IMPACT OF HERD SIZE ON THE PRODUCTIVE EFFICIENCY OF SHEEP BREEDING PROJECTS AT THE KOKJALI REGION IN NINEVEH GOVERNORATE FOR THE PRODUCTION SEASON 2018

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ABSTRACT
This research was aimed study of the impact of at checking the extent of impact of the herd size on the levels of economic efficiency and its components, to indicate the extent of which optimality is realized in the exploitation of sheep breeding fattening inputs and for a sample of 75 farms in the Kokjali region in Nineveh Governorate and for the productive season 2018, spring batch. To achieve the research goal, the sample was divided into three categories according to the numbers of animals in the farms. To measure the economic efficiency and optimality in using the inputs, the DEA data envelopment analysis and the statistical program DEAP were used, and it was found from the results of the analysis that the research sample projects achieved high levels of technical efficiency averaging 0.962, 0.981, and 0.99 for the three categories respectively as a result of breeders having experience and skill in managing the resources used in breeding, whereas the levels of allocative and economic efficiencies were variable in the three categories; the three large volumes achieved the highest levels and averaged 0.852 and 0.843 for the allocative and the economic efficiencies respectively. The results showed that there is an increase in the rates of inputs use of fodder, duration of fattening and labor in the research sample, and a decrease in the use of primary weight inputs and the veterinary services. The third category, which is the largest, achieved the lowest increase and decrease rates compared to other categories, Thus, we recommend the breeders in the research sample projects to take advantage of economies of scale and to exploit barns capacity in proportion to the numbers of animals, and the decision-makers not to follow the open market policy and to put restrictions on smuggling and entry of animals to the country, as well as the necessity of supporting the prices for veterinary services and feed.

أثر حجم القطيع في الكفاءة الإنتاجية لمشاريع تربية الخراف في منطقة كوكجلي بمحافظة نينوى للموسم الإنتاجي 2018

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المستخلص

يهدف البحث التحقق من مدى تأثير حجم القطيع على مستويات الكفاءة الاقتصادية ومكوناتها وبيان مدى تحقيق الامثلية في الاستغلال لمدخلات تربية وتسمين الخراف ولعينة بلغت 75 حقل في منطقة كوكجلي بمحافظة نينوى وللموسم الإنتاجي 2018 الوجبة الربيعية ولتحقيق هدف البحث قسمت العينة الى ثلاث فئات حسب اعداد الحيوانات في الحقول ، ولقياس الكفاء الاقتصادية والامثلية في استخدام المدخلات استخدم أسلوب تحليل مغلف البيانات DEA والبرنامج الاحصائي Deap ،وتبين من نتائج التحليل ان مشاريع عينة البحث حققت مستويات عالية في الكفاءة التقنية بلغت في المتوسط 0.962 ، 0.981 ، 0.99 للفئات الثلاثة على التوالي نتيجة امتلاك المربين خبرة ومهارة في إدارة الموارد المستخدمة في التربية بينما كانت مستويات الكفاءة التخصيصية والاقتصادية متباينة في الفئات الثلاثة وحققت الحجوم الكبيرة اعلى المستويات وبلغ في المتوسط 0.852 ، 0.843 للكفاءة التخصيصية والاقتصادية على التوالي ، وأوضحت النتائج ان هناك زيادة في نسب استخدام مدخلات العلف ومدة التسمين والعمالة في عينة البحث وانخفاض في استخدام مدخلات الوزن الابتدائي والخدمات البيطرية وحققت الفئة الثالثة الأكبر حجما اقل نسب الزيادة مقارنة بالفئات الأخرى ، لذا نوصى المربين في مشاريع عينة البحث بضرورة الاستفادة من اقتصاديات الحجم واستغلال سعة القاعات بما يتناسب مع اعداد الحيوانات وعلى اصحاب القرار عدم اتباع سياسة السوق المفتوح ووضع قيود على عمليات تهريب ودخول الحيوانات للبلد وكذلك ضرورة دعم أسعار الخدمات البيطرية والاعلاف .

INTRODUCTION

Agricultural activity has its economic importance in the economic structure of many countries, and animal production is an essential element of realizing self-sufficiency through fulfilling the people's needs of animal protein represented by red meat, hence, livestock should play an important role in economic development, side by side with planets production since food supply of animal products and their associated products depends on this livestock. Livestock products are among the products of elastiaty(7). Demand despite their high prices. Sheep breeding projects have an active contribution in meeting the demand for red meat products in addition to calves raising projects that attain a great interest from producers and consumers in the agricultural sector in Nineveh Governorate as well as many Iraqi provinces for their contribution to fulfilling local demand, on the one hand, and being a source of income for many rural families, on the other hand. The area of Kokjali (research sample), being one of the most important areas of Nineveh governorate, considering animals breeding especially calves and sheep breeding projects, as it contributes to supplying most governorates with a large percentage of their needs of beef and mutton. The most common type of sheep raised in Kokjali region is Awassi sheep, because they adapt to the conditions of the region and to their response to fattening during an appropriate period not exceeding four months. Sheep in the research sample are raised in barns dedicated for fattening, equipped with all requirements of fattening such as fodder stores, water sources in addition to breeders housing which mostly consist of the family of the main breeder), thus, most barns are close to the housing of the breede. The research problem is that products of sheep projects occupy a degree of importance in the list of local consumer demand, and that the process of breeding and fattening sheep in the research sample is not based on scientific standards and foundations as well as not organizing the number of sheep in these projects in proportion to the sizes and accommodation capacity of barns. Therefore, there is a deviation in the output of these projects from the optimal production that can be achieved as a result of regulating economic resources, breeding, care and feeding in a manner that ensures elevating the production efficiency in projects of sheep breeding and fattening in the research sample. The importance of the research comes from the importance and role of livestock products, including the products of sheep breeding and fattening projects i.e. red meat, which is one of the main food sources for the population, and is highly demanded due to the increase in population and the improvement of their standard of living. The importance of research is also evident in how to achieve and raise the productive efficiency of sheep breeding projects and how to make optimal use of economic resources, and thus, the possibility of expanding these projects and achieving a response to the demand for these products through the optimal utilization of the sizes and capacities of barns in these projects. The research hypothesies that there is a confirmed relationship between the size of the herd and the level of achievement of productive efficiency that may be directly proportional to the size of the herd in sheep breeding projects in the area of the research sample. The research aimed at defining the extent of the herd size impact on the level of productive efficiency and the efficiency of the optimal use of economic resources used in sheep breeding and fattening in the project of the research sample.

MATERIALS AND METHODS

In order to achieve the goal of the research, a random sample of sheep breeders was chosen from the Kokjali region in Nineveh Governorate and their number were 75, all of which are breeding and fattening sheep for the agricultural season 2018, the spring batch. Kokjali is one of the largest districts which deal with livestock and particularly sheep and cows. Data were collected in the questionnaire and personal interviews with the breeders during the breeding and fattening period which means increasing the weight of the animal during a period of time, usually ranging between 60-150 days. The increase in weight depends on the weight of the animal at purchase as well as age, gender, health and nutrition and the end of the production season, data collection, unloading and tabulation to

achieve the goals of the research and according to the requirements of the statistical analysis method. The number of animals in the fields under study ranged between100- 450 sheep, hence, the research sample was divided into three categories to show the extent of correlation and the effect of herd size on the level of economic efficiency and its components. The first category included (41) farms in which the sheep number ranged between (100 - less than 200) sheep and included (5495) sheep in total with an average capacity of (143) sheep /farm. This category accounted for (54.66%) of the total number of farms in the research sample. In the second category the numbers ranged between (200 - less than 300) sheep and the total number of animals reached (5325) sheep with an average of (222) sheep/ farm. The number of studied farms in this category was (24) farm and constituted (32%) of the total number of farms in the sample. The third category included 10 fields and constituted (13.3%) of the total number of fields in the research sample. The total number of animals in this category reached (3250) sheep with an average of 325 sheep and included the fields in which more than 300 sheep are kept. Sheep are bred in all the governorates of Iraq, and the governorates of Nineveh, Sulaymaniya, and Anbar come at the forefront of the provinces in terms of sheep numbers. Nineveh occupies the first place in this regard, and number of sheep in it reaches 1247225 heads (4). This research is considered a link to previous researches, and studies as knowledge assets that contributed to defining methodologies, research methods and analytical tools as well as identifying approved explanatory variables, especially those related to livestock economics, one of which was studying systems and economics of Awassi sheep production to assess the productive performance and economic return of sheep breeding in Syria for the season 1999/2000. The sample was divided into three categories according to the production systems ,stable, semi-stable, and nomadic, the average size of sheep possession was 222, 440, and 844 sheep for the production systems, respectively. This study included economic variables affecting milk production, especially the fodder value, possession size, lambs weight, sheep prices,

births, labor, and veterinary services, and the study found that the return net amounted to 1901, 2309, 2279 SL for the production systems, respectively. Whereas, the ratio of return on capital reached 21.1%, 21.6%, and 28.6% for the production systems respectively, thus, the semi-stable system achieved the highest net return (19). Another study was of sheep breeding economics with the aim of analyzing costs and revenues and estimating the profit achieved during the production season 2006 and for a sample of 120 sheep breeders in Babel Governorate/Iraq. The sample was divided into four categories to analyze production costs represented by the costs of dry and green fodder, administrative costs, vaccines and veterinary supervision. Using the method of returns and costs, the results of the study showed that the economic returns of all groups in the research sample were economically acceptable. The third category, which included 32 sheep, realized the higher revenues from the sale of sheep and accounted for 40% of total revenues,. The study concluded the need to spread veterinary and economic awareness among breeders (7). Also there is the study of investment in cattle fattening projects that targeted the possibility of expanding in red meat production and for a sample of 30 farms to produce cattle meat in Egypt by using the cost analysis methodology and the feasibility of investment. The sample was divided into two categories; one-circle/year fattening farms and two- circle/year farms. The results of analysis showed that the costs of producing one ton of meat are 20,433 EGP, and the variable costs represent 91% of the total costs, the most important of which is the value of buying calves, followed by fodder, and the total revenues were estimated of about 475.6 and 218.7 thousand Egyptian pounds for the breeding system for the two and one circles respectively. the study recommended providing credit facilities and technical support to find an efficient marketing system that contributes to the expansion of those projects (6). on other study was performed on the determinants of profit efficiency for cows breeders, to verify profit efficiency and determine the factors affecting the competitiveness of cows keepers in Botswana and for a sample that included 556

farms which were randomly selected and the sample was divided into three categories, the first category included farms that have less than 10 cows, the second category included farms that have between 10-20 cows, as for the third category, it included farms with more than 20 cows raised. The data were collected of the revenues, production costs and of the technical, financial and demographic variables for the farms by using the random profit function and the stochastic analysis (SFA), dual method. The results of the analysis showed that the average efficiency of profit was 58% for the entire sample and 56%, 62% and 68% for the first, second and third sizes of the sample, respectively, indicating the existence of a large room for improvement of farm profitability in light of inputs and the mainstream technology (17). Finally, there is a study of the profitability of the farm according to the size of the herd, to show the effect of the herd size on the productivity of cows and determining the profitability of the farm. The study included 60 farms with 34633 cows and the sample was divided into three sizes according to the numbers of animals. The first category included less than 399 cows in 15 farms and the second category included between 400-749 cows in 31 farms. As for the third category, there were 14 farms and the number of cows in there was more than 750 cows. Data were collected on milk production, the costs of concentrated and coarse fodder, manpower, breeding and veterinary services, using a questionnaire, and for the agricultural season 2012. The data were analyzed using the Proc Mixed model on the basis of herd size, the results of the analysis showed that the total costs in the three categories amounted to an average of 9.53, 8.68, and 8.32 CZK / L, respectively. The lowest net profit was 1.81 CZK/ liter and the highest profit was in the third category and amounted to 73.77 CZK / liter. The results of the study indicated that the highest cost of fodder was in the third category, amounting to 2.39 CZK/ liter, and the chance to improve production efficiency can be achieved by focusing on nutrition and benefitting from economies of scale in general and apply the specialization within the farm (13).

Economic efficiency and methods of estimating it: Measuring economic efficiency is the most important indicator for measuring the success of production units. Studies related to measuring efficiency and its components indicate that there are many methods of measurement of which the most used are two methods: the non-frontier method DEA (Data Envelopment Analysis) and the frontier method SFA (Stochastic Frontier Analysis) (14). Economic efficiency indicators are measured by the input side and the indicators are called input-orientated measures, and by the output side and the indicators are called output-orientated measures, and in the cases of stability and variation of size returns (8). The research adopted the Data Envelopment Analysis method because of its ability to deal with random errors that govern the agricultural sector (11) and its comprehension of traditional testing hypotheses; it is a non-frontier approach that uses mathematical programming techniques (12).

Data envelopment (DEA) method: A methodology that adopts linear programming to generate an envelope or a field that envelops data in a way that efficiency can be estimated for various farms according to the combination of resources used in this field (4). And enables the producer distinguish farms with efficient productivity from the inefficient ones, thus, gives indications to producers about the percentages exploited of the used resources in the production process.

Economic efficiency and its components: Efficiency is a relative concept that means using the available economic resources to obtain the highest production or obtaining a specific production with fewer quantities of inputs (7). The extent of exploitation of economic resources reflects productivity and is a measure of the degree of productive efficiency (6); it means the efficient employment of production elements from the technical point of view and achieving the optimal specialization and scientifically efficient use. Efficiency is measured by the ratio of total achieved production to the actually used elements of production, and the degree of efficiency increases and decreases with the increase and decrease of this ratio (13). Technical efficiency TE is related to the

physical quantities of all production factors used and the range of value of efficiency is between zero and one, and is inversely related to the level of inefficiency and it represents the operational condition of the production unit compared to the highest levels of production achieved from certain quantities of production that represent the maximum levels of production (5). Allocative efficiency AE represents the farm's ability to optimize the allocation of inputs used in the production process taking into account the prices of inputs and the available technology (18). And if the input allocation was close to the optimal use of the inputs then achieving the goal of maximizing profits would be guaranteed (16). While, economic efficiency EE depends on both technical and allocative efficiencies (EE = TE * AE) and it reflects the farm's ability to increase production quantities by using a certain level of input and technology from the outputs side. From the inputs side, it represents the ability of agriculture to reduce inputs while achieving the specified production target (20). Economic efficiency is achieved by fully employing productive resources in a manner that ensures efficient allocation of resources

Description of the model used to estimate economic efficiency:To achieve the goal of the research, data were analyzed using the data envelopment method (DEA) and using the DEAP statistical program to obtain the economic efficiency from the input side due to the producer's control over the inputs more than the outputs with the presence of K of economic variables obtained from unloading the questionnaire form, and the variables included each of (primary sheep weight at purchasing in kg (X_1), fodder amount (X_2), fattening period (X_3), number of workers (X_4), veterinary services (X_5) and other costs including interest on fixed capital, depreciations and other direct expenses affecting the dependent variable M represented by final animal weight or marketing weight for a sample N of farmers using the theory of dual linear programming and the quantities and prices of economic variables, allocative efficiency and economic efficiency were obtained under circumstances of variable returns to scale (VRS). Hence, the mathematic model will be:

Min (x_{i2}) $W_{i1}X_1$
Subject to:
$-y_i + Y\lambda \geq 0$
$\Theta x_i * - x\lambda = 1$
Where:
X_i= Vector of quantities of inputs used in the farm
W_i = Prices of used inputs
Economic efficiency (EE) or what is called costs efficiency (CE) for the farm is calculated by the following equation:
$EE_i = W_{i1} \ X_i */ \ W_i \ x \ I$
Whereas allocative efficiency (AE) can be obtained through the following equation:
$AE_i = EE_i / TE_i$
Knowing the components of economic efficiency; technical and allocative efficiencies, we can obtain the economic efficiency as follows:
$EE_i = TE_i \ * \ AE_i$
And to determine efficiency and optimality in using economic variables, the results of the statistic program was relied on in analyzing the efficiency and the amounts at the lowest average cost realizing complete economic efficiency through which amounts of deficit or surplus were calculated, as well as the percentage of waste for each farm by comparing to amounts that realize efficiency with the actually used amounts, and as follows(8):
Deficit or surplus= resource amount at the lowest average cost- the actually used amounts.

RESULTS AND DISCUSSION
First: Results of analysis of the economic efficiency and its components: To show the impact of the herd size on the level of economic efficiency and its components for sheep breeding projects in the farms of the research sample, the sample was divided into three sizes and it was found from the results of the analysis shown in table 1 that the average technical efficiency in the farms of the first category amounted to 0.962, indicating a deviation of the actual production from the production realizing the complete technical efficiency which can be achieved by making optimal use of inputs, and therefore farms' owners can increase the final weight of the herd size or reduce the amount of inputs and obtain the same marketing weight of the herd.

20 farms achieved full technical efficiency and accounted for 48.7% of the total number of farms of the first category which was 41, and the lowest average technical efficiency within the farms of this category was 0.898, and the level of technical efficiency of the rest of the farms ranged between the minimum and full efficiency and they formed the largest percentage. The number of farms that achieved technical efficiency below average is 9 farms. Whereas, the level of technical efficiency in the second category farms reached 0.981, and 17 farms achieved complete efficiency and accounted for 70.8% of the total number of the second category which was 24 farms. The level of technical efficiency of this category ranged between the full level of efficiency and a minimum of 0.929, and 5 farms achieved technical efficiency below average within the second category. While the average technical efficiency of the third category reached 0.99, and 8 of the farms achieved complete efficiency and accounted for 80% of the total number of the third category farms which was 10 fields, and by observing the results of the level of technical efficiency of the three categories they seem to be close to each other and close to full efficiency, and this means that the level of technical efficiency depends on the efficiency of the breeder and his accumulative experience and clear knowledge of the herd needs to standard quantities of resources, and hence , breeders in the research sample were able to use the resources optimally. As for the results of the level of allocative efficiency for the farms of the research sample and as shown in table 1, the average of this efficiency for the first category reached 0.804 and this indicates that there is waste in the marketing weight of the herd by a percentage of about 20%, and breeders in this category can reduce the level of production costs by about 20% while maintaining the same final weight. Four farms achieved the full level of efficiency and they constituted 9.7% of the total farms of the first category. The minimum allocative efficiency in this category reached 0.443, and 24 farms achieved a level of allocative efficiency below the average. The average level of allocative efficiency for the second category was 0.846 and this means that the breeders can achieve a higher level in the final weight using the used costs, or reach the level of actual final weight while reducing the level of costs by approximately 13.4%. Four of the farms achieved complete allocative efficiency within the second category, and they accounted for 9.7% of the total number of the second category farms. The minimum allocative efficiency for this category was 0.643, and 12 farms achieved an allocative level below average. The average level of allocative efficiency for the third category reached 0.852, and 3 farms achieved full allocative efficiency and constituted 30% of the total of the third category fields, and the minimum allocative efficiency for this category reached 0.626, and 4 farms achieved an efficiency level below the average. Noting the level of allocative efficiency for the three categories of the research sample, it turned out that they are close, but their level increases with the increase in the size of the herd. The third category farms achieved the highest level of allocative efficiency, which is much less than the level of technical efficiency, and this indicates that the level of this efficiency depends on external variables such as prices of production elements, the final product, government restrictions, and the open market, which are variables that cannot be controlled by the breeder, and consequently have affected the level of the allocative efficiency. The results of technical and allocative efficiencies entailed a level of economic efficiency that averaged 0.773, 0.829, and 0.843 for the three categories respectively, which means that breeders can achieve the actual weight of the herd using less quantities and costs, with percentages of 22.7%, 17.1% and 15.7% for the three groups, respectively, and the minimum economic efficiency reached was 0.443, 0.643, and 0.626 for the three categories respectively. The results of economic efficiency in table 1 show that there is little variation in the level of this efficiency between the three groups and the category with the largest herd size achieved the highest level of economic efficiency, and this proves the research hypothesis that there is a direct relationship between the size of the herd and the level of economic efficiency.

Table 1. technical, allocative and economic efficiencies for the projects of sheep breeding in the research sample

Category	First			Second			Third		
Number of farms	41			24			10		
	TE	AE	EE	TE	AE	EE	TE	AE	EE
Average efficiency	96.2	80.4	77.3	98.1	84.6	82.9	99	85.2	84.3
Minimum efficiency	89.8	44.3	44.3	92.9	64.3	64.3	89.7	62.56	62.6
Number of farms achieved full efficiency	20	4	4	17	4	4	8	3	3
% Farms achieved full efficiency in the sample	48.7	9.7	9.7	70.8	9.6	9.6	80	30	30
Number of farms with efficiency less than average	9	24	20	5	12	14	1	4	4

Source: Prepared by the researchers based on the results of the analysis program

Second: Results of analysis of the size of inputs realizing economic efficiency

By using the data envelopment analysis method (DEA) and by relying on the quantities and prices of sheep breeding projects inputs in the research sample, and using the statistical program (DEAP), the size of inputs achieving complete economic efficiency for the projects was determined at the lowest average cost, and from that the surplus or deficit in the size of the inputs was calculated compared to the size of the inputs actually used, as well as calculating the ratio of the surplus or deficit in the size of inputs, as follows: the ratio of the surplus or deficit = the surplus or deficit in the input / the actual amount used * 100. Taking into consideration the large sample size, the researchers were satisfied with presenting the results of the actual inputs and those achieving efficiency at the lowest average cost, amount, and percentage of increase and decrease in the size of these inputs for the three categories. The results of the analysis in table 2 show that there is a surplus in varying proportions in the size and quantity of the inputs used in the sheep fattening process in the research area compared to the size of the inputs achieving economic efficiency.

1- Size of weight input at purchasing in kg / herd (primary weight x1 achieving economic efficiency): Table 2 shows that the average weights of herds when purchasing were 2883, 3883 and 6210 kg for the herd in each category and for the three categories,

respectively, whereas, the average sizes of this input achieving economic efficiency at the lowest average cost were 3131, 4674.6, and 6245.8 for the three categories respectively. By comparing the two sizes it was found that there was a decrease in the average size of the primary weight input amounted to 648, 791.3 and 35.8 for the three groups respectively, and the percentages of deficiency reached 26%, 20.3% and 0.57% for the three categories, respectively.

2- The fodder size input X2 achieving economic efficiency: The results of table 2 show that the average sizes of the fodder size input actually used in the farms of the research sample were 19480, 48685 and 55042 kg / per herd in the three categories respectively, while the averages of this resource achieving economic efficiency reached 14784, 29944.9 and 42854 kg / herd and for the three categories respectively, and by comparing the size used with the size achieving economic efficiency, the result was a surplus in the used input size averaged 4696, 18740 and 12187 kg / per herd in each category, respectively, and accordingly the percentages of surplus in the average sizes of the fodder input were 24%. 38.5% and 22.1% for the three categories, respectively.

3- Fattening period X3 achieving economic efficiency: The average fattening periods adopted by breeders were 102.5, 108.9, and 125.5 days during the production season and for the three categories respectively, and the

average periods achieving economic efficiency were 65, 96.6 and 93 days and for the three categories respectively, and as a result of exceeding the period of actual fattening duration to that achieving efficiency, the average surplus in the fattening periods were 37, 12.3, and 32.5 days for the three groups respectively, thus, the percentages of the surplus in the three categories were 36.1%, 11.2% and 25.8% respectively, as shown in table 2.

4- Size of the labor input X4 achieving economic efficiency: The results of unloading the questionnaire and the results of the economic efficiency analysis showed that the average numbers of workers achieving economic efficiency were 184, 454 and 336 workers for the production season and for the three categories respectively, and the average numbers of those actually used were 252, 342.7 and 383 workers for the three categories respectively, thus, achieving a surplus in the average number of workers amounted to 68 and 47.1 which represent 26.9% and 12.2% for the first and third categories, and a deficit in the second category equals to 62.2 representing 15.3%, and these percentages were achieved due to the dependence of farms on family labour.

5- The size of the veterinary services input X5 achieving economic efficiency: The results of the economic efficiency analysis, stated in table 2, showed that there is a deficit in the average inputs of the veterinary services used equal to 44.6, 51.9 and 27.3 mm / herd during the production season, with percentages of 15%, 12.8% and 4.38%. The high rate of usage of treatments, vaccines and other veterinary services was due to breeders' reliance on their own experiences and failure to follow standard criteria, as well as the high prices of vaccines and medicines in the private sector, and thus the use of quantities less than those needed.

By comparing the average percentages of surplus and deficit shown in table 3. we note that the size of herd has an impact on the level of efficiency in general and on the allocative efficiency in particular. The third category achieved the least percentage of increase or otherwise decrease in the size of resources actually used compared to the size achieving efficiency where percentages of surplus or deficit in the categories X1, X2, X3, X4 and X5 were (-4.38%, 122%, 25.8%, 22.1% and -0.5%) respectively compared to percentages of surplus or deficit for the same inputs in the first and second categories shown in table 3. Thus, we note that the size of herd is one of the factors responsible for the efficiency of use of the available production elements; small sizes are usually accompanied by low production efficiency. In conclusion, from the research results it was evident that sheep breeding farms in the research sample achieved high technical efficiency which was close to each other in the three categories as a result of the competency and experience of breeders, whereas, the levels of allocative and economic efficiencies were variable and less than the technical efficiency in the three categories due to factors not subject to the control of breeders, especially, prices of inputs, governmental policies and the influence of open market. It was also clear that the larger size of herd achieved the higher levels of economic efficiency and its components, therefore, researchers recommend the necessity of having a price policy for the inputs of production projects, particularly fodders and veterinary services as well as subjecting livestock market to measures that put limits to open market policy. We also recommend breeders to benefit from economies of scale, and optimally using barns capacities in a way which suits the capacity of barn and number of animals.

Table 2. The size of actual inputs and those realizing economic efficiency of sheep breeding projects in the research sample

category	First				Second				Third			
Resource	Size of resource actually used	Size of resource realizing efficiency	Increase or decrease in the size of used resources	Percentages of increase or decrease%	Size of resource actually used	Size of resource realizing efficiency	Increase or decrease in the size of used resources	Percentages of increase or decrease %	Size of resource actually used	Size of resource realizing efficiency	Increase or decrease in the size of used resources	Percentages of increase or decrease%
X1	2883	3131	-648	-26	3883.3	4674.6	-791.3	-20.3	62100	6245.8	-35.8	-0.57
X2	19480	14784	4696	24	48685	29944.6	18740	38.5	55042	4285.4	12187	22.1
X3	102.5	65	37	36	1089	96.6	12.3	11.2	125.5	93	32.5	26
X4	252	184	68	26.9	342.7	404.9	62.2	15.3	383	335.9	47.1	12.2
X5	295.8	340.4	-44.6	15	405.2	457.1	-51.9	12.8	622.5	649.8	-27.3	4.38

Source: Prepared by the researchers based on the results of economic efficiency analysis

Table 3. Percentages of surplus or deficit for the inputs of sheep breeding projects in the research sample

Category	X1	X2	X3	X4	X5
First	-26%	24%	36.1%	26.9%	-15%
Second	+20.3%	38.5%	11.2%	-15.3%	-12.3%
Third	-0.5%	22.1%	25.8%	12.2%	-4.38%

Source: Prepared by the researchers based on the results of economic efficiency analysis

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