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Research Article

Impact of Technological Determinants on the Production and Marketing of Dairy Products in Small and Medium Productive Projects in Egypt

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Abstract

Background and Objective: In Egypt, small and medium projects (SMP) are pivotal in meeting the requirements of the local market of dairy products such as soft, hard cheeses and fermented milks. The aim of this research was the study of technological and production determinants mainly production and marketing technology, in small and medium production projects. **Methodology:** The research method deal with 40 enterprises in Greater Cairo area. Quantitative analysis, multiple regression, one-way ANOVA, morality test (T), (F) and less significant difference (LSD) were applied by SPSS. **Results:** Obtained data indicated that there were significant differences at ($p \leq 0.01$) when measuring the effect of the technological determinants of the quantities used in production and marketing. The increase in the number of technological processes produced by one process of production conditions lead to increase the quantity of used milk by 0.39 t and about 35.2 kg of marketed quantities. While, increasing in technological marketing process lead to increase the amount of milk used in production by 0.31 t and about 33.6 kg of marketed quantities as a result of improved production and marketing level. However, increasing the diversity of products to the production unit with a new product was lead to increase the quantities of milk by 0.48 t and about 46.1 kg for marketed quantities. On another hand, the results showed that there were significant differences ($p \leq 0.01$) between the production and marketing problems as obstacles, facing the workers, in dairy production and marketing units. **Conclusion:** Present study recommends that encouraging unregistered productive enterprises to enter the formal economy of the country, facilitate loans, registration procedures and exemption from taxes for a specified period in exchange for their entry into the formal economy of the country. In addition, supporting the producers, technically, through the competent institutions. As well as, supporting funding programs for these projects, providing technological means for production and marketing and finally, tighter control to reduce the use of preservatives and unhealthy materials.

Key words: Dairy products, soft and hard cheese, productive enterprises, technological determinants, marketing

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INTRODUCTION

Day after day, the importance of technology in the agricultural sector has increased with better improved the efficiency of production materials than in the past. It should be noticed that, agricultural development and food processing policies were based on the use of technological packages in agricultural and industrial development^{1,2}. In order to increase the requirements of local and foreign markets and increase Egyptian exports, it is imperative to optimize the use of technological determinants³. Productive enterprises are important solutions that can contribute to the economic development of real economy, especially under current conditions, the ability to rotate the wheel of production and achieve real economic boom viability.

There were several reliable criteria for defining small and medium projects (SMP), including the size of capital required, the size of employment and the quality of technology used. The use of the technology standard used in the definition of SMP is due to the great technological development that accompanied the production processes in these projects. Food and dairy industries such as soft and hard cheese or fermented milk (in terms of production or marketing) required by such manufactured products as transport and storage.

Although there are many definitions of small and medium enterprises in many Egyptian agencies such as the Social Fund for Development and the Central Bank, taking into account the level of technology used, the General Organization for Industrialization defined small and medium enterprises as those characterized by their production in the model and using machinery and equipment. Technology is simple or appropriate and that the establishment, which costs investment to one million pounds and the number of employees ranging from 10-100 workers⁴.

When measuring the impact of technological determinants on the quantities produced and marketed from dairy products in small and medium-sized production units, it may be useful to measure the meaning of the concept of technology and agro-technology. The concept of technology was varied and varied according to the angle in which technology was seen. In Abbas⁵, define it as the embodiment and synthesis of human knowledge, expertise and skills in the form of in-kind means of production and productive arts used by man to manufacture products or to create units that manufacture these products. It was the social process aimed at using scientific knowledge in the development of the productive forces in order to increase its goods and services

and to improve the performance in the units⁶. On another side, Faraj⁷, define technology as the knowledge and skills needed to produce in-kind tools to improve and market goods and services to meet the needs of society. Accordingly, advanced technological methods are the most important means of implementing economic development policy.

In Egypt, production of cheese and other dairy products achieves through two main scales. The first one was large industrial scale. The second was small or medium scale. Both the two sources of production are sharing in dairy consumption. Despite the importance of small and medium projects in the dairy industries to meet the requirements of the local market, except if these units often suffer from many of the constraints of production.

The main objective of this research was to clarify the importance of small and medium production projects in providing market requirements by dairy products, especially soft and hard cheese or fermented milk. The role of technological production and marketing determinants was in increasing quantities of the products. In order to achieve this target, three research topics were studied. The first one was the current status of small and medium projects in the dairy industry in Egypt. The second was the influence of technological production and marketing determinants in increasing the quantities of produced and marketed dairy products. While the third topic was production and marketing constraints faced by small and medium productive projects for dairy products.

MATERIALS AND METHODS

Materials: The main materials consisted of the original data collected through questionnaires for producers and marketers which was designed for 40 enterprises in Greater Cairo area through the year of 2015 and 2016. The data of the research questionnaire indicate that most SMP were specialized in the manufacture of hard, soft cheeses and fermented milk, which were similar in their production and marketing conditions. The adoption of these factories and production units were depends upon simple and medium levels of technology.

Status of small and medium projects (SMP) specialized in dairy manufacturing in Egypt: Small and medium projects (SMP) were considered the locomotive of the national economy because they were of great importance and a key role for economic decision-makers in Egypt. They were considered the cornerstone of the economic and social development process due to their positive impact on the national economy.

The number of small, medium and micro enterprises registered as a data was indicated in Table 1, with the official authorities in Egypt reached about 2.4 million projects and companies in 2015/2016, where the projects for dairy products represent about 0.5% of the total, which is about 12 thousand facilities at the level of the Republic and registered with the official authorities of the country. In fact there were a lot of small and medium enterprises in Egypt (including dairy products) were often outside the framework of the official economy of the country. This is one of the obstacles facing the Egyptian economy in general, which indicates the importance of working to integrate these projects within the framework of the official economy of the country.

For the samples used in the research, the multi-stage random sample method was used as follows: First of all, a random selection for a small and medium production unit of the official bodies represented in the small enterprises sector in the Ministry of Commerce and Industry, which supervises small and medium enterprises. Secondly, these units were divided according to their location. Thirdly, random selection of the sample items between these units was carried out in each production area.

The general features of the production process between 2009 and 2015 were shown in Table 2. The obtained data illustrated that, the number of small and medium-manufacturing units has been increased for dairy products in Egypt, despite the economic and political conditions of the country during that period. For the production units, some of them were registered within the framework of the official economy, while the other was not registered. Many of these units, especially small ones do not fall under the framework of the formal economy. The number of these production units was about 60% of the sample items with the years of experience between 2-5 years. The average of milk-daily- amount used by most of these units (during the production process) was between 2-10 t/day, which was

much lower than the average of similar quantities in many countries of the world, (5-8 t/day), especially in the European countries⁸. These units get their milk from different sources varies between getting it directly from farmers, or through intermediaries and suppliers. Finally, the number of workers in the production process ranges from 3-10 workers, in the marketing process from 2-5 workers and the management of the production and marketing processes was often shared and carried out by the owner of the production unit himself.

The accuracy of the obtained results depends on the way which the sample was taken. In order to select the appropriate design for the sample, all technical sources and facilities available, as well as various information, either statistical or other information available about the society take Place of study⁹. In addition to a secondary data (published and unpublished) has been used in various factors related to research topic¹⁰.

Methods: Data which were collected in the season from 2015-2016 were statistically analyzed using descriptive and quantitative analysis methods .Parameters such as multiple regression method, T-test, F-test, one-way analysis of variance (ANOVA), less significant difference (LSD)^{11,12} at ($p \leq 0.05$) and ($p \leq 0.01$) were used by applying SPSS program version 16.

Table 1: Number of small and medium-sized projects registered with the social fund for development as an average for the period (2009-2015)

Activity	Number of establishments	Contribute (%)
Environmental and domestic industries	108000	4.5
Clothing and furniture	117600	4.9
Food outlets	74400	3.1
Dairy products industries	12000	0.5
Other activities	2088000	87
Total	2400000	100

Source: Central Agency for Public Mobilization and Statistics (CAPMAS)⁴

Table 2: Characterization of the research sample according to some criteria

Items	Field characterization	Sample (%)
Years of experience	Less than 2 years	5.0
	From 2-5 years	60.0
	More than 5 years	35.0
Production capacity for the amount of daily used in the production process	Less than 2 t/day	22.5
	From 2-5 t/day	55.0
	Greater than 5 t/day	22.5
How to get milk as one of the most important production inputs	Using suppliers and middlemen	47.5
	By direct farmers	52.5

Source: Compiled and calculated from the research questionnaire

RESULTS

Impact of technological determinants on the production process:

The results are shown in Table 3, illustrated the effect of the technological determinants on the production process. The average of these quantities increased from 1.9 -4.07 t. The impacts of the technological determinants on the quantities of milk used in production are shown in Table 4. The variation in production leads to an increase in the amount of milk used in the production process by 0.48 t. In order to determine the extent of the positive role, the multiple regression method between the difference in milk used in production processes before and after using the technological determinants as a dependent variable, Marketing and diversity of products as independent. Reviewing the results of Table 4, the statistical significance of these technological illustrated the productivity of the units at ($p \leq 0.01$) expressed by the quantities of milk used in the production. The results indicated that, as the increase in the number of technological production processes

by one, lead to increase those quantities required for production by 0.39 t. While, with one process increasing in the level of marketing technological production in those units was lead to increase the quantities of milk used in production by 0.31 t. However, by increasing the diversity of products for the production unit -with a new product-increased the quantities of milk was used in the Production process by 0.48 t.

Impact of technological determinants on the marketing process:

The results are shown in Table 5 reflected the marketed quantities of dairy products before and after the application of the technological determinants. The average quantities increased from 306.1-466.7 kg, respectively. It could be noticed that a significant difference at ($p \leq 0.01$) of the marketed quantities of dairy products before and after application. The positive impact was demonstrated by the use of technological determinants in marketing processes. The results in Table 6 showed the statistical significance of these technological determinants on marketed quantities at

Table 3: Differences in the quantities of milk used in the production processes of the small and medium units manufactured for dairy products in season (2015/2016)

Statement	Average quantities (t)		T calculated	Degrees of freedom
	Before using technological productivity determinants	After using technological productivity determinants		
Quantities of milk used in the production processes of small and medium units	1.9	4.07	12.6**	32

**: $p \leq 0.01$, Source: Calculated from the research questionnaire

Table 4: Impact of technological determinants on the quantities of milk used in production in small and medium-sized dairy products

Dependent variable (y)	Independent variables	Calculated value of t	Regression coefficient	Fixed amount	Coefficient of determination	Calculated value of F
Factors	Number of technological production processes added (x1)	4.09**	0.39			
	A number of technological processes marketing additives (x2)	3.74**	0.31	0.12	0.84	60.9**
	Diversity of products (x3)	2.36*	0.48			

**: $p \leq 0.01$, *: $p \leq 0.05$, Source: Computed from: Research questionnaire form

Table 5: Moral test results differences of quantities marketed in small and medium units manufactured dairy products in the search sample for the season 2015/2016

Statement	Average quantities (kg)		T calculated	Degrees of freedom
	Before using technological productivity determinants	After using technological productivity determinants		
Quantities marketed to small and medium units manufactured dairy sample search	306.06	466.66	7.3**	32

**: $p \leq 0.01$, Source: Computed from: Survey questionnaire

Table 6: Effect of technological determinants on quantities marketed in small and medium-sized dairy products during the 2015/2016 season

The dependent variable (y)	The independent variables	The calculated value of t	Regression coefficient	Fixed amount	Coefficient of determination	Calculated value of F
Factors	(X ₁) Number of technological production processes added	2.8**	35.2			
	(X ₂) Number of technological processes marketing additives	3.1**	33.6	-17.12	0.90	89.6
	(X ₃) Diversity of products	2.65*	46.06			

**: $p \leq 0.01$, *: $p \leq 0.05$, Source: Calculated from the research questionnaire

Table 7: Relative importance of the major production constraints of dairy products in small and medium projects

Obstacles productivity	Number of Projects	Relative importance (%)
(X ₁): The use of the production requirements of low quality and less efficient	16	25.4
(X ₂): Irregularity in the supply of milk to the plant	19	30.2
(X ₃): Increase the use of preservatives and non-authorized products on the market	18	28.6
(X ₄): Difficult to identify commercial fraud milk supply during the operations of the plant	10	15.9
Total	63	100

Source: Computed from: Research questionnaire form

Table 8: Results variation of the most important obstacles to the production of dairy products for small and medium-sized projects analysis

Type obstacles	Source of the difference	Degrees of freedom	Total distractions boxes	Average total deviations boxes	F-estimated
Technological obstacles	Between problems	3	3	1	4.334**
Productivity	Inside problems	128	29.515	0.231	
Total	131	32.515			

** $p \leq 0.01$, Source: Computed from: Research questionnaire form

Table 9: Order productivity obstacles faced by small and medium enterprises prioritized using the least significant difference method (LSD)

Type of Obstacles	Order obstacles				LSD value at the level of morality	
	X2	X1	X3	X4		
Obstacles productivity	1.6	2.6*	2.45*	3.5	0.62	0.83

*There is no significant differences, Source: Computed from: Research questionnaire form

Table 10: Relative importance of the main marketing obstacles for dairy products in small dairy processing units and medium -sized dairy manufacturing

Obstacles	Number of units (%)	Relative importance
(X ₁): Post-production on the areas of consumption areas	18	28.6
(X ₂): Lack of reliance on modern technology resulting from high sterilization, packaging and cooling costs for dairy products	14	22.2
(X ₃): The absence of marketing information for all episodes in spite of Importance in taking appropriate marketing decisions	12	19.0
(X ₄): Lack of commitment marketers standard specifications and health conditions related to the production and marketing of milk	10	15.9
(X ₅): The inadequacy and lack of activation of the legal and regulatory legislation regulating and monitoring the various marketing functions for the producer and the consumer	9	14.3
Total	63	100

Source: Computed from: Research questionnaire form

($p \leq 0.01$), increasing the number of technological processes produced by one operation. The increasing of the quantities which marketed by these units were by 35.2 kg. One was marketed by 33.6 kg, whereas by increasing the variety of products to the production unit with a new product, the marketed quantities of these units increase by 46.1 kg.

Constraints related to the production process: The results shown in Table 7 illustrated that, the problem of irregularity in the milk supply to the factory has ranked first in terms of the relative importance of the production obstacles by about 30.2%. It was difficult to identify the commercial fraud of milk during the supply of the factory. Using a one-way variance analysis, the calculated F-value was statistically significant

at ($p \leq 0.01$). This indicates a significant difference between the problems and production constraints faced by the small and medium-sized dairy producers as shown in Table 8. On the other hand, as shown in Table 9, there were significant differences at ($p \leq 0.05$) and ($p \leq 0.01$) between production problems and obstacles using of a less significant difference method (LSD) were noticed.

Constraints related to the Marketing process: The results shown in Table 10 indicated that, the problem after the production areas of dairy products from the areas of consumption has taken the lead in terms of the relative importance of marketing obstacles by about 28.6%, followed by lack of reliance on modern technology resulting from high

Table 11: Results of analysis of variability of the most important marketing constraints of dairy products in small medium projects

Types of obstacles	Source of the difference	Degrees of freedom	Total distractions boxes	Average total deviations boxes	F-estimated
Technological obstacles	Between problems	4	110.6	27.7	21.96**
Marketing	Inside problems	95	119.8	1.26	-
Total		99	230.4		

** $p \leq 0.01$, Source: Computed from: Research questionnaire form

Table 12: Order marketing obstacles faced by small and medium enterprises according to the priorities using a less significant difference method (LSD)

Type of obstacles	Order obstacles					LSD value at the level of morality	
	X1	X2	X3	X4	X5		
Obstacles Marketing	0.54	0.42	0.36	0.30*	0.27*	0.62	0.83

*There is no significant differences, Source: Computed from: Research questionnaire form

costs of sterilization and packaging of dairy products. As well as, the absence of marketing information for all episodes despite of the importance of making the appropriate marketing decisions. Finally, the problem of non-activation of legal and regulatory legislation for marketing functions ranked fifth among marketing obstacles with a relative importance of about 14.3%. The results also showed significant differences between marketing problems and obstacles. Using ANOVA as shown in Table 11, the value of (F) is statistically significant at 0.01. This indicates a significant difference between the problems and constraints faced by those working in small and medium dairy manufacturing units. The results shown in Table 12 illustrated, significant differences at ($p \leq 0.05$) and ($p \leq 0.01$) between production problems and obstacles using of a less significant difference method (LSD).

DISCUSSION

The study of technological determinants² is a combined package of determinants of production activity, marketing technology, products. The technological determinants contribute to increasing the efficiency of the employment of productive elements¹³. This leads to increase production efficiency. The quality and safety standards were also increased. The traditional production mode limits production efficiency. Dairy products require a special quality of marketing services and have an active role in maintaining the quality of these products during marketing, such as the use of technology in storage and other marketing services. The diversity of products produced and their number was considered to be variable within technological determinants. It was assumed to be an indicator of production efficiency in the production unit and the presence of suitable machinery and equipment and thus the ability to conduct technological services for the production and marketing processes, this was match with the results obtained by Khatab and Morse¹⁴.

As known in T-test, if (T) was significant, this indicates that there was a difference between the variables before and after the use of technology in the production and marketing processes, whether that technology has a positive or negative role on production and marketing processes in the units studied. The differences between the mean quantities of milk used, as well as the quantities marketed for the final product were calculated before and after the use of technology. If the differences after the use of technology were greater than before use, this indicates a positive effect of technological determinants and vice versa, multiple regression method to measure the positive role of technological processes².

Impact of technological determinants on the production process:

Technological change optimizes the use of production elements, increases production volume and reduces production costs at the same level of production but requires more time and expertise to achieve those goals.

This is the positive role of using these determinants, the number of technological processes increase the quantity of production by 0.39 t by one process, while increase the quantity of milk used in production by 0.31 t in marketing technological processes. The results of the measurement of the effect of technological determinants on the production process indicate a statistically significant difference at ($p \leq 0.01$) for the quantities of milk used in the production processes before and after the application of the technological determinants in the production units in the sample of the study, This indicates the positive role of using technological determinants in production processes, this was in agreement with Montaser *et al.*². However, it was interesting to note that smallholder producers are technically more efficient in producing milk than their larger counterparts and the intensity of market participation has had a significant and positive impact on technical efficiency. This provides a clear indication that increasing the level of marketing of dairy farms will have

a beneficial impact on their productive efficiency. As indicated by the finding obtained by Bardhan and Sharma¹⁵.

Impact of technological determinants on the marketing process: This was evidenced by the positive role of using these determinants. By increasing the number of technological processes produced by one process, the quantities marketed are increasing by 35.2 kg and by increasing the number of marketing technological processes by one process the quantities increase by 33.6 kg, while increasing the diversity of products with a new product, the quantities increase by 46.1 kg. The results of the measurement of the effect of technological determinants indicate that there are statistically significant differences at ($p \leq 0.01$) for the quantities marketed before and after the application of the technological determinants. This indicates the positive role of using technological determinants, this was in agreement with Montaser *et al.*².

The importance of using technology to improve the efficiency of production and marketing in small and medium-sized dairy-producing units, this was in agreement with El Said and Hamam¹³. This was evidenced by the importance of working through state agencies by supporting producers technically through the institutions responsible for sponsoring government and non-governmental food processing projects, projects to provide their financing needs to provide the required technological means to increase the capacity of these units of modern machines and tools, advanced production lines and modern means of transport, storage, marketing and other needs required for the development of production and marketing of those units, this was in agreement with El-Qazzaz¹⁶. As far as marketing variables are concerned, selling milk to individual consumers or organizations seems to contribute positively and more significantly to dairy efficiency than other marketing outlets such as traders or chilling plants. Membership of a dairy cooperative has a positive effect but is not statistically significant. As the results obtained by Gelan and Muriithi^{17,18}.

The obstacles facing the production and marketing processes in the small and medium production units of dairy products.

In the light of the successive changes experienced by the Egyptian economy in general, which directly or indirectly affect the small and medium-sized enterprises, including the production units manufactured dairy products there are many obstacles and problems that must be addressed and find ways to overcome them, The research sample revealed a number of constraints related to the production process and

the marketing process which the respondents referred to in the forms. The most important of these problems were the following.

Estimating the relative importance of the obstacles to study was the most important means of explaining the importance of this problem to other problems. Since some of the relative differences between these problems are so minor that the relative differences between these problems cannot be determined. As F was testing the whole model, if F was significant, this means that there was a difference between the variables (the problems that make up the whole model). However, it cannot be said that all these variables differ significantly in a given level. It is necessary to use a less significant difference (LSD) method, which can only be used if the significance of the F test is proved. This method is based on the fact that the difference between any two averages is significant at the probability level of at ($p \leq 0.05$) and ($p \leq 0.01$) if the difference between the two averages (LSD) at a level of at ($p \leq 0.05$) and ($p \leq 0.01$). A line below the problems that have no significant differences should be placed after the order of these problems^{13,19}.

Obstacles related to the production process: The study found that there are number of constraints related to the production process in the small and medium-sized dairy producers during the season (2015/2016). In order to show the significance of the differences between these constraints, the LSD method was used. The problem of irregularity in the milk supply of the factory (X_2) was the first of the exporters concerns. While, the problems of increasing the use of unauthorized preservatives in products in the markets (X_3) and the use of low quality and low efficiency (X_1) products together in the second place of the respondents' concerns. There are no significant differences between them, while the difficulty of identifying the commercial fraud of milk during the supply of factories (X_4) in the third place of the problems and constraints of production faced by those working in dairy processing unit, this was in conformity with Montaser *et al.*². Nevertheless, the study of El Said and Hamam¹³, indicates the problems faced by the dairy producers in the study, they found that the problem of the absence of milk collection centers occupies the first rank was about 86.7%, followed by the second and Third Order, the increase in the price of the buffaloes milk for the cow's milk. Khatab and Morse¹⁴, mentioned that the survey of the owners of the municipal factories for the manufacture of white cheese and yogurt in Qalyubiya Governorate that the problem of low quantities of milk supply for manufacturing occupies the first place by

21.65%, followed by the problem of fear of dairy corruption in the summer by 18.56% and finally the lack of cleanliness of raw material by 7.22%.

Obstacles related to the marketing process: Number of constraints related to marketing operations was found in small and medium sized dairy products during the 2015-2016 seasons, which are related to new technologies in one way or another, as indicated by the respondents.

In order to show the significance of the differences between these constraints, the LSD method was used. It was clear that, the problem of the remoteness of the production areas for the consumption areas (X_1) had occupied the first place, while the packaging and cooling of dairy products (X_2) in the second place, followed by the problem was the absence of marketing information despite the importance of (X_3) in third place. The problems of non-compliance of marketers with standards specifications and health conditions were related to production and marketing (X_4). The problem of inadequate and non-activation of legal and regulatory legislation regulating and monitoring various for the marketing functions of the product and consumer (X_5) together in fifth place, where there is no significant difference between them. No doubt that these obstacles and problems limit the efficiency of work in these enterprises and then the permeability of those products appropriately to the markets, it was noted that most of these problems and obstacles lurking in one way or another to the extent of the capacity of the production unit relying on high levels of technology, this was in agreement with Mahrous²⁰. This confirms El Said and Hamam¹³, which illustrated the lack of marketing information was important about 33.3 and 18.3%, respectively, followed by the importance of the problems of distance from manufacturing places by about 15%. By exploring the opinion of producers in the study of Khatab and Morse¹⁴, the most important problems of marketing white-soft cheese and yogurt in municipal laboratories were the two most important problems, distribution places and increase in transportation and the lack of adequate storage places ranked first at about 24% each of them. Abou El-Amaiem²¹, the most important marketing problems are the infrastructure to ensure the quality of the product, the proper transport of milk requires cooling to maintain its quality. However, facilities cannot be accessed and a large percentage of milk was lost. This is due to the lack of availability of cold chain facilities, which are high costs for cold chain processes.

CONCLUSION

To overcome the most important problems facing the production and marketing process in the small and medium-sized dairy production units. Working on the necessity of the concerns of the quality specifications required during the production process. As well as, taking into account the training of workers is in the use of technology through specialized centers (such as specialized technological centers of the Ministry of Commerce and Industry). In addition, control over the markets to curb the counterfeit products used in the dairy industry and the provision of appropriate mechanisms to facilitate producers to obtain the necessary completion of technological development loan operations. Finally, training of producers in order to contract small farms is to ensure the continued supply of milk to the production unit.

SIGNIFICANCE STATEMENTS

This study deal with the role of productive and marketing technological determinants in increasing the quantities of produced and marketed dairy products such as soft and hard cheese. The study is a new point that has not been discussed in previous researches on dairy products. So it will help to encouraging small and medium- productive projects that are not registered to enter the official economy of the country. Thus, this study could also help to increase the quantity of dairy products needed by the local market.

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