Agrociencia Uruguay 2022 | Volume 26 | Number NE2 | Article 1113
DOI: 10.31285/AGRO.26.1113
ISSN 2730-5066

25 YEARS

25 years in 25 articles

Dairy farm management: a typology of dairy farmers according to their disposition to the use of economic and physical records

La gestión en los establecimientos lecheros: una tipología de los productores según su disposición al uso de los registros físicos y económicos

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Article originally published in:

Agrociencia (Uruguay). 1998;2(1):125-133.
doi: 10.31285/AGRO.02.1008

Abstract

The technological model applied during the last years in Uruguayan dairy production has made it possible to consolidate the efficiency and productivity of dairy farmers. Although for many dairy producers there is still room to incorporate new production techniques, the most advanced producers seem to have reached their ceiling in the possibilities of improving the recommended technological package for dairy production. In consequence, for these farmers, keeping economic records is becoming increasingly important at the planning and decision-making stages. In this study, we describe in the first place the different behaviors of dairy producers from the perspective of the management of their farms, and we identify the variables that are underlying these diverse behaviors. In the second place, we construct a typology of dairy farmers, distinguishing four categories: **(1)** Disintegrating farmers, **(2)** Agribusiness wage-laborers, **(3)** Quasi-entrepreneurs, and **(4)** Diversified entrepreneurs. Finally, the study concludes with some thoughts regarding the feasibility of using physical, economic and financial records for each of the identified types of dairy farmers.

Keywords: dairy farm management, entrepreneurship, farmer typology, dairy production

Resumen

El modelo tecnológico aplicado en los últimos años en la producción lechera del Uruguay permitió consolidar la eficiencia y la productividad de una buena parte de los establecimientos lecheros. Si bien para muchos productores todavía es posible avanzar en la incorporación de técnicas productivas, los productores más avanzados parecen haber alcanzado un tope en las posibilidades de mejorar el modelo tecnológico recomendado. En consecuencia, el cálculo económico de la explotación lechera adquiere cada vez mayor relevancia en la planificación y el proceso de toma de decisiones. En función de ello, en este trabajo se caracteriza en primer técnico los diversos comportamientos de los productores lecheros desde el punto de vista de la gestión de sus establecimientos, identificando las principales variables que inciden en dicho comportamiento diferencial. A partir de este análisis, se construye una tipología de los establecimientos distinguiendo así cuatro categorías de productores: (1) Desintegrados, (2) Asalariados de la agroindustria, (3) Proto-empresarios, y (4) Empresarios diversificados. El trabajo concluye con algunas reflexiones en torno a la factibilidad de aplicar una tecnología de registro físico y de cálculo económico y financiero en cada uno de los tipos identificados.

Palabras clave: gestión, producción lechera, producción de leche, racionalidad empresarial, tipología de productores

I. INTRODUCTION

During the 1980s, a technological model was consolidated in Uruguayan dairy production that significantly improved the efficiency and productivity of the farms.[3]

This model basically consists of the expansion of the forage base through pasture improvement and the implantation of annual summer and winter forage, the improvement of the genetic base of livestock and their reproductive management concentrating the deliveries in the autumn and spring, widespread and rational use of concentrates (depending on the needs of the different categories) and forage reserves during the summer.[4]

This model, widely disseminated by the technical team of CONAPROLE, by the technical advisors of the groups of dairy producers, and from INIA, spread variably within the mass of dairy producers. While the improved technology package has been adopted by a large number of dairy farms, it is also true that for many dairy farmers it is still possible to progress by closing the technological gap between the practices they actually use and the recommendations of the model mentioned.

However, the most advanced producers seem to have reached a peak in terms of the possibilities of improving the recommended technological model. On the one hand, further adjustments to the model seem to have less effect on production and economic results.[5] On the other hand, the considerable increase in the supply of milk generated by the widespread use of the aforementioned technological model has changed the relationship between milk destined for domestic consumption (with a discounted price) and milk destined for the export industry. As the amount of the latter has increased, the final price (which is a combination of both) has tended to gradually, but steadily, decline. As a result, final prices for the producer have tended to decrease. The decrease in international prices has also influenced this fall (Hernández and Pereira, 1994). As a result, an adjusted economic calculation of dairy production is increasingly important in recent years as a way of estimating the final economic results and as a procedural tool for decision-making on the farm throughout the year. Based on the above, it is thought that the effort in the coming years should be put into the registration and economic calculation techniques. This is assumed as the new technological gap that needs to be bridged and that new methods and techniques in this area will have a proportionately greater effect.

The premise guiding the study is that there is variability among dairy farmers that should be taken into account when building a management system ("a management technology") for dairy farms. In other words, we believe that a management technology should not be the same for all dairy farms, but that different management systems adapted to the particularities of different types of farms should be built, or at least different modalities within the same management system. In this context, our research focuses on identifying and characterizing the various behaviors of dairy farmers from the management point of view, and the variables that explain this differential behavior.

Achieving this, will demonstrate the heterogeneity of dairy farms and allow building a typology of farms with different management structures and processes.

II. CONCEPTUAL FRAMEWORK

From the conceptual point of view, there are two central terms to this study; these are: ***company*** and ***management.*** Defining the first one. The ***agricultural company*** is defined in the Rural Administration manuals as "the unit that brings together a set of resources under a single administration". These resources are allocated to a production process in order to meet the company's objectives (Frearía and Nin, 1993). However, this broad definition has, in our view, the disadvantage of grouping a very different set of companies. This use of the term determines entrepreneurs to all those who control the resources; that is, those who make decisions about their use. This could be avoided by adjectivizing the term. To begin with, a distinction could be made between capitalist companies and family companies to separate two large groups that have different production objectives. However, it does not seem adequate for small dairy farmers who milk ten cows, to

[3] Census figures clearly demonstrate the increase in productivity and efficiency of dairy farms. In fact, between 1982 and 1992, the submission to pasteurization and industrialization plants in Uruguay went from 495 million to 789 million liters respectively (equivalent to an increase of about 60%), while the number of senders decreased, from a figure of 7,208 in 1982 to 5,998 in 1992 (MGAP-DIEA, cited by Hernández, 1994).

[4] This model will henceforth be referred to as the "improved technology package".

[5] This statement arises from the observations made by CONAPROLE technicians and by the producers. There is no published information about it.

be defined as family businessmen. In addition - and this is the main problem - there is a risk of assuming that because we call them entrepreneurs (family or capitalists, but entrepreneurs at last) they behave in the same way. As the axis of our research is precisely to identify the diversity of social subjects within the dairy production, a homogenizing concept that treats everyone as entrepreneurs, confuses rather than clarifies.

The second term that needs to be clarified is ***management.*** For this, two paths were followed: on the one hand, nine CONAPROLE technicians, involved in the technical assistance and future users of the project, were asked what was their concept of the term management. On the other hand, its definition was searched through a bibliographic review.

The opinions of the interviewed technicians were diverse and, in some cases, opposite. Some technicians attributed a restricted meaning to the term management, assimilating it to the registration and analysis of physical and economic values of the farm.

Other technicians gave the concept of management a more comprehensive meaning, including, in addition to registration and numerical analysis, planning and decision-making on how to use physical and economic-financial resources.

The definitions of the term management in the literature are varied. According to Brossier and others (1990) the term ***gestion*** (in French) appears closely associated with the concept of decision, or, in other words, derives from the theories of decision, coming from economic science or sociology. Also, according to these authors, the term management is associated with accounting, since many tools called management are based on accounting rules. Likewise, from a pragmatic "American-style" approach, important mathematical modeling efforts have been made with limited implementation success (Brossier and others, 1990. p. 65). Hennen (1995) points out that the term ***farm management*** is so comprehensive that it is difficult to define. Webster (1988, cited by Hennen, 1995, p. 25) defines ***farm management*** as "the process by which resources and situations are manipulated by the producer [farm manager] in the attempt to - with the incomplete information available - achieve his objectives". Consequently, it becomes indispensable to have specially collected information in order to make decisions with minimum uncertainty. Therefore, from this perspective, information is a key resource to achieving efficient and cost-effective farm management.

In Spanish-speaking literature, the term ***administración*** is frequently used to designate the way in which the farm's financial and economic resources are handled and used. It is then worth asking, is management the same as administration? Being possibly a Gallicism, is it however analogous to the Anglo-Saxon term "management"? As seen, there are many inaccuracies regarding the use of the term. Let us provisionally accept that the term refers, on the one hand, to the farm's physical resources, and, on the other hand, to the use of the "physical and accounting registration techniques that allow making decisions (procedural situation) and calculations of economic and financial results. That said, we postulate that management would thus refer to the synergistic combination of two technologies: the farm management technology and the registration and economic calculation technology. In this sense then the term is similar to "management" and perhaps also to administration.

So why not use the more widespread term of administration? Even if it were for simple fashion, when one word replaces another it is because it carries some different meaning. If the emphasis of the term ***management*** is on the aspects of registration and accounting calculation, then we consider the distinction valid with respect to the term ***administration.***

Taking into account the postulate that management is a combination of two technologies, it is also pertinent to make some comments regarding the technological issue. On the one hand, as we saw above, the Uruguayan dairy production has developed an "improved technological package" that is well proven and has been successful at least in achieving productivity increases. Whether it has also managed to increase profitability or revenue, is more debatable. This topic leads us to discuss whether the technological package should not be more than one, to adapt it to different situations. But that discussion is outside our scope, for the time being. This improved technology package has some components that technicians recommend by making adjustments and varying the proportions according to individual cases. They are management techniques of the farm's physical resources that have been long tested. Producers adopt them or not, and they can adopt them in varying proportions. There has been a wide debate in the Latin American scientific field on how these technologies are generated, which, in general, has tended to show the asymmetrical ability of social groups to influence the State (Piñeiro and Trigo, 1983). The debate has also been broad on the ways of adopting technology, identifying

different schools of thought in the field of agricultural extension.

As for the management component referred to the physical and accounting registration and economic and financial calculation, we think that if it is accepted as a technology, it would be necessary to investigate in greater depth, for example, if the theory of Rogers (1983) can be applied to explain the process of its diffusion, or if we can build a map of the incentives and restrictions that exist behind the decision to use a registration and economical calculation technology.

This research is based on the assumption that it is not necessary to work on one of the components of the term management, i.e., on the management of physical resources, because the current "improved technological package" is considered sufficient (capable of being improved and adjusted, but essentially correct). The study aims to focus on the second component of the term management which is the physical registration of the farm, the accounting records and the calculations of the economic result. Moreover, the information from this technology will be used to improve decisions in the field of resource management (that is, to improve the technological package even more). Therefore, as stated above, it is very important to understand: (a) if this is a new technology for the producer, (b) what are the incentives or limitations for its adoption, and (c) how is the adoption process of a management technology (to be able to influence this process). Based on this study we will outline some comments on these three aspects in the final reflections.

III. METHODOLOGY

A methodology of an interpretative nature (also called naturalistic or qualitative) was chosen to carry out the study. Since the '70s, this approach has been increasingly used in the social sciences as an alternative to the positivist model, also commonly called the quantitative method. The interpretive approach is used when seeking to achieve a greater understanding of a phenomenon, a situation, or a particular social process.

From this research perspective, the researcher does not manipulate the studied behaviors or impose a priori any unit of measurement on the results of the study but elaborates theory from the information collected. This method does not intend to demonstrate preconceived hypotheses, but the information is analyzed inductively in order to obtain results not anticipated at the beginning of the study. In other words, through qualitative research, the researcher first collects the information and then tries to understand[6] the results and reveal the theory they conceal (Borg and Gall, 1989).

To gather the information, the qualitative method frequently uses purposive sampling, instead of the representative or probabilistic sampling used in positivist research. In purposive samples, the individuals that are investigated, are selected based on certain criteria defined at the beginning of the research, to cover a wide range of realities or multiple situations (Borg and Gall, 1989). When the population to study is not precisely characterized, and the researcher is still exploring and developing theories, it is more convenient and appropriate to use purposive samples than representative samples (Arber, 1993). Thus, since our object of study is the characterization of producers from the point of view of management, and not having previous knowledge about the management methods used in dairy farms, we considered that purposive sampling was the most appropriate way to approach the study of the subject in question.

The collection of information consisted of two successive phases: (a) interviews with a selected group of CONAPROLE technicians, and (b) interviews with dairy farmers.

(a) Open interviews were conducted with nine CONAPROLE technicians working in the four zones into which dairy production is divided: Canelones, Florida, San José and Litoral Oeste. The main objective of these interviews was to make a first approach to the subject of management and decision-making regarding dairy production from the technicians' perspective.

These interviews lasted from one and a half to two and a half hours depending on the technicians' availability. Interviews with the technicians took place between 31 March and 30 May 1995.

(b) Based on the variability seen in the producers' characteristics of interest for the investigation, it was considered possible to conduct interviews with a total of 40 producers. The selection criteria were provided by the researchers, being the head of the Extension Department of CONAPROLE in charge of the actual selection of the producers. The problem researchers faced when defining the purposive samples, was finding variability in the main attribute

[6] In Anglo-Saxon literature, the word "verstehen" (from German) is frequently found, which Weber used, in his writings on research methodology, to designate the comprehension process.

that was interesting to investigate: the way producers keep the physical and economic records of the farm. In the absence of a previous description of the producers based on this attribute, a categorization of the dairy producers who submit to CONAPROLE, carried out by the Extension Service, was taken as a basis, according to a variable called "entrepreneurial capacity". This variable, although it was never clearly defined, points to the possibilities of farm development taking into account the capacity of the family nucleus, the existence of successors, the "push" and the producer's interest. Undoubtedly, there are important differences in the application of this classification criterion by the different technicians that this form of evaluation entails. However, the research team considered that this "synthesis" variable could be related to the variable they were interested in studying (diversity in the records). Therefore, a distribution of the dairy producers submitting to CONAPROLE was requested according to four strata of farm size and three categories of entrepreneurial aptitude (from lowest to highest: 0, 1 and 2). This information is summarized in table 1. The researchers "closed" the criteria to select the interviewees even more due to the limitation of the existing resources for the research implementation and to the idea that they were not elaborating a representative sample but looking for variability in the way producers keep records. Thus, it was decided: (a) to select within categories "0" and "1" among the producers of the most typical surface range of their category; (b) to conduct a similar number of interviews with "pure" and "diversified" dairy farmers for category "2", without considering the surface strata.

Table 1. Distribution of dairy producers submitting to CONAPROLE according to categories of entrepreneurial capacity

Stratum size (ha)	Total Submit	%	Category "0" Submit.	%	Category "1" Submit.	%	Category "2" Submit.	%
0-50	1474	39	390	64	732	46	352	22
50-150	1444	38	180	29	600	38	664	42
150-300	464	12	29	5	169	11	266	17
>300	385	10	14	23	80	5	291	19
Total	3767	100	613	100	1581	100	1573	100

Source: CONAPROLE, 1995.

In short, the dairy farmers to interview were chosen according to the following cuts, as we requested, clarifying that we were interested in reasonably "typical" producers of their category and not necessarily "better", nor with a larger surface area:

- Ten interviews with producers of category "0" among those farms smaller than 50 hectares;
- Ten interviews with producers of category "1" distributed between the surface ranges "less than 50 ha," and "50-150 ha" (which accumulate between them more than 80% of the total category);
- Ten interviews with category "2" producers dedicated exclusively to dairy farming;
- Ten interviews with producers of category "2' also dedicated to another activity (livestock, grains, etc.); these were selected mainly in the coastline basin since they are the most typical of this subcategory.

Finally, as the classification of producers according to entrepreneurial capacity could be influenced by the subjectivity of the technicians of each region, it was requested that the interviewees come from several regions of the southern and coastline basin, although, it should be clear, that no criterion of geographical representativeness was used.

The interviews were conducted with a guideline that contained the following items: basic data of the farm and its productive history; composition and workforce provided by the family nucleus and wage laborers; decision-making processes in the production and domestic units; herd characteristics and technology package application; group membership and technical advice; physical and economic records; future prospects; etc. Interviews with producers were conducted between August and October 1995.

IV. RESULTS

The repeated reading of the forty interviews, identifying the different topics, allowed grouping the producers into four different groups according to the way of keeping (or not) the physical-productive records and according to the way of keeping (or not) the economic-financial records. Having identified these four groups of producers (according to the type of records), the next question that the researchers tried to answer was: what were the factors that influenced the formation of these groups?[7] The identification of these factors came from two areas: on the one hand, from the nine interviews previously conducted with CONAPROLE technicians, who suggested some of the factors and guided the search; and on the other hand, the repeated reading of the interviews and the isolation of the most frequent factors in the interviewees' own words. In this way, a typology of producers was elaborated, which is described below:

TYPE 1 ("Disintegrated"). Most of these producers do not use any or use only one of the techniques recommended by CONAPROLE, but these do not affect productivity. In fact, these usually record low productivity per milking cow[8].

The "account" of the services, estimated calving times, cows' drying period, each cow's milk production, breeding, etc. are kept from memory or with a very elementary record consisting of a calendar or a notebook. Production decisions (drying, entore, supplementation, livestock selection, etc.) are not made or are scarce and (if they are made) are based on memory or an elementary record.

Also, most do not belong to groups of producers. When they receive technical assistance, it comes from the Cooperative itself, but the presence of the technician is rather sporadic with little capacity to influence farm decisions.

Actually, they are producers with little or no integration to the agro-industrial system. This generates an attitude problem towards physical records, to the extent that it could be assumed that the use or "compliance" to the proposals of use of the technological package, is the first step for integration. Without the use of these techniques, it will be difficult to use registration techniques, since the need for these records is stimulated by the use of the aforementioned technological package. This attitude is reinforced because generally, these producers have small herds, in which the cows are known by name and the tendency is to keep the "account" of services, calvings, calves, productivity per cow, etc., "in the head". As these producers also tend to have low levels of training, it is very clear that the "costs" of keeping these records are not compensated (in their perspective) by the benefits they could provide.

Since most of this subset of producers are also at strong or initial levels of decumulation, the non-perception of profits acts as a strong discouragement to the interest in understanding the economic results of the farm. There are no economic and financial calculations. CONAPROLE's payment is not fully understood. The low levels of training and the evident difficulties in understanding complex operations that involve economic calculations reinforce the image of a producer whose main characteristic is disintegration. With some frequency, these family nuclei contain family destructuring or even ill members. In cases where the family nucleus is composed of elderly people, there is no clear line of succession.

It should be emphasized that, although these situations are associated with small farm sizes, not all small producers share this TYPE 1. On the contrary, most of them are in TYPE 2, described in the following section.

Conclusions for TYPE 1. It would seem clear that efforts directed at this type of producer would be sterile if they focused on physical or economic records. Rather, these efforts should be aimed at the adoption of the techniques recommended by the technology package, while in the area of registration, efforts should be made on physical records, with a moderate expectation towards positive responses. The lack of training, which was mentioned as a strong constraint on registries, should be addressed with particular attention.

TYPE 2 ("Agribusiness wage-laborers"). Unlike the previous type, these producers are strongly integrated into the agroindustry.

They use some or several of the techniques recommended to achieve incipient effects on the productive results of the farm. The "account" of the services, calving periods, drying of the cows, production of each cow, breeding, etc. are kept in simple registers such as calendars, notebooks, or forms (of CONAPROLE). The herd size is greater[9] and in most cases influences record-keeping although the

[7] It is not appropriate to refer to them as determining factors.

[8] The number of milking cows in this TYPE ranges from 7 to 30 cows.

[9] The herd size in this TYPE is between 13 and 75 milking cows.

size is still small and can act as a limit for some of the more complex record-keeping operations. The training levels of the decision-maker or his close relatives are also higher, predominantly what has been described as equivalent secondary training. But there are also levels of equivalent primary and tertiary training, acting in each case as a restriction or stimulus to improve registration systems.

The predominance of farms with moderate decumulation or economic balance discourages interest in keeping economic records. The only or main economic instrument is CONAPROLE's payment, which is understood in its main aspects. The main concern is cash flow and its symbol is the result of the aforementioned payment. The importance given to this instrument is equivalent to the wage of a worker or employee. The concern is focused on the final balance of the payment, on understanding the discounts that CONAPROLE has made, and on checking whether the purchases made in the Cooperative were properly debited. The positive balance of CONAPROLE's payment is necessary (as a salary) to cover the current expenses of the household: the store, electricity bills or school supplies.

There is a strong tendency to make all their purchases and expenses through CONAPROLE, not only because credits are obtained and the forms of payment are simplified, but also because in this way CONAPROLE's payment becomes the main instrument of economic control. In addition, these farms tend to have low incomes from other sources (except in some cases from off-farm salaries of family members). Rather, income from sources other than the sale of milk is due to the need to "patch holes" more or less unexpected. Dry cows or calves are sold to pay property taxes or to fix the tractor. Groups membership or non-membership does not seem to be a factor affecting whether or not members of this TYPE keep physical and economic records since all possible situations were found.

As for the family cycle, there is a clear predominance of consolidated families with teenage children or young adults, who work under the parents' direction and share the domestic unit. In cases where families are at a later stage of fission, family succession is clearly identified.

farms with scarce natural resources predominate, possibly with excessive family labor and **an unfavorable relationship between producers** and consumers, which also explains the accumulation difficulties.

Conclusions for TYPE 2. The description that has been made of this TYPE has emphasized the image of an agro-industry employee. The attitude, the reasoning, the way of seeing farm problems of this producer, is much closer to that of an employee than of an entrepreneur.

It must be clear that the responsibilities for the construction of this behavior (both in its positive and negative aspects) lie with both the producer and the agro-industry. Undoubtedly, this occurs because of how agro-industry operates: the obligation to take on every producer who wants to start, the financing systems, the partially subsidized technical assistance, the systems of internal redistribution of income, and the clientelistic relations, appear, among others, as instruments that contribute to generating dependence of the producers towards the agro-industry. From the producers' side, the structural limitations that most of them have, make the farm of this type of "wage" relationship in which the company finances part of expenses and investments, are perhaps a necessary condition for their initiation and subsistence as a dairy producer.

If this diagnosis is correct, the use of economic records is hardly felt as a need by producers. Physical records, on the other hand, can be perceived as an important contribution to the improvement of the conditions of farm production, that they can contribute to improving the productivity and therefore the net monthly income. The emphasis should therefore be placed on this type of registration and on improving the training conditions of producers in those cases (few) in which this may be a limitation. CONAPROLE's payment could also be improved (for example by detailing the expenses of each producer as it was in the past) and encouraging them to keep a simple book of income and expenses of the farm with those expenses and income (few) that do not go through CONAPROLE's payment. In the case of insisting on complex economic registration, it may be seen as something external, as an imposition of the technician or the Cooperative.

However, this situation will not raise resistance (due to the asymmetrical relationship that exists with the Cooperative) but only indifference.

TYPE 3 ("Quasi-entrepreneurs"). In this TYPE, the use of the recommended technological package is widespread: several or all techniques are used with clear effects on the farm's productivity. However, on some farms, the use of techniques may be incomplete and the synergistic effect of the techniques on the farm may be in an early stage. The

herd size is greater than the previous TYPES and is already a clear stimulus for record-keeping.[10]

The first defining element of this TYPE is that the "account" of the services, periods of calving, drying of cows, production per cow, breeding, etc., are kept in simple registers (calendar, notebook, etc.) or more sophisticated such as individual forms or cards per cow. This information has been collected for a long time, regularly and is an instrument of common and decisive use for productive decisions. Moreover, the predominant training levels in this producer's TYPE are comparable to secondary and tertiary.

In terms of economic results, producers with positive net income and a moderate capacity for accumulation predominate. Producers belonging to groups also predominate in this TYPE, who receive periodic technical visits and in many cases who also meet periodically at other producers' homes. They are strongly integrated into the agro-industry.

The second characteristic that defines this TYPE is that, in terms of economic records, CONAPROLE's payment is used and fully understood. Written records (notebook, cash book, bank accounts) are kept for other expenses not made through CONAPROLE and income not coming from milk. Cash flow is still the producer's main concern, but they are interested (or initial actions are being taken) in knowing economic performance measures. This "quasi-entrepreneurial" behavior is a consequence of the fact that they have a certain capacity for accumulation, not only because there are positive results from the sale of milk itself (that is, from the functioning of the dairy farm) but also because there is usually a certain amount of income from other sources. More often these come from the sale of dairy cattle, but in some cases, there is also income from other items (beef cattle or agriculture) that although being clearly subsidiary items of the dairy, they can contribute to the total net income. Usually, in these farms, the disposition of natural resources is not a limitation or is not a strong constraint on the company.

The family cycle does not seem to have an impact since almost all the defined categories are found. However, none of the families are in the process of family fission without clear succession. This situation must therefore be a limitation to belonging to this TYPE.

Conclusions for TYPE 3. In this type of producer, physical registration is kept regularly and therefore only some cases may need an effort to improve and clarify the registration systems. In terms of economic registration, they are clearly the producers who most easily approved the use of the economic registration proposed by CONAPROLE. For many of these producers, the absence of such records is perceived as a limitation. Some of them are already in the process of creating their own economic registration or are starting the green or blue folders. Therefore, it is the group that can have the greatest differential impact from the technique of economic registration. While decision-makers with tertiary training levels seem to predominate, there are also some producers with secondary training levels. Therefore, a conscious and sustained effort will be required in non-formal training of registration management, recording techniques and the use of necessary abstractions to understand the results. The favorable disposition of producers should facilitate learning.

TYPE 4 ("Diversified entrepreneurs"). This producer TYPE uses several or all techniques of the technological package recommended by CONAPROLE with clear effects on the farm's productivity. The herd size requires the use of physical registration.[11] Therefore the first feature that distinguishes this TYPE is that the "account" of services, calving times, drying of cows, cow production, breeding, etc., is kept in simple or sophisticated registers as an inherent part of the farm management and is always used in productive decisions.

Farms show positive results in net income with clear signs of accumulation. Together with equivalent levels of tertiary training, it results in what would be the second characteristic of this TYPE and is that in terms of economic registration, the cash books and **CONAPROLE**'s payment are complemented by the use of the green folder, the blue folder, accounting balances and economic-financial results, etc. These are used in economic-financial decisions and medium-term planning. In addition, the measures of the farm's economic result are known and operation is based on a clearly business logic that seeks the profit from the invested capital.

Technical assistance (agronomic, veterinary, accounting, tax) is always present, to some extent. However, group membership does not appear to be a requirement as these farms can pay for individual technical assistance.

[10] In this case, the herd size ranges from 28 to 120 milking cows.

[11] The number of milking cows within this TYPE amounts to 70-124 cows.

The natural resources in these farms are often abundant. They are generally farms that complement livestock production or agriculture with dairy farming. In the production scheme they have set up, the dairy provides them with the monthly income that allows them to finance the current farm's expenses. The administration of the dairy production is individualized with respect to the administration of the other productive items and, in addition to providing the current farm's expenses, the dairy production is expected to be self-financed. Otherwise, there would be no problem in discontinuing it. This position makes its attachment to agribusiness neither weak nor strong but conditional on economic results.

As in the previous TYPE, there are families in all phases of the cycle except for fission without family succession, which would indicate that this situation is a limitation for belonging to this TYPE of producer.

Conclusions for TYPE 4. In producers of this TYPE, physical registration and economic performance measures are firmly established in the management. Difficulties are not expected in the use of the economic management techniques that the Project is recommending. In the case of producers who do not currently maintain economic and financial registrations as complete as those recommended by the Project, there should not be difficulties in the implementation of these new records. The equivalent training levels of these producers will facilitate this instrumentation. However, to the extent that most producers of this TYPE already use similar economic calculation instruments, the results of the use of this new management technology in this TYPE are not expected to cause major changes in the farm management and the adjustment of its results.

V. FINAL THOUGHTS

How new is a physical registration and economic and financial calculation technology (p.r.e.c.t.)? Interviews reveal that it is a simplification to assume that this technology does not exist among the different types of dairy producers. In some cases, there is a proprietary non-objectified technology, which through mental or partially written annotations, keeps a rudimentary account of the physical aspects of the farm and through records such as CONAPROLE's payments, the producer carries at least one cash flow and possibly performs calculations of rudimentary economic result. In other cases, the level of formalization of the physical registration is higher, with greater written support and apparently perform calculations of rudimentary economic result.

In some farms (possibly few) the physical and economic records are kept with high accuracy.

As proposed when constructing the four TYPES, the greater or lesser formalization of this process depends in part on structural factors (and therefore difficult to modify) but also on non-structural factors. Farm size and stage of the family cycle are among the first. Also difficult to modify, but with some greater possibility of manipulation are the herd size and the ability to accumulate surpluses. More easily modified factors include factors that were identified as group membership, training of the decision-maker and his family group, and the technology package.

Although, in theory, the seven factors are modifiable (because even the most structural as the farm size can be "expanded" by the rearing fields), undoubtedly, in the last three it is possible to put efforts with the expectation of greater results.

It is important to bear in mind that when a management technology is referenced, it is a question of the objectification and rationalization of a form of physical registration and economic calculation. First, it must be recognized that more than one way is possible. The technology that is currently being applied for physical, economic and accounting registration is close to the type of registration developed for a capitalist company whose objective is the maximization of the profit rate. When TYPE 1 and TYPE 2 were discussed, it became clear that this type of economic calculation does not apply to the owners of these farms. It is necessary to ask whether this technology, as it is being developed, applies to all farms, and if not, whether it is possible to develop several registration and economic calculation technologies adapted to the different objectives and procedures of the different farm types.

Another conclusion that would seem to emerge from the research is that the factors that intervene in the decisions to adopt a technology for the physical management of dairy farms are not always the same (and can also intervene with different "strengths") as the factors that would influence the adoption of technologies for physical registration and economic calculation. Without delving into this aspect, we will say that the factors that seem to intervene in the decisions of technological adoption are more and their interaction more complex, than the factors that intervene in the adoption of the

techniques of physical registration and economic calculation.

As some of them coincide, their modification would affect both management decisions and economic registration decisions.

ACKNOWLEDGMENTS

We thank the directors of the Dairy Producers Business Training Project: Ing. Agr. Jorge Alvarez (Agronomy College) and Agr. Daniel Zorrilla (CONAPROLE) for the support provided during the implementation of this study. We also thank the CONAPROLE technicians and the producers who kindly provided the required information and dedicated some of their time to the interviews. Finally, we would like to express our appreciation to the CSIC and CONAPROLE for providing their financial support, thus enabling the implementation of this Project.

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