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SHORT NOTE [NOTA CORTA]

PRODUCTIVE PROGRESS IN A GOAT PRODUCERS ASSOCIATION, "CAPRINOCULTORES UNIDOS DE GUANAJUATO AC", THROUGH A TECHNOLOGY TRANSFER SYSTEM GGAVATT (LIVESTOCK VALIDATION AND TECHNOLOGY TRANSFER GROUP) (2001-2007)

[PROGRESOS RODUCTIVOS EN UNA ASOCIACIÓN DE CAPRINOCULTORES, "CAPRINOCULTORES UNIDOS DE GUANAJUATO AC", POR MEDIO DEL SISTEMA DE TRANSFERENCIA DE TECNOLOGÍA GGAVATT (GRUPO GANADERO PARA LA VALIDACÓN Y TRANSFERENCIA DE TECNOLOGÍA) (2001 – 2007)]

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SUMMARY

The aim of the study was to analyze the effect of technology adoption on milk goat producers in central México. The association has 13 producers, with an average age 41.5 years old, the average schooling reaches junior high school (3rd year), and a mean of 6 dependants per family. This association has an average number of 246 female goats per herd, a total of 3447 females, and 2190 females in production control. The income in relation to investment is 36%. Technological practices implemented to date and the percentage of use are: Weighing milk (100%), Animal Nutrition consulting (71%), Estrus synchronization and reproductive management techniques (40%), Gestation Diagnosis (93%), Brucellosis control herd program (100%), Artificial kids raising in slat (46%), Disease diagnosis and management (61%), Certification of good milking practice (53%), Linear and genetics evaluation (87%) Evaluation of genetic records (61%), Forage conservation by silage (93%), Milk components analysis (100%), dispersion of genetic material (71%), Analysis and data processing for replacement selection and animal sale (Sire and females)(100%), Bacteriological analysis of milk (93%), Cryoscopic point of milk (100%), and Diagnosis of subclinical mastitis (cytometryc flow) (100%). An 80% of the producers have adopted different practices, and the association has promoted and implemented different programs such as: control milk production, milk quality, genealogical records, disease control, marketing in group, sales of fluid milk and dehydration of milk for conservation and sale. Accordingly to such practices, results are as follows: 11,180 kids born, from which 52% were females and 48% males, with 56.9%, 24.3%, 15.7% and 2.9% of double, triple, simple and quadruple births, respectively. The mean birth weight was 3.32 kg and 15.7 kg weaning at 60 days, with a daily gain weight (DGW) of 206.33 g. For milk production, 3534 lactations were analyzed from 1999 to 2007 in a 90.4% of animals ranging from 1 to 4 lactations, a 9.58% from 5 to 11 lactations, and 35% of animals in the 1st lactation. An ANOVA was performed under a randomized design considering the effects of lactation number. The lactation number influenced ($P < 0.05$) the number of open days with an average of 221.6 ± 6.5 d, being greater from the 5th lactation; the number of days in milk was 301.2 ± 6.8d and were different ($P < 0.05$) without a tendency. Milk production per lactation was 987.2 ± 33.9 kg, with higher values ($P < 0.05$) at the 2nd lactation (1105 ± 11.4), 3th lactation (1101.8 ± 13.5) and 4th lactation (1089 ± 18.53), resulting in an daily production average of 3.27 ± 0.93 kg/day, which was higher ($P < 0.05$) at the 2nd (3.50 ± 0.8), 3rd (3.63 ± 0.9) and 4th (3.63 ± 0.97) lactation. In conclusion, the implementation of various technological tools such as: production controls, management consulting and food conservation, disease control, and genetic evaluations, have yielded higher productions and could be appropriate tools for decisions making on goat production systems.

Key words: Association, Technology transfer, Lactation.

INTRODUCTION

Goat milk production represents only 2 to 2.5% of the milk produced in the world by all the different species. However, the growth of goat population has become very important, especially in countries with low

economic development (Africa and Asia), where the goat population growth over the past 20 years has been 70% (Morand-Fehr et al. 2004). Even though goat population in low income countries accounts for 79% of the world population (711 million goats), this produce 67% of milk in the world. In contrast, developed countries that account with the 1.3% of the goat population in the world, produce 9% of the total goat milk production (FAO 2005). Goat production represents an activity of obvious cultural and economic dimensions (Sinapis et al. 2000). In Mexico goat population is close to 9 million, most of them are in extensive and semi-extensive production systems, grazing in arid or semiarid zones; and meat is the main product. These production systems have a poor and seasonal milk production. Mexico produced 163 million liters of goat milk in 2006, equivalent to a production per female (20 to 35 kg average weight) per year (SAGARPA, 2008). However, it is considered that most of this milk is produced by only 10% from the total number of goats in the country, located in intensive and semi intensive production systems. There are major constraints in milk production, as the seasonal production of milk and fodder; lack of producer organization and markets; lack of infrastructure for conservation, processing and distribution of goat milk products; and especially a deficient system for technology transfer (FIRA, 1999). However, SAGARPA (Secretary of Agriculture, Livestock and Rural Development and Fisheries of Mexico) has proposed an organization scheme and technology transfer called GGAVATT (Ranchers group for validation and technology transfer), where the farmer is the one who validates and transfer various technologies recommended by technical consultants, whom are part of the same organization. These systems have allowed not only increase the technological diffusion, but also enhance the organization of producers in groups. The producer organization can improve income through the production, technologies transfer, processing, distribution and sale, as well as the shared acquisition of feed ingredients, machinery and other inputs to get better prices for the group. (Caprinocultores Unidos de Guanajuato).

Therefore the purpose of this study is to analyze the productive and organizational performance of GGAVATT, Caprinocultores United de Guanajuato A.C.

MATERIAL AND METHODS

We analyzed the productive information of 13 goat farms associated to Caprinocultores Unidos de Guanajuato, A.C.(CUG) These farms have a total of 3447 females goats, and 2190 of them are enrolled in the production control system by Holstein de Mexico A.C., as the company included in the analysis. A static analysis of this information found the rate of technology adoption, and various social and economic indicators of producers, such as the average age of producers, their schooling level, the number of economically dependent persons per household and the total number of goats per farm. Finally a one-way analysis of variance was carried out (Steel and Torrie, 1986), considering the number of parity as the main source of variation.

RESULTS AND DISCUSSION

Various aspects of social and economic characteristics of the producers of the association "Caprinocultores United de Guanajuato (CUG)'' are shown in table 1. The average schooling is high (3rd degree High School), when compared with the rest of goat producers in the country, whom only reach the 1st to 3rd degree of Elementary school. This circumstance could be one of the main elements in the successful development of this organization. Morand Fehr et al. (2004) mention that the educational level is one of the constraints in adopting new technological practices and limits productive development. Moreover, the income was 36% on investment, which indicates to be a profitable business. Even though, the average farmers age is 41.5 years old and the number of economic dependants is high (6 persons per family). In general, information analysis indicated that an average of 271 females in production, farmers can have a profitable business. Moreover, revenues that correspond to the percentage of gain in relation to investment in milk production, are important from an production average of 3.4 liters of goat milk per day; this without considering the income from the sale of males or females to breeding. However, the point of economic balance of farms is 2.5 kg of milk per day, therefore production systems where farmers make substantial investments in infrastructure and technology requires a minimum of 750kg/lactation on average.

Table 1. Social and economic aspects of goat producers in GGAVATT Caprinocultores Unidos de Guanajuato.

Aspect	
Start date of GGAVATT	March/2001
Founders Producers number	15
Actual producers number	13
Age Average (years)	41.5
Average schooling	3rd High school
Number of dependents per family	6
Average of goats per farm	271
Income in relation to investment (%)	36

Table 2 shows the adoption degree of various technological practices, comparing technologies adopted in 2007 and expected in 2008. It is evident that farmers have been convinced in the use of assessment tools such as weighing milk, production control, analysis of milk components, genetic evaluations, as well as diseases control, such as brucellosis (official control), and the mastitis subclinical diagnosis which affects significantly in the milk yield and quality of the product. On the other hand, pregnancy diagnosis by ultrasound and conservation of fodder has taken importance. Such factors are a major constraint of the goat farmers in the association, because few farmers have cultivated land and depend on the grain and forage purchase, which is followed by an increase in the application of nutritional consulting.

The technologies that presents less dispersion is artificial breeding, a practice recently introduced, that involve a greater need of labor (in terms of labor hours per men). However, the results are interesting, especially those of mortality and disease incidence reduction, control and apparent decline of caprine arthritis encephalitis, and a homogeneous development of kids. These technology adoptions have been taking according to the actual profitable economic, such as assessing the animals productive capacity, the production control system and genetic evaluations, which affect the ability for selection of replacement animals and sale of males and females to breeding. Similar situation is observed in various countries, such as France, Norway, Netherlands and the USA, where farmers participating in programmers of milk production control and genetic evaluation from 20 to 40% of the goat population in the country. This has produced an increase of milk production and genetic development in those countries (Haenlein, 1996).

Table 3 presents the parameters of rearing of the CUG, analyzing 11, 180 kids born from 2001 to 2007, which showed a ratio female: male of 52:48%. Birth distribution was 15% simple, 56.9% double 24.3% triple and 2.9% quadruple births; the prolificacy was 2.1 kids by birth and the birth weight was of 3.2 kg and 15.7kg at weaning to 60 days old, which gives an average daily gain of 206 gr.

There are several factors influencing the development of the kid from birth to weaning, and one of the most important is birth weight, which is influenced by the number of kidding of mothers and the total kid's birth by kidding. The larger number kidding, the greater weight of kids at birth, and females on their first kidding have a lower weight of birth, being largest in animals from 4 to 5 kidding (Andrade et al. 1992).

Table 2.-Technological practices in goats in GGAVVAT Caprinocultores Unidos de Guanajuato**.**

Technological practices	2007(%)	Expected 2008 (%)
Milking weight	100	100
Nutrition Consulting	71	80
Estrus Synchronization	40	80
Pregnancy diagnosis	93	100
Brucelosis free herd	100	100
Artificial kids raising in slat	46	50
Disease prevention, diagnosis and control	61	80
Milking good practices certificate	63	80
Genetic and lineal evaluation	87	100
Genetic registers expedition	61	70
Forage conservation (corn and alfalfa silages)	83	90
Milk components analysis (Infrared)	90	100
Genetic material dispersion (Sale of females with genetic evaluation)	70	100
Analysis and evaluation of genetic information to selection, and sale.	100	100
Bacteriological analysis of milk in tank	93	100
Cryoscopic point determination	100	100
Subclinic Mastitis diagnosis	100	100

Table 3. Productive parameters of rearing and production of the Association Caprinocultores Unidos de Guanajuato.

Parameter	
Kids Born	11.180
Females born (%)	52
Males born (%)	48
Type of parity (%)	
Simple	15.7
Doble	56.9
Triple	24.3
Quadruple	2.9
Birth weight (kg)	3.2
Weaning weight (kg)	15.7
Weaning days	60

On the other hand, introducing heavier animals from simple births and less heavy animals in quadruple birth, is also important to the type of kidding (Andrade et al. 1992; Garcia et al. 1995, a and b). Andrade et al. (1992) observed that a larger number of kidding in a Nubian goat herd increases the prolificacy, where 60% of the animals in the first kidding presents simple births (only one kid), compared to a 25% of simple birth in animals from 3 to 5th kidding. Moreover, the average daily gain is linked to the mother's raising and production scheme. On systems with natural breeding kid, growth will depend on mother's milk production as well as the number of kidding, the increase in milking availability to kid and also is dependent on mother's kidding number (Garcia and Rankin, (1988) in Andrade et al.1992). However, in artificial breeding systems, such as those adopted by the producers association CUG, growth is dependent on birth weight, sex and the offered food quality and quantity (milk, concentrated and fodder), instead of being dependent on mother's milk production (Morand-Fehr and D. Sauvant, 1982).

The effect of the number of kidding in milk production and milk quality from goats of the association (CUG) is observed in Table 4, where that dry days (70 ± 2.2 days) or open days (days kidding to gestation, 222.5 ± 5.3 days) were not affected by the number of kidding ($P > 0.05$). However during milking days, a lower ($P < 0.05$) milk production per lactation, and milk production per day were observed in first kidding animals. The percentage of fat in milk was higher in 3rd, 5th and 6^{th} kidding ($P < 0.05$), and the percentage of protein in milk was higher ($P < 0.05$) in 1st, 4 and 5 kidding animals. It is important to note that the number of animals in production control is substantial (3445) and representative and this can be compared to the number of animals in production control in several countries such as USA (16000), Italy (8000), Cyprus (3000) (Haenlein et al., 1996). The productive performance on these farms is similar to that observed by various authors, mentioning that they get less milk production in the first kidding, increasing until the third (Sahni and Chawla, 1982; Dickson et al., 2000; CAPRIGENE, 2007; ADGA, 2008). Moreover milk production is higher than that reported in France on animals' production control, which is 793 kg of milk on average 268 days (CAPRIGENE, 2007), even if they must consider that population production control in France was in 2007 at 293, 886 animals. Although Saanen goats production is similar to that production control of the best herds in United States, which was of 922 kg per lactation in 34 herds goats and 1130 goats (ADGA, 2008). On the other hand, the fat in milk was 3.3% which is within the levels observed in Alpine and Saanen goats in intensive systems in the United States (ADGA, 2008), but slightly lower than that observed in France (3.5 to 3.6%) (CAPRIGENE, 2008). The amount of protein in milk (2.8%) is close to that observed in Alpine and Saanen goats in the U.S.A (2.9%) (ADGA, 2008), but lower than the protein in the milk content of French goats (3.18%) (CAPRIGENE, 2008). The fat milk content is influenced by various factors, such as the goat, breed, the lactation state, birth number, the production and nutrition levels (Sahni and Chawla, 1982); however, the milk protein content is more affected by a genetic component, making more difficult its modification. In that sense, an important part of breeder males used in CUG farms are coming or are descendants of goats from the United States, where the content protein in milk is lower.

CONCLUSIONS

The organizational system and technology transfer GGAVATT has been an important tool for economic development and productive partnership of Caprinocultores Unidos de Guanajuato. Several factors have determined the success of this organization, one of the greatest impacts is the cultural level and school grade of producers. The organization has enabled the collective collection and distribution of milk, thus being able to organize their distribution and sale at a better price. The distribution and purchase of grains and forage to better prices has allowed to consultants recruit and technical expertise. The most commonly adopted technologies are better related to selection of animals, as well to programs for health control and quality of milk, followed by the consulting nutritionist who has a strong impact on its economy. These selection and evaluation tools for animal production, has allowed little time in increasing of production in other countries. On the other hand, the use of different technologies as production control, nutrition, and

health control programs. Finally, the producer organization has enabled an income of 36% on investment, making of the Caprinocultores Unidos de Guanajuato a profitable and sustainable enterprise.

Table 4. Productive parameters of the Caprinocultores Unidos de Guanajuato by lactation number.

	Lactation Number								
	1	2	3	4	5	6	Mean	EEM±	Prob
Dry days		65.7±1.2	67.1±1.6	76.9±2.2	71.7±3.0	68.9±3.0	70.0	2.2	NS
Open days	223.7±2.6	224.2±3.0	219.2±3.9	221.0±5.4	218.7±7.3	220.6±7.3	222.5	5.3	NS
Milking Days	268.5±2.0a	284.7±2.1b	279.3±2.7cb	276.0±3.8cb	274.1±4.7cb	279.5±4.6c	276.3	3.3	**
Milk/prod/ Kg/ goat	715.5±12.1a	1012.6±12.5b	1057.9±16.5c	1008±22.7c	955.4±28.5bc	923.3±28.0d	916	20.05	*
Milk Prod. Day/kg	2.7±0.04a	3.5±0.04b	3.8±0.05c	3.6±0.07c	3.5±0.09cd	3.3±0.08d	3.29	0.07	***
%Fat in milk	3.3±0.2a	3.2±0.02b	3.4±0.03c	3.3±0.04ab	3.4±0.05c	3.4±0.05c	3.3	0.03	***
%Protein in milk	2.9±0.02a	2.7±0.02b	2.8±0.02b	2.83±0.03a	2.8±0.04a	2.7±0.04b	2.8	0.04	***

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