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INVESTMENTS IN SMALL GOAT FARMS

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SHORT NOTE [NOTA CORTA]

THE USE OF LINEAR PROGRAMMING TO EVALUATE THE IMPACT OF CREDIT FOR INVESTMENTS IN SMALL GOAT FARMS

[UTILIZACIÓN DE LA PROGRAMACIÓN LINEAR PARA EVALUAR EL IMPACTO DEL CRÉDITO PARA INVERSIÓN EN PEQUEÑAS FINCAS DE CABRAS]

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SUMMARY

The PRONAF is a governmental program that subsidies the credit for investment to smallholder farming and improves the social development in Brazil. This research was carried out to evaluate the effect of increasing the values of credit for investment used for the PRONAF farmers in semi-arid areas, and their impact in the income and labor in smallholder farming production system. Economic data of dairy and meat goat systems of PRONAF farmers in "Rio Grande do Norte", Brazil was used. The limit of the model was the credit for investment, maximum number of animals in the system and the labor time. The current values of credit for investment (US$ 2,850.00) were increased by 25%, 50% and 100% and its impact analyzed in the farm income when considering milk and meat production. The maximum number of animals in the system was estimated by multiplying the carry capacity (1.5 heads/ha/year) plus the average pasture areas of PRONAF farms (35 ha). The maximum labor time, available for farm work, was 12 hours/day. This mathematical model was solved using linear programming with LINDO® software. When the credit for investment was expanded in 25 and 50%, the income of the system increased, respectively, to 22 and 41%. It happened because the values of credit allowed increasing the number of dairy goats in the system. However, this income was not enough to use and pay more than 5 hours/day in dairy goat system activities. When raising the credit for investment up to 100% it could increase the income of the system around 81%. It happened because the number of dairy goats grew up to 83% and the dairy production had better results than meat production. The system with more dairy goats produces enough income as to pay the farmer labor (7 hours/day) and during the other five hours could develop other activities. Therefore, the results of the analysis indicated that an increase in the credit for investment in small goat farms in semi-arid areas in Brazil could be addressed towards the dairy goat production, enhancing the income of families and employment opportunities.

Key words: Smallholder farming, Rural development, Modeling, Production systems, Farm planning.

INTRODUCTION

The smallholder farming production systems congregate the majority of the agricultural population of Brazil. These systems are characterized by possessing the following conditions simultaneously: small farm, the direction of the works in the establishment is exerted by the producer and the use of the family labor is higher than the contracted work (Sabourin and Caron, 2003). Given these characteristics, the smallholder farming systems are responsible for the generation of about 56% of the jobs in rural areas of Brazil, this represents about 15 million people (Guanziroli and Cardim, 2000).

Beyond social importance, smallholder farming systems has fort presence in the Brazilian economy in food production and jobs generation (Oliveira and Teixeira, 2005). The semi-arid region of Brazil, occupies around 900,000 km², and concentrates 90% of the Brazilian goats' population (6.5 million heads) (IBGE, 2007). In this region, the smallholder farming

systems represent about 88% of the agricultural establishments and traditionally the production of small ruminants is used as a source of food and financial reserve for the family (Guanziroli et al. 2001).

With the aim of increase income, production and productivity of smallholder farming systems, in 1995 the PRONAF (Program for the Strengthening of Family Farming) was created. Due to the success of the program, it became expanding the volume of availability financed credit to smallholder farming in Brazil. Moreover, the PRONAF encouraged the attendance of the diverse categories of producers in such a way that stimulate the programs for technical assistance and strengthening of infrastructure of the farms (Guanziroli, 2007). For this reason, with the objective of information generation to guide the credit limits and financing the rural activities of PRONAF, is necessary to optimize the use of production factors, to promote the stability of the income of families and to increase the sustainability of smallholder farming systems in Brazil. This research was carried out to evaluate the effect of increasing the values of credit for investment used for the PRONAF farmers in semi-arid areas, and its impact in the income and labor in production system.

MATERIAL AND METHODS

The system modeled is a typical small ruminants (goat and sheep) production system in Northeast region of Brazil. The description of the systems (land, animal and plant use; scale of production; pointers and economic information) and data used in this work had been gotten from França et al (2006a) and (2006b) and the diagnostic of the agro-industrial productive chain of the goat and sheep industry of the "Rio Grande do Norte" state of Brazil was gathered from SEBRAE/RN (SEBRAE/RN, 2001). França et al (2006a) and (2006b) made a description and characterization of the modal type of dairy and goat meat smallholder production systems at "Rio Grande do Norte" state of Brazil. Using the data from França et al. (2006a) and (2006b) the income, costs of production and investment for adult female goats was estimated as US$ 152.64, US$123.46 and as US$145.82 for dairy goat and US$67.18, US$48.58 and US$66.35 for meat goats, respectively.

In the milk goat production systems the gross margin of the activity was estimated by selling "in natura" goat milk, for the price of US$0.49/liter. The income from selling kidding goats and manure as pastures fertilizer was also been computed. The total area of the dairy goat farm had 30 hectares (ha), and the goat flock had 33 animals, being 26 adult female goats (of

which 18 in lactation), 1 buck and 6 young does (França et al, 2006a).

In the meat goat production systems the main activity was the production of meat goat, which price estimated was of US$2.20/kg. The incomes from selling manure as pastures fertilizer were also computed. The total area of the meat goat farm had 35 ha, and the flock had 118 heads, divided in: 40 adult female goats, 68 kidding, 10 young does and 1 buck (França et al, 2006b).

Either for milk and meat goat production systems some assumptions were adopted: exclusively familiar man power, use of native grass during water station and use also silage, forage and protein banks and/or buy concentrates to supplement the animals in the dry station (SEBRAE/RN, 2001). Additionally, it was assumed that a minimum infrastructure in the farm used for animal production exists. The complement or adequacy of the existing structure, for the small ruminant production, was made possible by new investments through resources of the PRONAF credit. For this, the sum of the loans can reach up to US$ 5.515.00, being US$ 2,845.00 for new investments and $ 2,670.00 for maintenance and defrays of the production unit.

The model proposed had the objective to maximize $\sum I_j$, subject to:
(1 - Maintenance and defrays) $\sum MDC_j \leq CMD$
(2 - New Investiment) $\sum NI_j \leq CNI$
(3 - Animal Units) $\sum CA_j \leq AU$
(5 – Labor time) $\sum T_j \leq T$

Where $\sum I_j$ is the sum ($\sum$) of the incomes (I) gotten in each activity "j" (dairy goat, beef goat and employee in other activity). MDC_j is the capital used for maintenance and defrays in activity "j". CMD is the capital available for maintenance and defrays. NI_j is the requirements for new investment in activity "j" and CNI is the limit of the PRONAF credit available. The actual values of CMD and CNI are, respectively, US$2,670.00 and US$ 2,845.00. In this work five scenarios that simulate an increase of 0%, 25%, 50% and 100% in the values of CMD and CNI and their effects in the smallholder farming system were evaluated.

CA_j is the carry capacity of the farm and AU is the maximum number of animal units that the system can support. The carrying capacity was estimated dividing the number of adult female (França, 2006a; França, 2006b) into the total area of the production unit. It was estimated in 1.5 animal unit of goat with 45kg of live weight per hectare/year.
T_j is the requirements of labor time working in "j" activity and T represents the limit of labor in the farm,

12 hours a day. The value of "T" for smallholder farming systems used in this work was two persons working in rural or agricultural activities for six hours each.

The model was run using the software L.I.N.D.O® (Pretty Systems Incorporation, Chicago, IL, the USA) version 6.1.

RESULTS AND DISCUSSION

Using the current values of credit for investment (US$ 2,845.00) and maintenance and defray (US$ 2,370.00), the producer uses most part of this capital in the dairy activity (Table 1). However, these values did not allow buying enough number of animals as to generate a minimum income to satisfy the needs of the family. In this in case, in order to complement the family receipt, to work 8 hours as employee will be necessary. This situation is similar to the observed in others production units that use credit from PRONAF. For this smallholder farming, a very important part of their receipt/income comes from government programs, retirement and/or the work as employee in other activities out of the farm (Guanziroli, 2007). To have access the available credit results in the economic security of the smallholder farming, therefore the incomes from retirement support the production and maintenance of the family (Ribeiro et al., 2007). Thus, an economic dynamism was created and has a synergy of results between these programs, the production and income transference for smallholder farmers.

The measurements and evaluation on the smallholder farming systems, when an increase in values of credit of 25% up to 100% is considered, can be observed in table 1. It changes the profile of the flock. The producer tends to increase the dairy goat and work time in this activity, which provides a greater gross margin per animal than the other options available here. A result of this specialization is an increase of the incomes, food production and occupation of the family labor. This kind of producers, that use approximately 70% of the area to one or two activities are more efficient and have increased their income (Guanziroli, 2007).

When goat production can be the main activity of the unit of smallholder farming, the values for investment and defray must be increased in 100%, passing to US$ 5,690.00 and US$ 4,740.00, respectively. Thus, it would be possible for the producer to acquire a sufficient number of adult dairy and meat goats to provide income enough as to pay for seven working hours/dayg in the smallholder farming systems. However, this result would be possible if a synergy between the PRONAF credit and other programs of technical assistance, infrastructure and commercialization of the production exist. On the other hand, if it does not occur, the situation of smallholder farming systems could be worse, as cited by Ribeiro et al. (2007) and Pereira et al (2006).

Two examples of how the synergy of action between release of PRONAF credit and other government programs can improve the goat production and the incomes of smallholder farming systems are the Program of the Milk of "Rio Grande Norte" and "Paraíba" states in Brazil. At those places, governmental programs that guarantee the purchase of all goat milk production from the smallholder farming systems exist. It results in the growth of the milk goat production, more employment and income in a very poor region. Data of the farming census of 2006 indicated the increase of the goat flock of 26% and 13% for RN and PB, respectively (IBGE, 2007). However, more important than the increment in the number of animals, was the growth of the total milk goat production going from 229.000 to 2.870.000 liters and from 1.248.000 for 3.995.000 liters of milk of goat in the "Rio Grande Norte" and "Paraíba" state, respectively (IBGE, 2007).

It must be pointed out that in these two states milk goat production is the main activity because in this semi-arid region, the rainfall is less than 500 mm of rain/year and the options of job and incomes are scarce. Thus, milk goat production makes possible a healthful food production and an adequate activity for smallholder farming systems. This activity beyond generating food and income can create regular resources for the families.

As this is the main production from smallholder farming systems, it results in the improvement in the social conditions, mainly the index of human development (IHD) at those places. The economic, social and environment importance of the goat production for the semi-arid areas in the Northeast of Brazil also match with the profile of the smallholder farming systems that has tradition in this activity.

CONCLUSIONS

The model demonstrated to be helpful to evaluate the impact of credit for investment in the smallholder farming systems. It showed the need for increase the PRONAF values of credit for dairy and meat goat production. However, this credit should come together with other programs of technical assistance and commercialization of goat products (milk and meat) to increase the profits and sustainability of the smallholder farming systems.

Table 1. Total income, number of dairy goats, meat goats, time spent in goats (dairy and meat) production system, and time working out of farm when the PRONAF credit for new investment (US$ 2,845.00) and for maintenance and defrays (US$ 2,670.00) to smallholder farming was increased at 0%, 25%, 50% and 100%.

Description	0%	25%	50%	100%
Total income (US$/year)	**US$ 3446.74**	**US$ 4191.67**	**US$ 4874.41**	**US$ 6221.58**
Dairy goats*	18	22	26	33
Meat goats*	3	5	7	13
Time spent in goat production system**	3	4	5	7
Time working out of the farm**	8	8	7	5

*Maximum number of adult female in the system
** Total of hours per day working in goat production system or work out of the farm

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