FEATURES OF MANAGEMENT AND CLUSTERING OF BEEKEEPING FARMS

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Abstract. ***In a market economy, an important and fundamental aspect of the effective operation of any business entity is a skillful organization and an effective management system. This is especially important in the subjects of entrepreneurship in the agricultural sector. This article is the result of a dissertation research, which is devoted to the organization of an effective management system for business entities in the agricultural sector, in particular in beekeeping. The article carried out a calculation and substantiated the need to create cooperative ties in agricultural production, which will include beekeeping farms. The efficiency of model beekeeping farms is also calculated and their efficiency is substantiated.***

Key word. ***Model beekeeping farms, clustering of agricultural production, beekeeping products, cooperative relations, apiary, honey resources.***

Introduction. Special studies carried out around the world show that beekeeping plays an important role in various sectors of the economy. The importance of this industry is determined not only in the production of bee products that are necessary for mankind, but also as a means of pollinating crops. "Reports of extinction of bees from around the world show that beekeeping is endangered". Accordingly, in many countries of the world, special attention is paid to improving the organizational and economic mechanisms of beekeeping management as an important condition for ensuring the efficiency and sustainability of the industry.

At present, research is being carried out in various scientific centers and research institutions around the world in many areas of effective beekeeping management. In particular, the formation of a beekeeping management strategy, improving the basic approaches to organizational and economic management mechanisms, expanding cooperation between relatively small farms, strengthening the diversification of beekeeping products, and increasing the efficiency of managing innovative processes in these farms.

In Uzbekistan, the lack of scientific approaches to the organization of labor in the beekeeping industry and the full use of available opportunities in the management system has led to a reduction in the number of such farms. In accordance with the Decree of the President of the Republic of Uzbekistan dated October 16, 2017 № PP-3327 "On measures for the further development of beekeeping in the country", it is planned to increase the efficiency of beekeeping in the country, including the study of best practices, the active use of modern technologies in honey processing. To improve the efficiency of beekeeping management, "Fergana State University was instructed to train highly educated specialists in the field of beekeeping, establish cooperation with foreign countries, including the United States, and also create Uzbek-American joint ventures for regular exchange of experience." Improving the efficiency of management in beekeeping is of great importance for the sustainable development of the industry, creating a concentration of high-quality cheap and natural products on the domestic market, and providing the industry with the necessary raw materials. In this regard, the problems of the development of beekeeping and management efficiency in the industry, as well as the integration of the industry with other sectors of the economy, are an urgent task today,

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requiring the improvement of its methodological and theoretical base, the development of practical recommendations in accordance with modern market conditions.

Literature reweave. The problem of increasing the efficiency of beekeeping is the subject of scientific research by many foreign and domestic scientists. Its development in agriculture is associated with the works of foreign scientists such as G.A. Avetisyan,

A.G. Chepik, V.V. Zhilin, E.P. Kolosova, N.A. Belyaeva, N.I. Krivtsov, S.V. Malkin, E.O. Odinokova, A.N. Prokhorova, Z.A. Zalilova, A.G. Mannapova, M.Kh. Kholnazarov and domestic, such as: S.N. Kabyldzhanova, R.M. Mukhamatzanova, G.S. Yaroshevich.

The development of control systems in various industries, including agriculture, was considered in the works of the following authors: I.A. Aktashkina, V.M. Mishina, O.S. Vikhansky, A.I. Naumova and many others.

The importance of honey plants in the development of the beekeeping industry was considered in the works of the following scientists: A.N. Burgomistrov, A. Khalko, R. Frenkel, G.Kh. Khamidov, D.T. Shakirov.

Research methods. In the process of preparing the article, such methods as general scientific, formal-logical, specific methods for studying the situation, classification, generalization, horizontal and vertical comparison, econometric modeling, empirical research, factor analysis, forecasting were used.

Discussions. Based on the results of the analysis of the effectiveness of beekeeping in the Akhangaran and Brichmulla state forestry enterprises, the following factors were identified that reduce the efficiency of honey production: the high cost of honey production and the lack of marketing channels for the industry's products.

It is necessary to consider models of commercial bee apiary for two levels of management: micro-level and meso-level.

At the micro level, it is necessary to consider the model of the economy, the optimal size and structure of production, the calculated parameters of which will provide the owners with competitive development and stable profits in market conditions.

At the mesolevel, one should consider a model bee farm that involves the use of high-tech production. A feature of the organizational mechanism of this production type is the ability to combine honey production, primary processing of bee products and marketing activities in one farm. It is assumed that the beekeeping products of the model bee farm will be sold both independently in the local and regional markets, and as part of procurement and trade organizations.

Organizationally, the first type is a bee apiary with a size of 130-150 bee colonies, with traditional technologies for obtaining industry products and the integrated use of bee colonies during the beekeeping season. This production type is most often found in modern beekeeping, the main purpose of which is the primary accumulation of capital. Such an organizational form is the basis of cooperation and the formation of a relatively large-scale commodity production. In regions with an increased concentration of bee colonies per 1 ha of melliferous vegetation, this production type of farming can be the initial one and transform into higher and lower groups of farms in terms of size and level of marketability of products.

The second type is a bee farm for 300-400 bee families using advanced mechanization, innovative methods and techniques of beekeeping when using at least 1-2 migrations during the beekeeping season. The very name of this production type suggests a more cyclical system of production, processing and sale of finished products.

The third type is a cooperative system formed on cooperative intersectoral principles, which includes bee apiaries of various sizes with a total number of 2,400 bee families, as well as enterprises

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of the agro-industrial complex and other industries that have their own interests in the development of beekeeping. The main goal of this system is not only the production, processing and sale of the end product of beekeeping, but also the development of its new samples.

On a bee farm of the third type, in the future, a significant increase in the final results of management is possible due to better organization of production and higher labor productivity, compliance with technological production modes, and organization of sales of products in a modified form through company trade and producers.

Analysis and Results. It is necessary to consider a model of a bee apiary with a size of 130-150 bee families, with traditional technologies for obtaining honey and other beekeeping products (wax, perga, royal jelly, bee venom). When building a model, it will be focused on obtaining the maximum profit from the sale of all types of apiary products. Full employment of apiary workers is expected.

Table 1

Standards for the production of bee products per 1 bee colony [1]

№	Product type	Apiary specialization	Unit of measurement	Product output from one family
1	Honey	Honey commodity	Kg	20
		bee breeding	Kg	18
2	bee packages	Honey commodity	total	1,5
3	Wax	bee breeding	Kg	0,5
		Honey commodity	Kg	0,2
4	Fetal uterus	bee breeding	total	15
		Honey commodity	total	-
5	royal jelly	bee breeding	Kg	0,08
6	Propolis	Honey commodity	Kg	0,01
		bee breeding	Kg	0,01
7	pollen	Honey commodity		0,3
		bee breeding		0,1

It is necessary to calculate the optimization of the production structure of a bee farm with a size of 130-150 bee colonies by solving a direct linear programming problem using the simplex method. As a model, we consider a honey bee apiary, using the norms for the production of beekeeping products from table 1

X1 – number of bee colonies, $130 \leq X1 \leq 150$

X2 - the volume of honey received. Based on 1 bee family, it is predicted to receive 20 kg of honey.

Since the number of bee colonies does not exceed 150, the maximum amount of honey obtained will be:

$X2 \leq 20*X1$ or $X2-20*X1 \leq 0$

X3 is the volume of beeswax produced by the apiary, i.e.:

$X3 \leq 0.5* X1$, or $X3 -0.5*X1 \leq 0$

X4 - the amount of propolis received by the apiary.

[1]Chepik A.G. Economics and organization of innovative processes in beekeeping and development of the industry's products market monograph / A.G. Chepik, V.F. Nekrashevich, T.V. Torzhenova; Ryaz. state un-t im. S.A. Yesenin. - Ryazan, 2010, p.59

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X4 ≤ 0.01*X1; or X4-0.01*X1≤ 0

X5 is the volume of royal jelly produced, kg. Based on 1 bee family, you can get no more than 0.01 kg of royal jelly:

X5 ≤ 0.01*X1 or X5-0.01*X1≤ 0

X6 - the amount of pollen received, which is predicted to be no more than 0.3 kg per 1 bee colony.

X6≤0.3*X1 or X6-0.3*X1≤0

X7 - bee packages, pcs. X7≤0.5*X1; X7-0.5*X1≤0

Target function:

F(X1,…X7)= -21.39*X1+X2+X3+X4+X5+X6+X7 max

Solving this problem of finding optimal solutions using the Stata 14 program (calculations are given in Appendix 4), the following result was obtained (table 2).

Table 2

Variant of the optimal solution for a farm with 130-150 hives

Parameters	X_1	X_2	X_3	X_4	X_5	X_6	X_7
150 bee colonies	150	3000	75	1,5	1,5	45	75
130 bee colonies	130	2600	65	1,3	1,3	39	65
Optimal solution	134	2680	67	1,34	1,34	40,2	67

Calculations show that the best option for creating a beekeeping farm at the micro level is the creation of an apiary for 134 bee colonies, which will be served by 2 beekeepers in the year-round employment mode. The production of honey and bee products in such a farm is carried out by traditional methods, most of the work is done manually. The activity of such an apiary is aimed at obtaining guaranteed volumes of products, carrying out bee pollination of agricultural crops, and saturating the local market with beekeeping products [7,9].

In contrast to the model apiary, many apiaries in Uzbekistan have not mastered the production of royal jelly and bee venom, the production of wax, propolis, bee bread remains low, while the production of additional products brings additional profit to the farm

Table 4

Calculations of the profitability of the apiary for 134 bee colonies

Indicators	Honey	Wax	Propolis	royal jelly	Pollen	bee packages
Profitability of the apiary for 134 bee colonies						
Manufactured products, kg.	2680	67	1,34	1,34	40,2	67
Selling price, thousand soums	40	50	50	900	180	220

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Proceeds from sales, thousand soums	107200	3350	67	1206	7236	14740
Costs per unit of production, thousand soums	20,6	17,5	19,0	432,1	94,0	70,4
Production costs, thousand soums	55208	1172,5	25,5	578,9	3763	4717
Net income, thousand soums	51992	2177,5	41,5	627,1	3473	10023
Profitability, %	49%	65%	62%	52%	48%	68%
Profitability of the apiary for 390 bee colonies						
Manufactured products, kg.	5800	195	3,9	3,9	117	195
Selling price, thousand soums	40	50	50	900	180	220
Proceeds from sales, thousand soums	232000	9750	195	3510	21060	42900
Unit costs products, thousand sums.	19,2	16,8	18,5	431,0	93,5	69,0
Production costs, thousand soums	111360	3276	72,2	1680,9	10939,5	13455
Net income, thousand soums	78880	6474	122,8	1829,1	10120,5	29445
Profitability, %	52%	66%	63%	52%	48%	69%

From the above calculations it can be seen that the production of all bee products is profitable. Slightly higher profitability for all types of products produced in an apiary for 390 bee colonies due to lower costs per unit of production.

Table 5

Calculation of the break-even point of a model farm for 134 hives

Sales volume, kg	Fixed costs, thousand soums	Variable costs, thousand soums	Revenue, thousand soums	All costs, thousand soums
x	FC	VC	SALES VALUE	COST
0	155 000	0	0	155 000
1	155 000	0,3	40	155 000
301	155 000	90,3	12040	155 090

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601	155 000	180,3	24040	155 180
901	155 000	270,3	36040	155 270
1201	155 000	360,3	48040	155 360
1501	155 000	450,3	60040	155 450
1801	155 000	540,3	72040	155 540
2101	155 000	630,3	84040	155 630
2401	155 000	720,3	96040	155 720
2701	155 000	810,3	108040	155 810
3001	155 000	900,3	120040	155 900
3301	155 000	990,3	132040	155 990
3601	155 000	1080,3	144040	156 080
3901	155 000	1170,3	156040	156 170
4201	155 000	1260,3	168040	156 260
4501	155 000	1350,3	180040	156 350
4801	155 000	1440,3	192040	156 440

It is necessary to calculate a model beekeeping farm for 300-400 bee colonies. Enterprises of this type can be created as a farm or as a subdivision of a large crop farm or forestry.

Similar to the calculation of a model apiary for 130-150 hives, in this model X1 is the number of bee colonies, X2 is the volume of marketable and fodder honey, X3 is the volume of wax produced, X4 is the amount of propolis obtained, X5 is the volume of royal jelly produced, X6 is the amount of flower pollen received , X7 - the number of bee packages.

Solving this problem with the help of calculations in the Stata 14 program, the solution of which is given in Appendix 5, the following result will be obtained (table 6).

This type of farm has a wider range of opportunities compared to the apiary for 130 hives, in the application of innovations in the field of beekeeping, various means of mechanization and organization of production. Conducting two or three migrations in such farms during the beekeeping season helps to increase the strength of the bee colony and significantly increase the amount of honey produced.

Table 6

Variant of farm optimality for 300-400 hives.

Parameters	X_1	X_2	X_3	X_4	X_5	X_6	X_7
400 bee colonies	400	8000	200	4	4	120	200
300 bee colonies	300	6000	150	3	3	90	150
Optimal solution	390	7800	195	4	4	117	195

The economy of scale contributes to the fact that the greatest economic efficiency is achieved in the production of bee products by large enterprises using all the possibilities of mechanizing the technological process.

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For the management of bee farms, the size of the bee farm is important. Thus, a large farm, due to the large scale of production, has the financial opportunity to purchase and introduce various mechanization means on the farm that facilitate the work of beekeepers, as well as to maintain zootechnical and veterinary services as part of the farm [2,4].

With the help of a process approach to management, it was possible to substantiate the feasibility of a production structure in which, depending on market conditions, one can flexibly change the amount of traditional beekeeping products received, as well as royal jelly and fetal queen bees. For example, in the early spring, fetal bee queens and bee packages are in high demand, the production of which is most effective before the main honey collection. In the late summer period, it is more profitable to produce pollen, bee packages and some other types of marketable products. These features of beekeeping are taken into account in the initial parameters of the economic and mathematical problem.

The scientific organization of labor is also a reserve for increasing the economic efficiency of beekeeping production. It is assumed that the link method will be used in servicing bee colonies, when one or two people and an assistant visit apiaries along a pre-planned route, where they carry out the necessary work at a predetermined time. To this end, the position of the operator of technological processes is introduced into the staff of the main workers, who, together with seasonal workers, prepares raw materials, refines and prepares beekeeping products for sale [3,5,6].

Model beekeeping farms with a high level of mechanization and organization of production can be created on the basis of the most highly efficient beekeeping farms as a larger independent production. As a unifying center of an integrated beekeeping system, one can consider a large enterprise for processing beekeeping products and raw materials, followed by bringing the finished product to the consumer, in which modernized inter-industry communications will be implemented [1,2].

An example of the implementation of intersectoral relations is the entry of beekeeping farms into the currently functioning agro-industrial clusters of Uzbekistan. The purpose of creating clusters is to create an industrial base, comprehensive use of the socio-economic potential of the territory, increase the competitiveness and productivity of the food sector in the region. All agricultural enterprises that are part of the cluster benefit from inter-farm cooperation with processing and trading enterprises that know the needs of buyers and have established relationships with them. The functioning of a beekeeping farm as part of a cluster is an example of vertical integration.

The functioning of agricultural clusters in the Republic of Uzbekistan is subject to the following conditions:

- the cluster necessarily includes farms and dekhkan farms as suppliers of agricultural raw materials to ensure the activities of leading companies;
- complex solutions are formed on the basis of science-based and technologically feasible recommendations;
- ensuring the activities of the agrocluster with innovations;
- creating a business climate includes a system of state regulation.

The creation of integrated systems in beekeeping is an objective necessity, since small, medium and large bee apiaries that specialize in the production of honey face increasing competition in terms of processing, selling finished products and purchasing high-performance equipment. In addition, the services of intermediary organizations, leasing and private entrepreneurs are expensive, which determines the need to strengthen vertical and horizontal cooperation.

In the course of the study, a model of an integrated beekeeping enterprise was developed.

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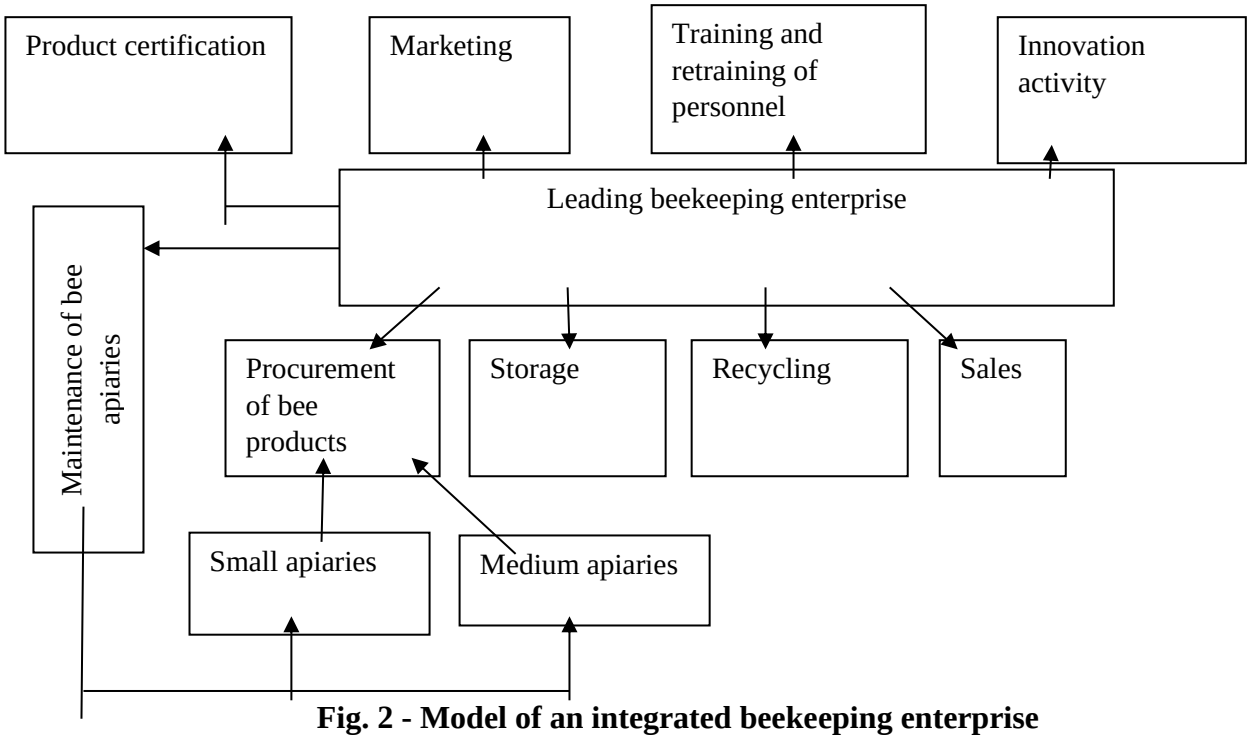

Fig. 2 - Model of an integrated beekeeping enterprise

The need to perform functions is determined by the timely achievement of strategic goals by the entire integrated system.

The main function of an integrated beekeeping enterprise is to provide each participant with a cost-effective activity that provides the opportunity to conduct expanded reproduction, reinvest part of the profits for technical re-equipment, and strengthen economic potential.

The participants of integrated systems in beekeeping can be bee apiaries of various forms of management. One of the most important features of the predicted education is that the members of the integrated system can be amateur bees and professionals, individual bee farms and bee complexes.

The strengthening of vertical integration is associated with the interaction of beekeeping enterprises with enterprises that process their products, as well as with enterprises that produce equipment and inventory for beekeeping. The economic activity of such integrated systems is characterized by high economic, social and environmental efficiency.

Beekeeping integration means the creation of large bee apiaries and bee farms with a high level of mechanization. At the same time, communication between apiaries is possible without intermediaries according to the scheme: apiary - product processing - sale on the market.

Highly mechanized large bee apiaries are characterized by the use of a complex of organizational and technical measures, namely:

- rejection of labor-intensive manual methods of caring for bee colonies in favor of organizing group care;
- the use of a link system for servicing bees;
- maximum mechanization of labor-intensive processes for selection, unpacking of honeycombs, extraction of honey and its packaging, mechanization of distribution of feed during feeding;
- effective use of honey collection from simultaneously flowering melliferous plants.

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Therefore, the management of the beekeeping industry should be considered as a set of economic, production and organizational relationships, quantitatively and qualitatively combined factors, economic relations aimed at ensuring a more complete use of the resource potential, expanded reproduction, the use of innovative management methods, vertical and horizontal integration, progressive means of production and scientific organization of labor, ensuring the competitiveness of beekeeping products.

Thanks to the implementation of the measures developed by the author in the Brichmulla State Forestry, with a slight increase in the number of bee colonies (only by 1%), honey production increased by 17%, the productivity of the bee colony by 16%. The cost of honey production in 2021 decreased by 17% compared to 2020, which ensured an increase in profit from the sale of honey by 17%, while net profit increased by 21% or 81.48 million sums.

Conclusion/Recommendations. In the process of considering the methodology for assessing the economic efficiency of beekeeping management, we proposed a number of measures to improve it, identified measures for the effective use of innovative technologies and the formation of a market for beekeeping products

In the course of the study, models of beekeeping farms of various sizes and organizations were developed that can effectively function in the market of the Republic of Uzbekistan.

1. An apiary with a size of 130-150 bee colonies, with traditional technologies for obtaining the products of the industry and the integrated use of bee colonies during the beekeeping season. This production type is most often found in modern beekeeping, the main purpose of which is the primary accumulation of capital.

2. A bee farm for 300-400 bee families using advanced mechanization, innovative methods and techniques of beekeeping when using at least 1-2 migrations during the beekeeping season. This production type involves a more cyclical system of production, processing and sale of finished products.

3. An integrated system formed on cooperative intersectoral principles, which includes apiaries of various sizes with a total number of 2400 bee families, as well as enterprises of the agro-industrial complex and other industries that have their own interests in the development of beekeeping. The main goal of this system is not only the production, processing and sale of the end product of beekeeping, but also the development of its new samples.

An example of the implementation of intersectoral relations is the entry of beekeeping farms into the currently functioning agro-industrial clusters of Uzbekistan.

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