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The Role of Agricultural Cooperatives in Improving the Logistics Management Performance of Camel Milk Production

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Abstract: This research aimed to address the following problem:'' How do agricultural cooperatives contribute to improving the logistics management of camel milk production - taking raw milk as a model in the Sekaya Factory, Tindouf Province''. This was achieved by exploring the aspects of the relationship between the agricultural cooperative system and the logistics chain of camel milk production, along with its various processes, in order to enhance and sustain milk production in the Sekaya Factory. An applied study was conducted using a descriptive- analytical approach, which involved distributing questionnaires to the stakeholders responsible for collecting the raw milk. Among the study's findings, it was proven that the agricultural cooperative system and its material and moral significance have a significant impact on the logistics chain of production. The study confirmed the existence of both material and moral influences on the stakeholders, and consequently, on the factory, leading to the improvement of product performance and sustainability.

***Key-words**: Agricultural cooperatives, Logistics management, Camel milk, Raw material.*

Introduction

Algeria, in its pursuit of economic diversification amidst fluctuating oil revenues, has emphasized the development of specialized sectors to meet evolving national demands. Among these, the agri-food industry plays a critical role, with camel milk production emerging as a promising sector due to its nutritional value and increasing consumer demand for alternative dairy products [12].

In this context, agricultural cooperatives have gained attention for their potential to improve logistics management within the camel milk supply chain, particularly in the procurement of raw milk from farmers [1].

Prior research highlights the significant role of cooperatives in agricultural supply chains, notably in collective decision-making, resource pooling, and improving market access [2]. Further analyses have shown that cooperative models can reduce transaction costs, enhance negotiation power, and improve overall coordination across supply chain actors [3].

Recent findings emphasize the positive impact of cooperatives on dairy supply chains, including increased operational efficiency, fairer pricing mechanisms, and better market integration [4]. Additionally, cooperatives contribute to sustainability by promoting environmental stewardship, social equity, and economic resilience [5]. A relevant example is found in Kenya, where women lead the Anolei Women's Camel Milk Cooperative, one of the country's largest camel milk producers. The cooperative processes between 2,500 liters in the dry season and 4,200 liters in the wet season, delivering approximately 3,000 liters of

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camel milk daily to Nairobi via public transport, thereby demonstrating the effective role of cooperatives in facilitating logistics under challenging conditions [13].

In Algeria, agricultural cooperatives are legally recognized under Article 54 of the Agricultural Guidance Law (Official Gazette No. 46, August 10, 2008). Defined as civil entities operating on the principle of free association, these cooperatives aim to unify agricultural investors to achieve common objectives, such as improving production, reducing costs, and enhancing product quality.

The Sekaya Factory, a limited liability company operating under the National Investment Agency in Tindouf, specializes in camel milk and its derivatives. Located in Al-Nasr city, Tindouf Province, it covers an area of 450 m² and has a daily production capacity of 5,000 liters of camel milk, aligned with market demand dynamics [6].

The objective of this study is to examine the role of agricultural cooperatives in improving the logistics management of camel milk production, with a specific focus on procurement efficiency, farmer engagement, and supply chain performance in the case of the Sekaya Factory in Tindouf.

Problem Statement:

Based on the aforementioned discussion, the problem statement of the study can be identified as follows:

How does agricultural cooperation contribute to improving the logistics management of camel milk production? focusing on the raw material supply chain, using Sekaya Factory in Tindouf as a case study.

Subsequently, the following sub-questions fall within the scope of this inquiry:

What are the theoretical concepts related to agricultural cooperation? raw material procurement, logistics management, and camel milk production.

How do the elements of agricultural cooperation impact the improvement of logistics management for camel milk production? specifically in the context of Sekaya Factory in Tindouf.

Research Hypotheses

- **Main Hypothesis:** There is no statistically significant impact of agricultural cooperation on improving the logistics management of camel milk production (as a raw material) in Sekaya Factory.
- **Sub-Hypothesis 1:** There is no statistically significant impact of collective efforts by farmers within the agricultural cooperative on improving the logistics management of camel milk production (as a raw material) in Sekaya Factory.
- **Sub-Hypothesis 2:** There is no statistically significant impact of profit realization for farmers within the agricultural cooperative on improving the logistics management of camel milk production (as a raw material) in Sekaya Factory.
- **Second Main Hypothesis**: There are no statistically significant differences in the elements of agricultural cooperation within Sekaya Factory for camel milk production based on the demographic characteristics of the sample.

To address the identified problem, agricultural cooperation has contributed to improving the logistics management of camel milk production in Sekaya Factory, by encouraging farmers to procure and provide the required raw material in terms of quantity and quality.

The Theoretical Aspect

Agricultural Cooperatives in Algeria

With the aim of developing agricultural activities, the Algerian authorities, represented by the Ministry of Agriculture, have been working on finding suitable formulas for organizing agricultural activities in Algeria. They also aim to provide a conducive environment and explore the intersections between activities that allow for the development of the profession and the prosperity of its members. Based on this basis, the Ministry of Agriculture proposed several organizational forms for agricultural activities in the Agricultural Guidance Law issued on August 10, 2008. These forms are believed to contribute to the development of the profession.

Professional associations for farmers can take the following forms:

- Agricultural cooperatives.
- Agricultural chambers.
- Joint interest associations.
- Agricultural mutual associations.

Supply Chain Management Evolution

The evolution of supply chain management has been associated with global changes in the business environment (production economy, distribution economy, market economy) and advancements in information technology. Based on this, the evolution of the supply chain can be divided into five stages as follows [7]:

- Decentralized Logistics (Unit Cost Management)
- Centralized Logistics (Quantitative Cost Management)
- Integrated Logistics Functions
- Integrated Functions of the Logistic Supply Chain

Supply Chain Management Definition:

Supply chain management is a loop that begins and ends with the customer. All materials, finished products, information, and transactions flow through this loop. Managing the supply chain can be a highly complex task due to the practical realities involved. On this basis, it can be defined as an interconnected set of tangible elements or entities (such as factories, production, processing centers, transportation units, warehouses) and intangible elements, including personnel, information, programs, and service records provided to customers, ensuring the flow of the required quantity of goods or services from the source to the beneficiary [7].

Supply chain comprises all stages that directly or indirectly contribute to fulfilling customer demand. It encompasses not only manufacturers and suppliers but also transportation [7], warehouses, retailers, and the customers themselves Furthermore, "the strategic coordination methodology of traditional business functions and tactics, work functions within a specific organization, and across all organizations in the supply chain, for the purpose of improving the performance of the organization and the overall performance of the supply chain in the long term." [7]

Supply chain management includes various planning, execution, and control processes for the movement of materials and finished goods along the path to end users. The interconnected activities of the supply chain start with customer demand and end when the product is in the customer's hands. Achieving this requires the contribution of all relevant parties within the supply chain, from raw material suppliers to manufacturers, distributors, wholesalers, and retailers [7].

The objective of supply chain management is to deliver the desired product or service to customers in a timely manner, while managing all supply chain activities and increasing the profitability of the organization. However, today, organizations cannot solely focus on profitability but must also consider social and environmental performance in addition to financial performance. This framework differs from the traditional concept that only includes financial aspects and encompasses economic, environmental, and social considerations in evaluating the organization and decision-making processes [11].

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The primary benefits of supply chain management are realized for both customers and suppliers. For customers, one of the key aspects of business is establishing and acquiring customers, and supply chain management aids the organization in achieving this. The supply chain simply starts and ends with the customer, understanding what they desire, when they desire it, and delivering products to them promptly.

Regarding costs, an efficient supply chain can reduce costs, increase market share and sales, and build strong relationships with customers, all of which lead to cost savings and increased cash flows for the organization. Supply chain management is a means to achieve operational excellence and increase the market value of the organization. Proper supply chain management also ensures that the right quantities are shipped to outlets at the lowest prices, thereby reducing distribution costs. Moreover, the selection of transportation and trucks is done to ensure timely delivery at minimal costs.

In terms of market value, an optimized supply chain can positively impact five elements that contribute to market value: sales growth, cost reduction, efficient utilization of fixed assets, excellent task accomplishment, and specific tax benefits [7].

Results and Discussion

In order to shed light on the cooperative system and its impact on the sustainability and improvement of the logistical chain performance for camel milk production at the Tindouf Dairy Factory, we conducted an applied study focusing on the loyalty of raw material suppliers to the factory. This study aimed to assess their commitment to and implementation of the cooperative system to provide high-quality milk. The study employed a descriptive- analytical methodology.

Study Population and Sample

The study population consisted of camel herders located in the surrounding pastures of Tindouf province. The sample size for this study was 80 herders, selected based on the variation in the number of camels owned by each herder, with a minimum requirement of 10 milking camels.

Research Tool

The study utilized a questionnaire as the primary data collection tool, along with information obtained through interviews with herders who met the cooperative membership criteria. We distributed 80 questionnaires and received 50 of them back, resulting in a response rate of 62.5%. The questionnaire was divided into the following sections:

- **First Area:** Agricultural Cooperative, comprising the following dimensions: Dimension 1: Cooperative work (3 statements)

Dimension 2: Profit realization (3 statements)

- **Second Area:** Performance of the Logistics Management for Camel Milk Production - Raw Material as a Model, which includes (6 statements).

Table 1 Show the scores on the five-point Likert scale

ANSWER	NON-AGREEMENT	I DON'T AGREE	NEUTRALAGREE		TOTALE AGREE
CLASS	1	2	3	4	5
AREA OF ENJOYMENT	1,79_1,00	2,59_1,80	3,39_2,60	4,19_3,40	5,00_4,20

Source: prepared by researchers based on the output of the SPSS system

To measure the reliability of the questionnaire: the stability coefficient alpha was used. Cronbach Alpha to measure the overall stability of the questionnaire and the internal consistency of its expressions.

Table 2 Show the results of Cronbach's alpha test to measure the reliability of the questionnaire

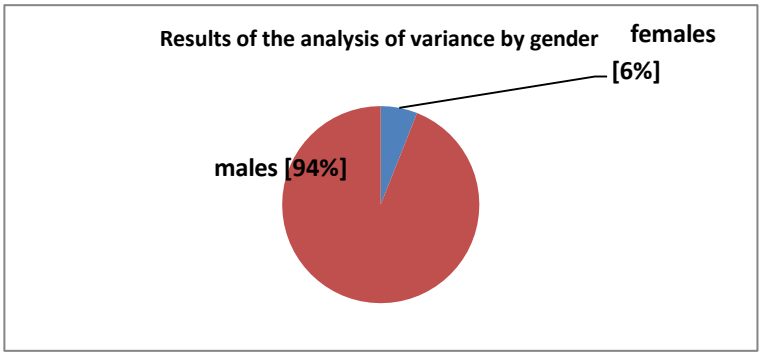
THE FIELD	CRONBACH'S ALPHA COEFFICIENT
CLASS	0,97

Source: Prepared by the researchers based on SPSS results

By looking at the result recorded in the table above, it is clear to us that Cronbach's alpha coefficient for all the questionnaires was 0.97, which is a high stability rate, which indicates that the questionnaires are characterized by internal consistency and reliability, and this is what makes them suitable for study, analysis and drawing conclusions.

a) Distribution of sample members according to gender

Fig 1 Represents the distribution of members of the research community by gender



Source: Prepared by the researchers based on the outputs of the SPSS system

It is noted **Fig 1** that the percentage of males surveyed among the farmers of the agricultural cooperative is 94%, and the percentage of females is 6% And we can conclude from the data that the nature of the work calls for the male element more than the female element, and this is due to the nature of the work inside and outside the field and its various activities.

b) Distribution of respondents according to age

Table 3 The distribution of members of the research community by age

THE AGE (YEARS)	REPETITION	PERCENTAGE %
< 35	4	8
35 - 44	9	18
45 - 54	7	14
> 54	30	60
THE TOTAL	50	100

Source: Prepared by the researchers based on the outputs of the SPSS system

We note through **Table 3** above that the majority of breeders and those interested in the camel division are over 54 years old, at a rate of 60%, and this indicates that camel breeding has a special character that requires special treatment and high-level breeders to benefit from the milk of this animal heritage.

Trends in responses from the study sample

Table 4 The arithmetic means and standard deviations of the questionnaires

THE FIELD	CONTACT PERSON	AVERAGES	ABERRATIONS	DIRECTION
Contribution of the agricultural cooperative	axis: joint work	4.22	0,890	AGREE
	The second axis: Making a profit	4.44	0.790	AGREE
	First field: contribution of the agricultural cooperative	4.33	0.840	AGREE
Supply Chain Management Performance in Camel Milk Production- Raw Material as a Model	The second field: Performance of the supply chain management of camel milk production -The raw material as a model	4.61	0.5186	AGREE

Source: Prepared by the researchers based on SPSS results

Table 4 shows the arithmetic means and standard deviations for the application score expressions for the agricultural cooperative And the performance of the supply chain management model of primary items Sekaya Factory for the production of camel milk Tindouf, where the value of the arithmetic

mean of the first axis was "joint work Pic

4.22 and a standard deviation of **0,890**, which corresponds to a degree OK The value of the arithmetic mean of the second axis, which is "Real benefits", was **4.44** and with a standard deviation of **0.790**, which corresponds to an OK degree. The value of the arithmetic mean for all its expressions was **4.33**, with a standard deviation of **0.840**. Camel breeders for camel milk raw material production are fully satisfied with the

application of agricultural cooperative contribution to their activity As for the second field, which is Performance of **camel milk production supply chain management-Raw material as a model The** value of the arithmetic mean for all of its expressions was **4.610** with a standard deviation of **0.5186**, which means that most of the respondents in the sample agreed on the sentences in the second area, which indicates that The agricultural cooperative provides the necessary contribution to the farmers, which resulted in the provision of raw material in the required quantity and quality, and this is what allows the improvement of the performance of the supply chain management of camel milk production for the Sekaya plant in the Wilayat of Tindouf by increasing the production desired.

The relation between the axis of the research

N.B: axis of research is joint work, making profits, ensuring the management of the supply chain of dairy production camels as raw material model.

Table 5 Presents the correlation coefficients between the axis of the study Agricultural Cooperative and Managing the supply chain of camel milk production (Main article model)

Contact Person		Joint work	Make profit	Ensure the management of the dairy production supply chain Camels
Joint work	Pearson's coefficient	1	0,558	0,493
	Moral significance		0,05	0,05
	Sample volume	50	50	50
Make profit	Pearson's coefficient	0,558	1	0,684
	Moral significance	0,05		0.05
	Sample volume	50	50	50
Ensure the management of the dairy production SC Camels	Pearson's coefficient	0,493	0,684	1
	Moral significance	0,05	0.05	
	Sample volume	50	50	50

Significant correlation at the 0.01 level Source: Prepared by researchers based on SPSS output

From the table above, it is clear that the relations between the axis of the study: **Agricultural Cooperative, Joint work, Making profits, Supply chain management performance of camel milk production (raw material model)** is direct and statistically significant at the level of significance, at 0.05 where we notice a strong correlation Making profits and Supply chain management performance of camel milk production With a value of 0.684, this means that making profits a greater impact on improving Supply chain management performance of camel milk production at the Sekaya factory, Tindouf State compared to the average joint work that was the correlation coefficient between it and between Performance of camel milk production supply chain management 0.493 and from this, it can be said that For the agricultural cooperative important and effective role in the process of improving Performance of camel milk production supply chain management So,

Whenever it is the joint work between the camel breeders of the agricultural cooperative is effective to achieve the profit of the raw material in the required quantity and quality, whenever the possibility of achieving or improving Performance

of camel milk production supply chain management achieved.

Hypothesis testing H The main premise:

H_0: There is no statistically significant effect for the contribution of the agricultural cooperative to the improvement of the performance of the supply chain management of camel milk production (the raw material as a model) at the Sekaya factory in the wilaya of Tindouf.

H_1: There is statistically significant effect for the contribution of the agricultural cooperative to the improvement of the performance of the supply chain management of camel milk production (the raw material as a model) at the Sekaya factory in the wilaya of Tindouf.

The agricultural cooperative has helped improve the performance of the camel milk production supply chain at the Sekaya factory in the Wilayat of Tindouf by encouraging farmers to collect the raw material and work to provide it in the required quantity and quality.

N.B: This hypothesis was tested with a simple linear regression **REGRESSION** and analysis of variance **ANOVA**

Table 6 The results of a simple linear regression test between farmer cooperative and supply chain performance for camel milk production (raw material as a model)

Independent variable: Agricultural cooperative			
Dependent variable: **Supply chain performance for camel milk production**	**Correlation coefficient R**	**Renewal coefficient R2**	**Corrected renewal factor**
	0,675	**0.547**	**0,500**

Source: Prepared by the researchers based on SPSS results

Table 7 Analysis of variance model **ANOVA** between Agricultural Cooperative and supply chain performance for camel milk production (raw material as model)

Snack	**Square complex**	**degrees of freedom**	**average of squares**	**Fisherman**	**The moral function**
Regression	4.16	8	4.675	22.212	0.003
Residues	5.468	41	0.171		

Significant correlation at the 0.05 significance level Source: Prepared by researchers based on SPSS results

It can be seen from Table 6 that the value of the correlation coefficient is R = 0.675, This indicates a medium correlation between the agricultural cooperative and the performance of the supply chain for camel milk production (the raw material as a model), And the value of the coefficient of determination is R2 = 0.547, which means that 54.7% of the Performance of the supply chain for camel milk production (the raw material as a model) comes to See Agricultural Cooperative, or through the analysis of variance Table 7 ANOVA , the level of significance Sig = 0.00, which is less than 0.05, the level of significance dependent, and this is what makes us reject the null hypothesis and accept the alternative hypothesis that there is a statistically significant effect For the contribution of the agricultural cooperative to improving the performance of the management of the supply chain for the production of camel milk (the raw material as a model) at Sekaya factory.

The first sub – hypothesis

H0: There is no statistically significant effect for the joint work of the agricultural cooperative educators to improve the performance of the camel milk production supply chain management (the raw material as a model) at the Sekaya factory.

H1: There is a statistically significant effect for the joint work of the educators of the agricultural cooperative to improve the performance of the supply chain management of camel milk production (the raw material as a model) at the Sekaya factory.

N.B: This hypothesis was tested with a simple linear regression regression and analysis of variance ANOVA

Table 8 Presents the results of the simple linear regression test between material incentives and quality of work life

Independent variable: Joint work of educators at Agricultural cooperative			
Dependent variable: **Supply chain performance for camel milk production**	**Correlation coefficient R**	**Renewal coefficient R2**	**Corrected renewal factor**
	0,493a	0.479	0.080

Source: Prepared by the researchers based on SPSS results

Table 9 Example of ANOVA analysis of variance between Joint work of educators in the agricultural cooperative and the performance of supply chain management for camel milk production (the raw material as a model)

Snack	**Square complex**	**Degrees of freedom**	**Average of squares**	**Fisherman**	**The moral function**
Regression	3.383	8	4.230	15.290	0.01
Residues	11.337	41	0.277		
Totale	14.720	49			

Significant correlation at the 0.05 level of significance Source: Researcher preparation based on SPSS results

It can be seen from **Table 8** that the value of the correlation coefficient is R = 0.493, indicating that there is a mean correlation For **the collaborative work of educators in the** agricultural **cooperative** to improve **Performance of camel milk production supply chain management (raw material as a model)** And the value of the coefficient of determination is R2= 0,479 This means that 47.9% of job satisfaction is due **to Collaborative** work **of educators**, either through a **Table 9** analysis Variation ANOVA, the level of significance is sig = 0.01, which is less than 0.05 the level of significance that is approved, and this is what makes us reject the null hypothesis and accept the alternative hypothesis that there is a statistically significant effect For the joint work of the educators of the agricultural cooperative to improve the performance of the management of the supply chain of camel milk production (the raw material as a model) at the factory Sekaya in the wilaya of Tindouf.

The second sub-hypothesis:

H_0: there is no Statistically significant effect Realizing benefits for farmers in the agricultural cooperative to improve the performance of the supply chain management of camel milk production (the raw material as a model) at the Sekaya factory in the wilaya of Tindouf.

H_1: There is a statistically significant effect on farmers in the agricultural cooperative to improve the performance of the supply chain management of camel milk production (the raw material as a

model) at the Sekaya factory in the wilaya of Tindouf.

This hypothesis was tested with a simple linear regression analysis Regression and analysis of variance.

Table 10 Presents the results of the simple linear regression test between moral incentives and quality of work life

Independent variable: Realizing benefits for agricultural cooperative educators.			
Dependent variable: **Supply chain performance for camel milk production**	**Correlation coefficient R**	**Renewal coefficient R2**	**Corrected renewal factor**
	0,684	0,468	0,150

Source: Prepared by the researchers based on SPSS results

Table 11 ANOVA between the analysis of variance of the model Realizing benefits for farmers in the agricultural cooperative and the performance of supply chain management for camel milk production (the raw material as a model)

Snack	**Square complex**	**Degrees of freedom**	**Average of squares**	**Fisherman**	**The moral function**
Regression	5.628	6	4.938	2.059	0.00
Residues	16.592	43	0.456		
Totale	25.220	49			

Significant correlation at the 0.05 level of significance Source: Prepared by researchers based on SPSS results

It can be seen from **Table 10** that the value of the correlation coefficient R = 0.684 This indicates a strong correlation Bringing profit to the educators of the agricultural cooperative Bringing profit to camel milk production supply chain management performance (raw material as a model), as well as the value of the coefficient of determination R2 = 0.468, which means that 46.8% of job satisfaction is due to bringing profit to the breeders, either through the analysis of variance table ANOVA No. 11 the significance level Sig = 0.00, which is less than 0.05, the approved level of significance, and this is what makes us reject the null hypothesis and accept the alternative hypothesis that There is Statistically significant effect Realizing profit for farmers in the agricultural cooperative to improve the performance of the management of the supply chain of camel milk production (the raw material as a model) at the Sekaya factory at Tindouf.

The second main hypothesis: There are no statistically significant differences in Sekaya factory for camel milk production in Tindouf province according to the demographic characteristics of a sample.

Table 12 Results of the analysis of variance by type

Variable	**F Relativity**	**Probability value**	**The decision**
Joint work	**0,793**	**0,380**	**There are no differences**
Make profit	**0,020**	**0,888**	**There are no differences**

It appears from **Table 12** that there are no differences of interest Sekaya factory for camel milk production of Tindouf with elements Agricultural cooperative regarding its impact on the

performance of camel milk production supply chain management (the raw material as a model) With differences in the type of pain Dieun (male, female).

Table 13 Results of the analysis of variance by age

Variable	F Relativity	Probability value	The decision
Joint work	**0,959**	**0,394**	**There are no differences**
Make profit	**0,335**	**1,132**	**There are no differences**

It appears from Table 13 that there are no differences of Sekaya factory for camel milk production Tindouf with elements Agricultural Cooperative regarding its impact on the performance of camel milk production supply chain management (the raw material as a model) with age differences.

Table 14 Results of the analysis of variance by employment level

Variable	F Relativity	Probability value	The decision
Joint work	**0,219**	**0,804**	**There are no differences**
Make profit	**2.528**	**0,096**	**There are no differences**

From **Table 14**, it appears that there are no differences of interest Sekaya factory for camel milk production of Tindouf with elements Agricultural cooperative with regard to its impact on Performance of camel milk production supply chain management (the standard raw material) by differences in employment levels.

Table 15 Results of the analysis of variance by years of work

Variable	F Relativity	Probability value	The decision
Joint work	**0,682**	**0,610**	**There are no differences**
Make profit	**0,823**	**0,521**	**There are no differences**

From **Table 15**, it appears that there are no differences of Sekaya factory for camel milk production Wilayat Tindouf with elements Agricultural Cooperative regarding its impact on the Performance of the supply chain management of camel milk production (the standard raw material) by years of work.

Conclusion

To assess the contribution of agricultural cooperatives in improving the performance of the logistics chain for camel milk production, a case study was conducted at the Sekaya Factory in Tindouf, Algeria. The study involved camel breeders who supply raw camel milk to the factory. An applied questionnaire was designed based on the theoretical concepts of agricultural cooperatives and the logistics management performance of camel milk production. The analysis of the empirical study and hypothesis testing led to the following findings:

- There is a statistically significant positive correlation between the cooperative collaboration of camel breeders and the logistics management performance of camel milk production at the Sekaya Factory in Tindouf, Algeria.
- There is a statistically significant positive correlation between profit generation in agricultural cooperatives and the logistics management performance of camel milk production at the Sekaya Factory in Tindouf, Algeria.
- Cooperative collaboration and profit generation in agricultural cooperatives are highly important for the Sekaya Factory in Tindouf to produce camel milk, as perceived by its workforce across various production stages.
- The cooperative collaboration in agricultural cooperatives has a statistically significant impact on

the logistics management performance of camel milk production at the Sekaya Factory in Tindouf, explaining 47.9% of the observed variations in the logistics management performance variable.

- Profit generation in agricultural cooperatives has a statistically significant impact on the logistics management performance of camel milk production at the Sekaya Factory in Tindouf, explaining 46.8% of the observed variations in the logistics management performance variable.

Recommendations:

Based on the findings obtained at the Sekaya Factory for camel milk production in Tindouf, Algeria, it is evident that the factory aims to improve the logistics management performance by implementing the agricultural cooperative system. The study also revealed that the agricultural cooperative focuses on organizing the affairs of camel breeders through cooperative collaboration and profit generation. This has a positive impact on the logistics management performance of camel milk production at the Sekaya Factory, leading to improved productivity and profitability for the industrial enterprise involved in camel milk production.

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