programs and they foresee the imitation design of functioning of the marked objects of configuration.

It is grounded that identification of system-products configuration of milk production development programs by domestic dairy farms should be performed simultaneously with authentication of systems-foods configuration of feed providing programs of domestic dairy farms.

The proposed method of identification of system-products configuration of milk production development programs by domestic dairy farms foresees the realization of nine stages. The procedure was based on system and factor approach and imitation simulation of the functioning of system-products objects of configuration in a changeable project environment.

The grounded cause-and-effect relations among the functional indexes of configuration objects of milk production development programs by domestic dairy farms and changeable descriptions of the project environment are the basis of prognostication of resources requirement in separate calendar periods of the functioning of these systems.

The cost evaluation of the functioning of system-product development programs of milk production by domestic dairy farms is the basis for the determination of rational (optimal) programs configuration so that the maximal system value of functioning of the marked system is obtained.

Key words: identification, configuration, system-product, program, development, production of milk, domestic dairy farm.

INTRODUCTION

The production of dairies in Ukraine degrades from year to year [1-3]. One of the reasons of such situation there is the imperfection of the existent technologically integrated systems of dairy production that requires realization of the appropriate programs of development of the dairy production systems [15-23]. Among these programs, the systems of milk production by domestic dairy farms is very important. To develop the marked systems one should ground the parameters (configuration) in the desirable standing that requires the development of the appropriate scientifically methodical regulations. The identification of configuration of system-products programs of development of milk production by domestic dairy farms (PDMPF) is the inherent constituent element of these scientifically-methodical regulations.

THE ANALYSIS OF RECENT RESEARCHES AND PUBLICATIONS

The questions of identification of projects and programs configuration of a development of different industries in the national economy were considered in the row of the advanced studies [4-10, 20-24]. Except that, there are international standards in the sphere of the management of projects and programs configuration [11-14]. The analysis of these works testifies that the present methods of identification of configuration of projects and programs are characterized by many shortcomings, in particular**,** they are not taking into account the features of changeable project environment of programs of development of milk production by domestic dairy farms. Except that, they do not foresee the identification of configuration of system-products programs based on imitation simulation that does impossible the receipt of maximal system value from such programs functioning for the interested persons. It does impossible to identify objectively the configuration of system-products of

PDMPF. Thus, for objective identification of configuration of PDMPF system-products, it needs to work out the scientifically-methodical principles that will take into account changeability of projects environment and feature of projects functioning.

OBJECTIVES

The objectives of the article are grounding the scientifically-methodical principles of identification of configuration of PDMPF system-products on the basis of imitation simulation of project objects functioning and also with taking into account the changeable descriptions of the project environment.

THE MAIN PESULTS OF RESEARCH

The configuration of PDMPF system-products, as marked already, is identified on the basis of imitation simulation of projects functioning and simulation of system-products functioning of the programs of providing of these farms with forage. In particular, in system-products of PDMPF the technological processes of milk production are simulated:

1) looking after (care of) cows,
2) preparations of feed,
3) feeding and watering,
4) milking,
5) primary processing of milk,
6) mucking out,
7) veterinary service and insemination of cows. In system-products of the programs of providing with forage of the domestic milk farms the next technological processes are simulated:
    1) productions of separate types of feed,
    2) forage of some types of feed,
    3) storages and delivery of separate types of forage.

Each of the mentioned above technological processes consists of separate works the amount of that depends on the chosen technologies and modes of production of milk, and the processes volume is predetermined to the populations of cows on a dairy farm. At the same time, the labour intensiveness of works implementation is predetermined by a presence and parameters of objects of configuration (technical equipment) for implementation of separate works.

Modeling of both processes of milk production and providing with forage of the dairy farms allows one to make a complete synthesis of all groups of programs factors of the products value. In particular, this simulation assumes implementation of the following stages:

1) define of the technology (T_u) of dairy herds keeping and population of cows (n_h),
2) ground the duration (t_i) of specific calendar periods of milk production and provide of the fodder,
3) determine the need for fodder (Q_k) and field areas (S_n) for fodder production, taking into account variables (t_u) of the keeping periods of cows,
4) give the list (according to the chosen technology) and determine the the amount (Θ_i) of work to be done to ensure both the milk and feed production,
5) determine the right amount of resources (n_{mi}) (technical, material and human) for each of processes under existing conditions of *r-th* models and types of the technical equipment,
6) define the functional indices of separate works for a given technical machinery and equipment (total length of using of the *r-th* technical means for implementation *i-th* work operation for each of the periods of milk production and forage providing, the total labour intensiveness of *i-th* works implementation by the *r-th* technical support for each of the periods milk production and fodder providing, the total demand for *a-th* kinds of supplies to perform *i-th* works by the *r-th* technical support) and cost (total cost of funds for the operation of a dairy farm (B_{vmt}) and its provision with feed (B_{kmt})),
7) change the models composition of technical means and repeat the procedure to determine the machinery needs for each of the periods, calculate the functional and cost parameters of the certain activities,
8) on the basis of comparison of the summary (ΣB) spendings for works on the milk production and feeds provide for the different options of technical support and (n_h) dairy herd the basic configuration of technical means fleet are defined according to conditions of the minimal cost of summary funds (ΣB) spendings; 9) purposefully change the technology (T_u) of the milk production and (n_h) livestock population of cows and determine the total unit cost of funds (ΣB) on milk production and feed provide of the dairy herd, which is a criterion for determining of the rational (optimal) configuration of PDMPF system-products.

Regarding the technology of milk production at farms, they are characterized by a system of cows keeping, way of cows keeping and the methods of keeping cows. For the climatic conditions of the western region of Ukraine the stall-pasture system of cows keeping are adopted [18]. There are three ways of cows keeping (bind/tie housing, loose housing and combined) and two methods of cows keeping (with litter and without litter). According to this, during the identification of rational (optimal) configuration of PDMPF system-products the three characteristic for climatic conditions in Western Ukraine

variants of milk production technologies should be considered:

1) the stall-pasture bound cows keeping using stall equipment,
2) stall-grazing loose cows keeping with rest in boxes,
3) stall-grazing loose cows keeping on deep straw litter [1].

Livestock dairy herd is characterized by its structure and productivity of dairy cows. The next condition is accepted that in the structure of dairy herds available: 50% - cows (including 5% - non lactation of cows, 5% - calving group, 15% - milking and insemination); 15% - heifers; 15% - heifers over 12 months; 20% - heifers under 12 months [2].

The duration of the (t_i) specific calendar periods of dairy herd milk production and providing cows with forage are separately grounded. In particular, processes oh the milk production is divided into four periods [5], which caused by the lactation cows (Fig. 1).

Duration of (t_i) separate periods of cows lactation and milk production volume increase (+ ΔQ) and decrease (- ΔQ) in those periods are determined by the substantive (breed, age and productivity of cows) and resource (type of feed and nutritional) factors of the value of PDMPF system-products.

The certain lactation periods of the cows and the effect of climate (length of light time of day) and natural (intensity of vegetation restore) factors of the value of mentioned system-products makes the need for regime change in works on the production of milk and according to use of available resources support (machinery, workers and needs of the supplies materials).

There are two modes of milk production (two and three fold milking of cows), characterized by the organizing factor of values – the multiplicity of cows milking.

Total duration of the characteristic periods of the cow lactation is equal to the duration of a separate calendar year. For the typical period the idealization is accepted that diet and need to feed for a separate day is constant and equal to the maximum value of daily milk production in that period. Total duration of periods that characterize profiles of milk is equal to the duration of cow lactation.

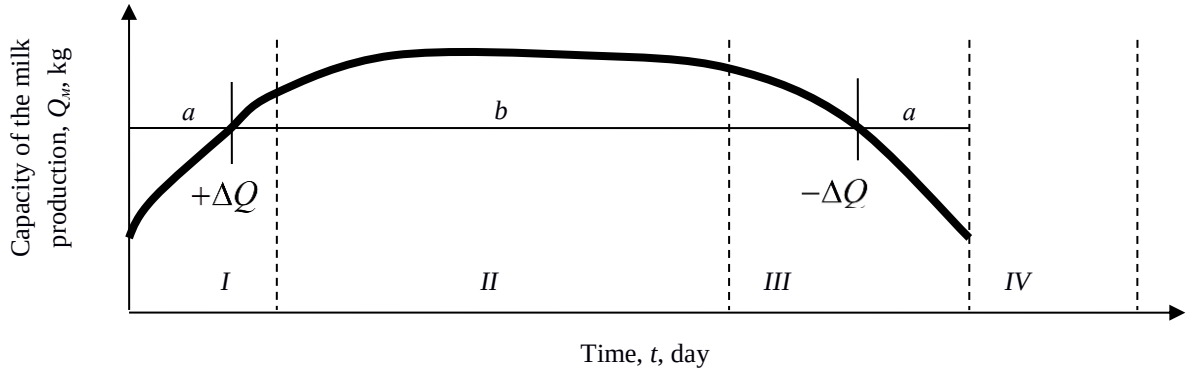

Fig. 1. Graphical interpretation of periods separation of milk production during cows lactation: *I* - the period of significant growth in the cows productivity; *II* - a period of intensive milk production; *III* - the period of reduced productivity of cows; *IV* - non lactation period; *a* – two fold milking of cows; *b* - three times cows milking

During the simulation the idealization is taken that lactation for all cows of the dairy herd is the same.

As to system-products of the development programs of dairy herd providing with forage there are four periods, which are determined by ways of cows keeping and which is the basis for determining of the need for feed (Fig. 2).

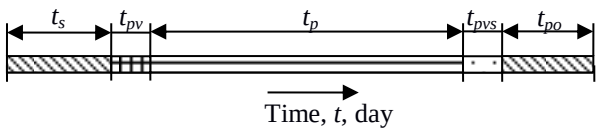

Fig. 2. Graphic interpretation of the system-products characteristic periods of development programs of the dairy herd providing with forage: t_s, t_{pv}, t_p, t_{pvs}, t_{po} - according the keeping cows duration of farmyard, grazing, transitional spring and transition autumn.

The length of cows housing in every year is the changeable according to the climate conditions of region. The length of these periods is determined on the basis of data of zoned agrometeorological stations. Total duration of the characteristic periods of the dairy herd providing with forage is equal to the length of the calendar year. At the simulation the condition is accepted that during a particular period of dairy herd providing with forage the way of cows housing is not changeable.

The feed requirement of the dairy herd livestock is forecasted on the next parameters population of dairy herd, its structure, cow productivity during lactation, duration of the characteristic periods of milk production and dairy herd providing with forage. To plan the feed requirement the dairy herd feed rations are set and on the base of simulation the of exchange energy needs for the each animal group the daily need for certain types of feed is determined. The total area that should be planned to the production of feed is defined on the base of the daily needs of feed for different age groups of the dairy herd and duration of specific periods of fodder providing the defined dairy herd.

The daily volume of the list of operations is determined on the base of setting of the livestock population of dairy herd and milk production technology by the expression:

$$\Theta_{ij} = g_{\partial j} \cdot m_j \cdot k_{ij}\,, \qquad (1)$$

where: Θ_{ij} – the daily volume of the *i*-th operation for *j*-th of age group of dairy herd, conventional unit; $g_{\partial j}$ – the specific volume of *i*-th operation, conventional unit per head; m_j – the population of *j*-th age group of dairy herd, head; k_{ij} – the response ratio of the *i*-th operation during day for *j*-th age group of dairy herd.

The total volume of daily $\left(\Theta_i\right)$ works is determined on the base of $\left(\Theta_{ij}\right)$ daily volume of *i*-th operations for *j*-th age group of dairy herd according to expression:

$$\Theta_i = \sum_{j=1}^{n} \Theta_{ij}\,, \qquad (2)$$

where: Θ_i – the total daily volume of *i*-th operation for dairy herd, conventional unit; n – the quantity of age group of dairy herd, units.

Quantity value of the total daily volume of *i*-th operation and given parameters of objects of the configuration (technical equipment) are the base for define of the resource requirement (technical, material, human).

Parameters of the objects configuration (type and model of technical equipment) are selected by several criteria. First, they must ensure operation fulfillment according the zootechnical requirements. Technical equipment must have sufficient capacity and possibility to use in the flow processing lines of technological processes of the milk production and providing with forage. In addition, the technical equipment should have low power consumption, high reliability and durability, simple design and good maintainability.

The dimension-type series of technical equipment are formed to perform of *i*-th operation according to defined criteria. For each of *i*-th operation the single technical equipment is chosen from the formed dimension-type series and machinery need is determined for separate days of characteristic period of milk production by the expression:

$$n_{mi}^{r} = \frac{\Theta_i}{q_r \cdot \left[t_i\right] \cdot k_i}\,, \qquad (3)$$

where: n_{mi}^{r} – the daily need of r-th single technical equipment in order to do the *i*-th operations, unit; Θ_i – the daily volume of *i*-th operations carry out, conventional unit; q_r – the hourly output of r-th single technical equipment, conventional unit per hour; $\left[t_i\right]$ – the technologically regulated duration of the *i*-th operation, hour; k_i – response ratio of the *i*-th operation during day.

The need for support staff is determined knowing the daily need of *r*-th single technical equipment in order to do the *i-th* operations and technologically regulated duration of operation according to expression:

$$n_{\text{ві}}^{\varphi} = \frac{\Theta_i}{q_k \cdot n_{mi}^{k} \cdot n_{\text{вr}}^{\varphi} \cdot k_i}\,, \qquad (4)$$

where: $n_{\text{ві}}^{\varphi}$ – the daily need of the φ-th professional skill of support staff for doing the *i*-th operations, persons; $n_{\text{вr}}^{\varphi}$ – the number of technologically requaired workers which operate simultaneously on the r-th single technical equipment, person.

Need for input goods for daily volume of *i*-th operations by the *r*-th technical equipment is determined according to expression:

$$n_{мі}^{\alpha} = g_{мі}^{\alpha} \cdot \Theta_i , \quad (5)$$

where: $n_{мі}^{\alpha}$ – the daily need in the α-th kinds of input goods for daily volume of *i*-th operations by the prescribed r-th technical equipment, unit; $g_{мі}^{\alpha}$ – the specific consumption of α-th kinds of input goods for doeing the *i*-th operations by the prescribed technical equipment, unit per conventional unit; Θ_i – daily volume of *i*-th operations, conventional unit.

The amount of resources for doing the *i*-th operations for each of separate days of the characteristic period of milk production and providing with forage is the base for calculation of following functional indices: 1) total duration of using the r-th technical equipment for doing the i-th operation on the each of periods of milk production and providing with forage; 2) totel labour-intensiveness of doing the *i*-th operations by the r-th technical equipment on the each of periods of milk production and providing with forage; 3) total need in α-th kinds of input goods for doing the *i*-th operations by the r-th technical equipment.

The total specific expenses of funds are determined on the base of functional indices for doing the *i*-th operations by the r-th technical equipment according to expression:

$$B_{cr} = \frac{B_{пг} + B_{кг}}{\Theta_r} , \quad (6)$$

where: B_{cr} – the total specific expenses of funds for doing the *i*-th operations by the r-th technical equipment, UAH per conventional unit; $B_{пг}, B_{кг}$ – the current expenses of funds and investment accordingly for doing the *i*-th operations by the r-th technical equipment, UAH; Θ_r – the volume of *i*-th carried out operations by the r-th technical equipment in the time of characteristic period of milk production and providing with forage, conventional unit.

Based on the comparison of the consolidated expenses of funds ($B_{пг}$ current expenditures and $B_{кг}$ capital investment) for doing the *i*-th operations of milk production and providing with forage for different variants of r-th technical equipment using the basic parameters of configuration objects of the appropriate system-products are defined in which the consolidated expenses of funds for its operation will be the minimal ($B_{cr} \to min$).

Having the basic parameters of objects of configuration of the appropriate system-products the consolidated specific expenses of funds per 1 ton of produced milk is defined according to expression:

$$B_{зт} = B_{вмт} + B_{кзт} , \quad (7)$$

where: $B_{зт}$ – the specific consolidated expenses of funds for dairy farm functioning with m-th population of dairy herd, UAH /t; $B_{вмт}, B_{кзт}$ – accordingly the annual specific expenses of funds for dairy farm functioning with m-th population of dairy herd and farm providing with forage, UAH /t.

Annual $(B_{вмт})$ expenses of funds for functioning of the PDMPF systems-product with the m-th population of dairy herd are determined according to expression:

$$B_{вмт} = B_{пт}^{вм} + B_{кт}^{вм} , \quad (8)$$

where: $B_{пт}^{вм}, B_{кт}^{вм}$ – the annual current expenses and capital investment accordingly for functioning of the PDMPF system-product with the m-th population of dairy herd, UAH.

Annual current expenses $(B_{пт}^{вм})$ of funds for functioning of PDMPF systems-product with the m-th population of dairy herd are determined according to expression:

$$B_{пт}^{вм} = B_{от}^{вм} + B_{кт}^{вм} + B_{ст}^{вм} + B_{от}^{вм} + B_{пт}^{вм} + B_{ст}^{вм} + B_{мт}^{вм} + B_{вт}^{вм} , \quad (9)$$

where: $B_{от}^{вм}$ – expenses for looking after the dairy herd with the m-th population, UAH; $B_{кт}^{вм}$ – expenses for preparations of feed for the dairy farm with the m-th cows population, UAH; $B_{гт}^{вм}$ – expenses for feeding and watering of the animals of the dairy farm with the m-th population of dairy herd, UAH; $B_{от}^{вм}$ – expenses for milking of cows at the dairy farm with the m-th population of dairy herd, UAH; $B_{пт}^{вм}$ – expenses for primary processing of milk at the dairy farm with the m-th population of dairy herd, UAH; $B_{гт}^{вм}$ – expenses for mucking out at the dairy farm with the m-th population of dairy herd, UAH; $B_{мт}^{вм}$ – expenses for means installation of microclimate at the dairy farm with the m-th population of dairy herd, UAH; $B_{вт}^{вм}$ – expenses for veterinary service and insemination of cows at the dairy farm with the m-th population of dairy herd, UAH.

The annual $\left(B_{кm}^{вм}\right)$ capital investment for functioning of the PDMPF systems-product with the m-th population of dairy herd are determined according to expression:

$$B_{кm}^{вм} = \sum_{r=1}^{n} \frac{B_{крm}^{вм}}{t_r} + \sum_{\upsilon=1}^{c} \frac{B_{кυm}^{вм}}{t_\upsilon}, \quad (10)$$

where: $B_{крm}^{вм}$ – the quantity of capital investment in the r-th technical equipment of the dairy farm with the m-th population of dairy herd, UAH; $B_{кυm}^{вм}$ – the volume of capital investment for construction (or reconstruction) of the production facilities of the dairy farm with the m-th population of dairy herd, UAH; t_r – the operating time of the r-th technical equipment, year; t_υ – the operating time of the ν-th production facility, year.

Annual expenses $\left(B_{кзm}\right)$ of funds for providing with forage of the dairy farm with the m-th population of dairy herd are determined according to expression:

$$B_{кзm} = B_{пm}^{кз} + B_{кm}^{кз}, \quad (11)$$

where: $B_{пm}^{кз}, B_{кm}^{кз}$ – the annual current expenses and capital investment accordingly for providing with forage of dairy farm with the m-th population of dairy herd, UAH.

Annual current expenses $\left(B_{пm}^{кз}\right)$ of funds for providing with forage of dairy farm with the m-th population of dairy herd are determined according to expression:

$$B_{пm}^{кз} = B_{вm}^{кз} + B_{зm}^{кз} + B_{дm}^{кз}, \quad (12)$$

where: $B_{вm}^{кз}$ – expenses to feed production for the dairy farm with the m-th population of dairy herd, UAH; $B_{зm}^{кз}$ – expenses to forage of some types of feed for the dairy farm with the m-th population of dairy herd, UAH; $B_{дm}^{кз}$ – expenses to storages and delivery of separate types of feed for the dairy farm with the m-th population of dairy herd, UAH.

The annual $\left(B_{кm}^{кз}\right)$ capital investment for providing with forage of the dairy farm with the m-th population of dairy herd are determined according to the expression:

$$B_{кm}^{кз} = \sum_{r=1}^{n} \frac{B_{крm}^{кз}}{t_r} + \sum_{\upsilon=1}^{c} \frac{B_{кυm}^{кз}}{t_\upsilon}, \quad (13)$$

where: $B_{крm}^{кз}$ – the quantity of capital investment in the r-th machinery and equipment for providing with forage of the dairy farm with the m-th population of dairy herd, UAH; $B_{кυm}^{кз}$ – the volume of capital investment for construction (or reconstruction) of the production facilities and buildings for storage the feed of the dairy farm with the m-th population of dairy herd, UAH; t_r – the operating time of the r-th technical equipment, year; t_υ – the operating time of the ν-th production facility and buildings for storage the feed, year.

By purposefully change the technology of the milk production and population of cows in livestock for each of the variants of configuration objects the $\left(B_{вмm}\right)$ annual specific expenses of funds are determined for function of the PDMPF system-products with the m-th population of dairy herd and providing farm with forage $\left(B_{кзm}\right)$. On the base of obtained data the $\left(B_{зm}\right)$ consolidated specific expenses of funds are determined for functioning of the PDMPF system-products which are a criterion for determining of the rational (optimal) configuration of the PDMPF system-products (fig. 3).

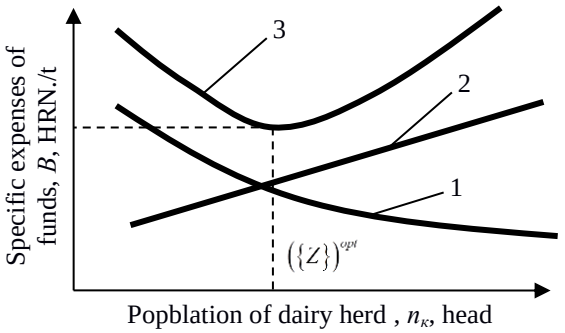

Fig. 3. Optimization of configuration of the PDMPF system-products: 1 – the annual specific expenses of funds for functioning of dairy farm with the m-th population of dairy herd; 2 – the annual specific expenses of funds for providing with forage of the dairy farm with the m-th population of dairy herd; 3 – consolidated specific expenses of funds for milk production and providing with forage of dairy farm with the m-th population of dairy herd

Configuration of the PDMPF system-products is rational (optimal), if $B_з$ goes to minimum value:

$$\Phi\left[\left(\{Z\}\right)^{opt}\right] = B_з \to min \quad . \qquad (14)$$

Thus, there are many of $\{Z\}$ variants of configuration objects (technical equipment), subject to optimize, so the challenge is finding among them the rational (optimal variant). The number of $\{Z\}$ possible variant is limited by the availability on the market of equipment, machinery and technical means of various capacities.

CONCLUSIONS

1. Nowadays the production of dairies in Ukraine degrades from year to year. One of the reasons of such situation is the imperfection of the existent technologically integrated systems of dairy production.
2. With the purpose of identification the configuration of system-products of development programs of milk production by the domestic dairy farms the scientifically-methodical principles are worked out. The principles are based on the imitation simulation of functioning of the objects of configuration and will consider the changes of the project environment.
3. The grounded cause-and-effect relations among the functional indexes of configuration objects of development programs of milk production by domestic dairy farms and changeable descriptions of the project environment are the basis of prognostication of resources requirement in separate calendar periods of the functioning of these systems.
4. The developed scientifically-methodical principles and method of identification the configuration of system-products of development programs of the milk production by domestic dairy farms are foreseen in the phased study by means of statistical imitation simulation of the influence of managed constituents on the functional indices of configuration objects.
5. The cost evaluation of the functioning of the system-products of development programs of milk production by domestic dairy farms is the basis of the determination of rational (optimal) programs configuration so that the maximal system value of functioning of the marked systems-foods are obtained.

REFERENCES

1. **Reznik E.I. 1992.** Organizaciia kormovoi bazy semeinoi molochnoi fermy. Kormoproizvodtvo. № 1, 13-18 (in Ukrainian).
2. **Smoliar V.I. 2013.** Obgruntuvannia tekhnolohichnykh parametriv molochnoi fermy rodynnoho typu. Visnyk Dnipropetrovskoho DAU, № 2 (32), 130-133 (in Ukrainian).
3. **Tryhuba A.M. 2014.** Scenario grounding of technologically integrated programm realization of dairy development. MOTROL Commission of motorization and energetics in agriculture. Lublin, Vol.16, No 4, 181-188.
4. **Zaver V.B. 2012.** Metod upravlinnia konfihuratsiieiu proektu udoskonalennia systemy protypozhezhnoho zakhystu hirskoho lisovoho raionu / V. B. Zaver // Vostochno – Evropeiskyi zhurnal peredovykh tekhnolohyi. – #1/11(55). – S. 16 – 20.
5. **Tryhuba A.M., Rudynets M.V. and Sydorchuk L.L. 2011.** Upravlinnia konfihuratsieiu ta robotamy v intehrovanykh proektakh molocharstva. Monohrafia. – Lutsk: LNTU, 230 (in Ukrainian).
6. **Tryhuba A.M., Myhalyuk M.A. and Rudynets M.V. 2011.** Kontrol confihuratsii intehrovanykh proektiv molocharstva. Naukovyi zhurnal LNTU : Compiuterno-intehrovani tekhnolohii: osvita, nauka, vyrobnutstvo, №7, 145-150 (in Ukrainian).
7. **Myhalyuk M.A. 2008.** Grounding of methods and models of the identification and control the projects configuration of the milk purveyance centralized systems. Extended abstract of candidate's thesis. Lviv, Ukraine, 20 (in Ukrainian).
8. **Tatomyr A.V. 2009.** Concordance of Projects Configurations of the Service and Served Systems (in relation to energy supply of agricultural enterprises on the basis of the wind energy using). Extended abstract of candidate's thesis. Lviv, Ukraine, 20 (in Ukrainian).
9. **Sydorchuk, L.L. 2008.** Identification of the combine fleet configuration in the projects of systems of the early corn centralized harvesting, assembling, collecting. Extended abstract of candidate's thesis. Lviv, Ukraine, 18 (in Ukrainian).
10. **Morozov, V.V. and Rudnitskiy S.I. 2013**. Conceptual model of the configuration management process in projects. Eastern-European Journal of Enterprise Technologies, 1/10(61), 3 part, Ukraine, 187–193 (in Russian).
11. ANSI/EIA-649, National Consensus Standard for Configuration Management.

12. Practice Standard for Project Configuration Management ©2007 Project Management Institute, Four Campus Boulevard, Newton Square, PA 19073-3299 USA, 53.
13. The Standard for Portfolio Management. – Project Management InstItute, 2006. – 65.
14. HOST P. ISO 10007:2003. Menedzhment organizatsii. Rukovodiashchie ukazaniia po upravleniu konfiguratsiei, M.: 2007 – 12 (in Russian).
15. **Tryhuba A. 2014.** Argumentation of the parameters of the system of purveyance of milk collected from the private farm-steads within a single administratinve district. ECONTECHMOD: An international quarterly journal on economics in technology, new technologies and modelling processes.– Lublin-Rzeszow, Vol. 3, No. 4. 23-27.
16. **Sydorchuk O.V., Tryhuba A.M. and Malanchuk A.V. 2013.** Value essesment of service programm of the agriculture // MOTROL. Commission of motori zation and enerqetics in aqriculture. – Lublin; Rzeszow, Vol.15 (4), 153-159.
17. **Tryhuba A.M. 2014.** Metod obhruntuvannia parametriv molochnykh ferm/Vcheni Lvivskoho NAU vyrobnytstvu : kataloh innovatsiinykh rozrobok. – Lviv : Lviv NAU, Vyp. 15, 50 (in Ukrainian).
18. **Tryhuba A.M., Sheleha O.V., Pukas V.L. and Myhalyuk V.M. 2015.** Uzhodzhennia konfihuratsii intehrovanykh proektiv ahrarnoho vyrobnytstva. Visnyk NTU «KhPI». Seria: Stratehichne upravlinnia, upravlinnia portfeliamy, prohramamy ta proektamy, №2 (1111), 135-140 (in Ukrainian).
19. **Sydorchuk O.V. and Tryhuba A.M. 2014.** Metod vyznachennia kontseptualnoho planu prohram rozvytku molocharstva. Upravlinnia rozvytkom skladnykh system : zb. nauk. prats KNUBA, Vyp. 17, 65-70 (in Ukrainian).
20. **Lykhochvor V.V., Horodetskyy I.M., Sydorchuk L.L. and Horodetska N.H. 2012.** Upravlinnia osvitnio-konsultatsinoiu dialnistiu v systemi ahrarnoho servisu // Visnyk Lvivskoho NAU : Ahroinzhenerni doslidzhennia. № 16, 21-25 (in Ukrainian).
21. **Sydorchuk O., Lub P. and Horodetskyy I. 2015.** Peculiarities of projects management by adaptive technological systems of tillage and sowing // MOTROL : Commission of motorization and energetics in agriculture. – Lublin : Vol.17. – № 4. – 2015. - P. 97-100.
22. **A. Sharybura, I. Horodetskyy and V. Hrabovets. 2011.** Enhance the effectiveness of management by energysaving projects of agricultural crops harvesting / Motrol - Motoryzacja i energetyka rolnictwa. Lublin. – 2011. – Tom 13 D. – C. 68-72.
23. **Tymochko V.O., Padiuka R.I. and Horodetskyy I.M. 2016.** Strukturna model informatsiinoi systemy pryiniattia rishen z upravlinnia resursamy u portfeli proektiv silskohospodarskoho pidpryiemstva/Visnyk NTU «KHPI» // Zbirnyk naukovykh prats. Seria: Stratehichne upravlinnia, upravlinnia portfeliamy, prohramamy ta proektamy. – №2 (1174). – C.49-54 (in Ukrainian).