Milk recording as an indispensable procedure to assure milk quality

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ABSTRACT - Brazilian milk production has increased significantly in the past two decades, but a good part of the dairy farms do not present yet the degree of specialization needed to assure the quality standard internationally accepted. This professionalization of the dairy sector depends on the establishment of services of performance recording and technical assistance to farmers, similarly to what is done in countries with more developed dairy chains. Performance data bases are the essential tool for optimal herd management practices, for dairy cattle genetic evaluation programs, for animal and dairy products traceability programs and for the strategic planning of the dairy business as a whole.

Key Words: dairy cattle, herd improvement, records of performance

O controle leiteiro como procedimento essencial à qualidade do leite

RESUMO - A produção de leite no Brasil aumentou significativamente nas últimas duas décadas, mas boa parte das propriedades produtoras de leite ainda não apresenta o grau de especialização necessário para a garantir o suprimento de leite com o padrão de qualidade aceito internacionalmente. Essa profissionalização do setor depende do estabelecimento no País de uma estrutura de serviços de registros de desempenho e assistência técnica aos produtores rurais, nos moldes semelhantes aos adotados nos países de pecuária leiteira desenvolvida. Bases de dados de desempenho zootécnico são a ferramenta essencial para o manejo racional dos rebanhos, para os programas de avaliação genética de gado leiteiro, para os programas de rastreabilidade de animais e produtos lácteos e para o planejamento estratégico da cadeia láctea como um todo.

Palavras-chave: gado leiteiro, melhoramento de rebanhos, registros de desempenho

Introduction

Producing high quality milk is the overall goal of the dairy chain for three major reasons: food safety, manufacturing efficiency and consumer satisfaction. Food-borne diseases are intimately associated with consumption of dairy products due to the fact that milk is highly perishable and provides an excellent environment for multiplication of microorganisms. Additionally, infectious diseases affecting dairy cows are easily transmitted to humans through milk, being the reason for generalized adoption of milk pasteurization worldwide. Milk is highly susceptible of biological, physical and chemical degradation, what alters drastically its composition and shelf-life, negatively impacts its processing properties and ultimately hampers profits throughout the whole chain. Finally, low quality milk does not fulfill its nutritional potential and adds undesirable taste and flavor to the dairy products, failing to please the consumers who are the economic drivers of the activity. The value which estimates the combined success of the production, harvesting, transport, processing and commercialization processes is referred to as milk quality (Dürr, 2006). Therefore, obtaining milk with high quality standards is a permanent effort of good practices for the entire dairy chain in order to prevent hazards in all stages, "from farm to fork". Failure in any phase determines loss of quality regardless of previous efforts. However, factors affecting raw milk quality before it reaches the processing plants are responsible for most cases in which milk quality standards are compromised. Therefore any strategy to assure milk quality necessarily needs to place a significant emphasis on the practices at the farm and at the raw milk transportation to the industry. That was the reasoning behind the publication of the Normative 51/2002, by the Brazilian Ministry of Agriculture (Brasil, 2002), which is meant to regulate raw milk quality and has promoted intensive

debate and effective modernization within the sector. A significant effort to broadcast the basic concepts behind this normative among dairy producers, milk collectors and extension agents has been made by several organizations since 1998 and therefore these concepts will not be discussed here. The aim of the present article is to show the importance of utilizing herd management records that allow dairy farmers to make informed decisions and adopt good practices that generate milk with high quality at the farm.

Discussion

Recording milk production per cow has been adopted as a common practice in many countries for more than a century (Figure 1). Besides quantifying production, other strategic information have been systematically recorded by dairy farmers, including milk composition, somatic cell counts in milk, events related to lactation and reproduction as well as additional information such as sire ID and reasons for disposal. These records are accumulated in regional and national data bases associated with recording and technical assistance services and formed the foundation of the milk production development and the selection of modern dairy breeds in countries with developed dairy business.

Overview of milk recording in Brazil

The Brazilian Institute of Geography and Statistics (IBGE) reports that in the 2006 agricultural census there were 1,349,326 rural units that produced milk in Brazil (IBGE, 2011). It is interesting to consider yet two other statistics from the census: 33,060 farms utilized milking machines (2.45%) and 19,348 farms applied artificial insemination (1.43%). The obvious conclusion is that even considering that the total number of dairy farms considered in the census seems to be significantly inflated with units that were not really specialized in dairy production, the number of farms adopting basic technologies such as mechanized milking and artificial insemination is extremely limited. The situation is drastically worse when it comes to milk recording practices. Costa et al. (2010), working with the national Holstein data base, reported records from 732 herds only. Two dairy herd improvement services from Southern Brazil (Paraná and Rio Grande do Sul) report a very modest number of herds in milk recording as well (Figures 3 and 4).

Although Brazil produces over 30 billion liters of cow's milk per year and has a dairy cow population of almost 20 million heads, it still behaves as a developing country when it comes to having a negligible number of herds under organized milk recording. Having experienced an accelerated growth during the past two decades, the Brazilian dairy sector incorporated into the business a countless number of farmers and workers coming from other agricultural activities and, consequently, without enough technical background to adopt the appropriate technologies for milk production. The risks of keeping this "amateur" profile are quite evident:
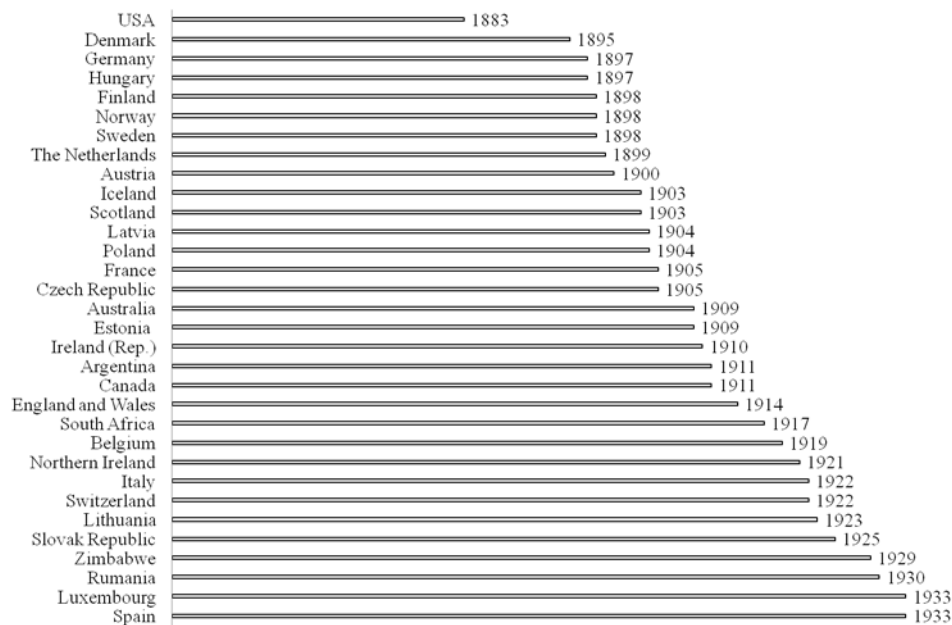
Source: ICAR (2011)

Figure 1 - Year in which organized milk recording activities started in different countries.

• Suboptimal herd management – jeopardizes the sustainability of the individual units in the long run, especially the small family farming units, which are the absolute majority. Considering the social importance of the dairy business in Brazil, this constitutes into a serious threat.

• Erratic technical support – the absence of systematic records prevents the establishment of systematic professional assistance from veterinarians, animal nutritionists and breeding specialists. The only possible assistance focus on the solution of immediate problems, not on planning, prevention and investments. A valid comment here is that reversing this situation also requires a cultural change among the technical assistance agents and starts at the educational programs currently in place in many technical schools and universities.

• Ineffective programs for improving milk quality – milk quality is usually assessed by laboratory analyses from bulk tank milk samples, which represent the momentary state of the raw material received by the industry. By this approach, it is possible to establish a diagnosis of the problems (e.g. subclinical mastitis, poor nutrition) but it provides very little input for the herdsman to find effective solutions. Only individual cow records can point out what needs to be done to solve problems and especially to prevent deterioration of the milk quality.

• Lack of strategic planning for the sector – not having a representative centralized data base of animal records means no precise knowledge about the situation of livestock in the farms and very little control over several strategic variables. Governmental agencies are unable to neither establish a realistic risk assessment for investments in the sector nor evaluate the impact of specific policies that have been put in place.

• Lack of traceability – animal recording presupposes animal identification and performance annotation. For those types of animal production in which harvesting happens once in a lifetime (slaughter), animal identification alone may provide consistent traceability for both health programs and final product quality control. However, in the dairy activity harvesting happens daily, and the link between the individual cow and the milk she produces gets diluted first in the bulk tank and definitely in the industry. Effective traceability in dairy cattle is only possible through regular milk recording. Even if the country is not an exporter of dairy products, considering that dairy cow disposals are part of the meat chain, traceability of dairy animals impacts the beef exports as well.

• Impossibility of genetic evaluation of livestock – records of performance is the most valuable asset of any animal improvement program. They constitute the phenotypes that will be used to predict the genetic merit of individuals, no matter which technology is applied for that. Not only have the traditional progeny testing schemes always depended on performance records, but also the novel genomic evaluation methods do. Not having a comprehensive national genetic evaluation program restricts genetic improvement of the cow population and determines a permanent dependency on imported genetics. In the Brazilian case, the average productivity of the cows is among the lowest in the world, and the incipient adoption of artificial insemination using genetically evaluated bulls indicates no prospective changes.

Milk recording and quality

Figure 2 presents the main types of information regularly recorded at dairy farms for management purposes that, once accumulated into regional or national data bases, provide a sophisticated tool for strategic decisions affecting the whole sector. Since the focus in this article is on the impact of milk recording to improve milk quality, this topic will be used to illustrate the information flow and the benefits of having an organized recording scheme in place.

Usually programs to improve milk quality are heavily focused on laboratory results obtained from regular bulk tank milk samples, consisting of milk composition, somatic cell counts (SCC), bacterial counts and antimicrobial residues. These indicators entitle the industry to verify the degree of degradation of milk's properties, failures in the hygiene and cooling system, deficiencies on the herd overall nutritional state, the health status of the mammary glands and the presence of contaminants. Based on such overview, industry decides about milk discards or type of processing and estimates the manufacturing yield. The tool used by the industry to stimulate dairy farmers to supply the best possible raw milk is a milk payment system based on penalties and premiums (Dürr et al., 2005). The message to the dairymen is clear: the higher the percents of fat and protein in milk, the higher the price per liter sold; the higher the SCC and the bacterial counts, the higher the penalties (discounts in the price). Although milk payment based on composition has been adopted very late by most Brazilian buyers, it is a concept well established in almost all milk producing countries worldwide.

Even though dairy producers can easily understand what are the attributes that the industry is after in terms of milk quality, in recently established dairy operations where technical knowledge about milk production is not yet well developed, it is evident the existence of a gap between the industry message and the dairymen capability of improving
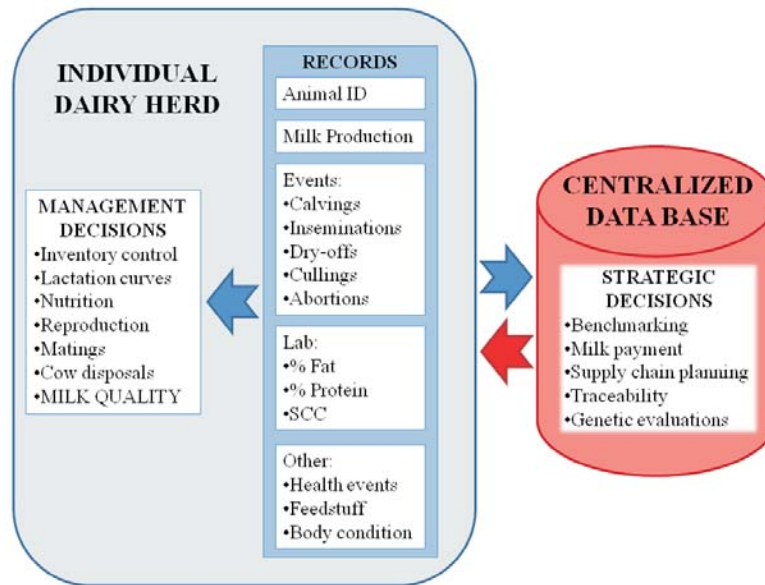
Figure 2 - Dairy herd records used for management decisions at the farm level and for strategic decisions at the dairy chain level.
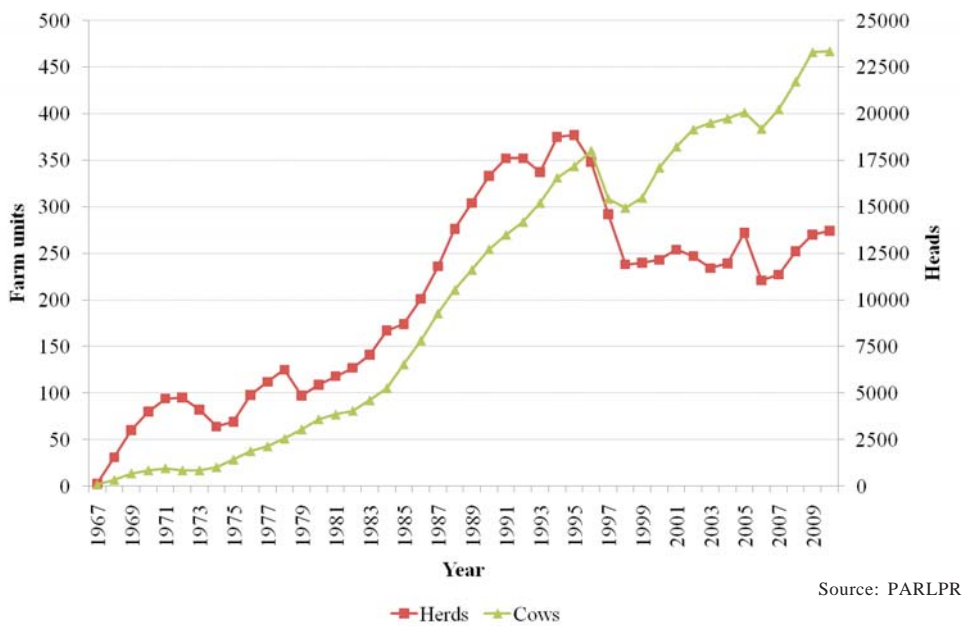

Source: PARLPR

Figure 3 - Evolution of number of herds and milking cows enrolled in the official milk recording at the Paraná state.

raw milk quality. It is not a trivial task for small and not specialized milk farms to optimize the management practices required to reduce mastitis, improve hygiene and refrigeration, and finally obtain substantial increases in milk components.

In countries were milk production has been an important economic activity for more than 50 years (Figure 1), the number of dairy farms and the delimitation of the producing regions have stabilized over time, with a relatively small number of "new entrants" in the dairy business. In the Brazilian case, however, milk production has experienced a tremendous evolution in the last two decades and a complete new map of dairy regions is still on the drawing board. While traditional producing regions such as the São Paulo state have recently decreased number of herds due to a strong competition with other agricultural activities, regions that had incipient or virtually no dairy herds 20 years ago are becoming extremely important in the national scenario (IBGE, 2011).

One of the consequences of having such differences in the dairy demography is that the average Brazilian dairyman is badly prepared to adopt adequate technologies
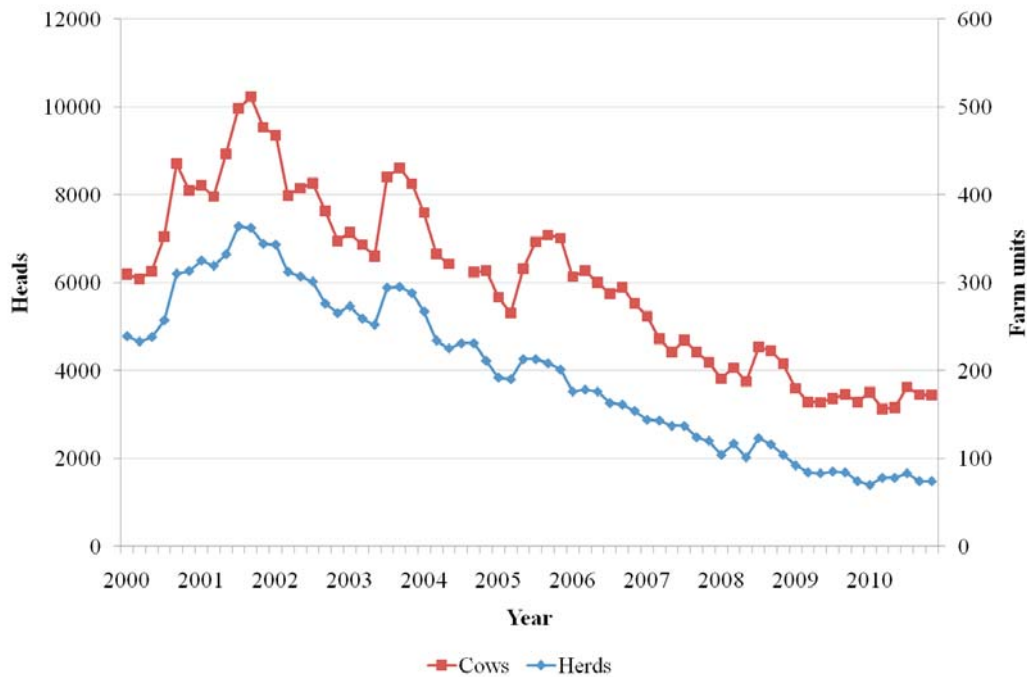
Figure 4 - Evolution of number of herds and milking cows enrolled in the official milk recording at the Rio Grande do Sul state.

for milk production when compared with the average dairy farmer from more specialized countries. The real deficiency that can be identified here is the absence of organized technical support services for the Brazilian dairy herds. The best known model of such services is probable the North-American Dairy Herd Information (DHI) associations, which are cooperative or associative organizations that provide services of laboratorial analyses, data base administration and technical assistance, and is generally referred to as 'milk recording services'.

As an example of how the records collected by DHI-like services are used to improve milk quality and aggregate value to dairy products, knowledge of individual cows SCC allows producers to explain drops in milk production for animals facing udder infection, as well as to forecast changes in milk composition and to assess the risk of antimicrobial residues in milk. Milk from cows with the highest SCC could be withdrawn from the bulk tank to avoid reducing the overall milk price, and cows would require special attention to avoid further losses. If only the bulk tank SCC is available, the possibilities of corrective measures are much more limited, and the producer will usually take action only after the milk quality and price are already affected.

Figure 5 also illustrates how the milk quality has improved for herds in milk recording in Paraná state,

regarding milk production and composition. There is a clear ascending trend for milk production, fat % and especially protein %, which reflects combined improvements in the herds' management and breeding decisions.

Possible actions

The International Committee for Animal Recording (ICAR) is an international non-profit body, dedicated to promote the development and amelioration of performance recording for farm animals and their evaluation through the establishment of definitions and standards for measuring characteristics having economic importance. In its Workshop on Animal Recording for Smallholders in Developing Countries (TRIVEDI, 1997) some common constraints for the development of animal recording were identified:

- Low awareness of benefits of recording
- Lack of right organizations for animal recording
- Lack of technical know-how
- Lack of finances

The above list still serves well to identify where priorities should be placed if a national program for developing milk recording is to be written and undertaken. It goes beyond the scope of the present document to suggest a possible action plan for the Brazilian situation, but if one is to be written, it necessarily needs to address the questions above.
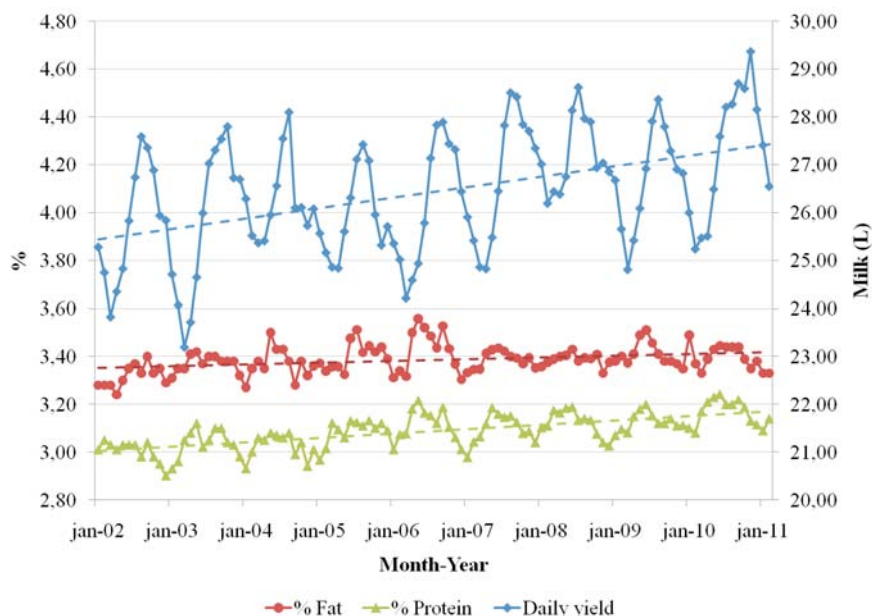
Figure 5 - Historical averages of test day milk production and composition in herds under milk recording in the Paraná state.

One fair comment would be about what kind of organization would be the right driver for this process. If we analyze the experiences around the world, the most common (and successful) situation is that milk recording is in the hands of farmer-owned service-oriented organizations. This type of organization does not exist in Brazil, at least for the purpose discussed herein. Breed associations, which have the legal mandate of collecting performance records in Brazil, do not conform to this description (with few exceptions, such as the APCBRH, in Paraná). The reason is not a matter of competence or good will, but of focus: breed associations have a clear mandate of promoting a specific breed and assuring an accurate representation of the breed by keeping genealogical records and conformation evaluations. Records of performance are not breed specific and require specialized infrastructure and services, which should receive priority by the organization in charge. Dairy cooperatives are not focused on recording either, since their main goal is to provide scale and aggregated value to the bulk of farmers' production. Finally, farmers' syndicates and federations are not service oriented at all, and would not be adequate for the task. Implementing effective milk recording will require a new type of farmer organization to be established.

Conclusions

Professionalization of the dairy business in Brazil passes necessarily by the establishment of milk recording services and a centralized data base which can provide the information necessary to all levels of the decision making process. Improving milk quality at the farm level without systematic individual cow records and technical assistance is neither realistic nor sustainable.

References

BRASIL. Ministério da Agricultura, Pecuária e Abastecimento. Instrução Normativa 51. 18 de setembro de 2002. (Regulamentos técnicos de produção, identidade, qualidade, coleta e transporte de leite). Brasília: 2002.

COSTA, C.N.; FREITAS, A.F.; COBUCI, J.A. et al. Genetic parameters for test day somatic cell count in Brazilian Holstein cattle. In: WORLD CONGRESS ON GENETICS APPLIED TO LIVESTOCK PRODUCTION, 9., 2010, Leipzig. **Proceedings...** Leipzig: German Society of Animal Breeding, 2010. (CD-ROM).

DÜRR, J.W. Controle de qualidade e aumento da competitividade da indústria láctea. In: MARTINS, C.E.; FERNANDES, E.N., DÜRR, J.W. et al. (Eds.) **Tendências e avanços do agronegócio do leite nas Américas**: industrialização. Juiz de Fora: Embrapa Gado de Leite, 2006. p.81-94.

DÜRR, J.W.; ANTONI, V.L.; TOMAZI, T. Pagamento do leite por qualidade no Brasil. In: CARVALHO, M.P.; SANTOS, M.V. (Eds.) **Estratégia e competitividade na cadeia de produção de leite**. Passo Fundo: Gráfica Editora Berthier, 2005. p.54-73.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA - IBGE. [2011]. Banco de dados agregados – Sistema IBGE de Recuperação Automática (SIDRA). Rio de Janeiro: IBGE. Disponível em <http://www.sidra.ibge.gov.br/bda/pecua/default.asp?z=t&o= 24&i=P> Acesso em: 20/4/2011.

TRIVEDI, K.R. Summaries. In: Workshop on Animal Recording for Smallholders in Developing Countries, 1997, Anand (India). **ICAR Technical Series**, n.1, p.11-23, 1997.