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Reference indexes of the goat milk price

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Abstract. According to the current EU legislation, all transactions of raw milk that take place in Spain should be registered in a contract. This contract must reflect, among other aspects, the price of milk, which can be fixed or variable. In case of being variable, it must be indicated on the basis of which that price will vary. Conscious of the importance of the reference used, the INLAC (Spanish Inter-professional of Milk) has made available to the sector some price indexes that serve as a reference for the contract. These indexes have been developed by the authors of this paper, which guarantees its transparency and impartiality. Based on interviews taking to traders and experts and using econometric adjustment methods (in which autoregressive techniques are involved), two indexes are proposed, both referring to the price of the total *Useful Dry Matter* content (protein plus fat): Index n° 1, reflecting the variation of market prices, and the Index n° 2 which also incorporates two factors regarding to the international market. A case-study shows a good adjustment between the real evolution of the prices and the behavior of the indexes.

Keywords. Goat – Reference index – Market – Milk price.

Indices de référence du prix du lait de chèvre

Résumé. Conformément à la législation UE actuellement en vigueur, toutes les transactions concernant le lait cru ayant lieu en Espagne doivent faire l'objet d'un contrat. Dans ce contrat doivent figurer, entre autres, le prix du lait, qui peut être fixe ou variable. En cas de prix variable, il doit être indiqué sur la base de quels éléments ce prix va varier. Conscient de l'importance de la référence utilisée, l'INLAC (Interprofession du Lait en Espagne) a mis à la disposition du secteur quelques indices de prix servant comme référence pour le contrat. Ces indices ont été développés par les auteurs de cet article, ce qui garantit leur transparence et leur impartialité. Basés sur des entretiens auprès d'opérateurs et experts et en utilisant des méthodes économétriques d'ajustement (à l'aide de techniques autorégressives), deux indices sont proposés, tous deux liés au prix de la teneur totale en matière sèche utile (protéine plus matière grasse): l'Index n° 1, reflétant la variation des prix de marché, et l'Index n° 2, qui incorpore aussi deux facteurs liés au marché international. Une étude de cas a montré un bon ajustement entre l'évolution réelle des prix et le comportement des indices.

Mots-clés. Chèvre – Indice de référence – Marché – Prix du lait.

I – Introduction

The current legislation requires that all supplies of raw milk which take place in Spain (from a producer to a processor) should be registered in a contract between both of them, prohibiting the marketing of raw milk which is not registered in the contract.

The contract, which has a minimum duration of one year, shall include, among others things, the duration, volume of milk, methods of collection, methods of payment and, of course, the price to be paid for that supply.

The price of the liter of goat's milk is calculated by multiplying the price of the Useful Dry Extract (sum of the fat content and milk protein) by the useful dry extract grades of the liter of milk.

The price of the useful dry extract, which should be agreed between producer and processor, may be fixed, variable or mixed:

Fixed: When signing the contract, a price for the milk will be set for each monthly payment, which will remain unchanged for the duration of the contract.

Variable: Starting from a base, the price will be calculated month by month based on a series of factors that will be established when signing the contract.

Mixed: including a fixed part and a variable part.

If the prices that are established have a variable component, it will be necessary to establish a reference that, once is applied, allows the calculation of the monthly price during the period of the contract. This reference will be an index with a numeric value. It is important that it is objective and not manipulable. Conscious of the importance of the reference used, the INLAC (Spanish Inter-professional of Milk) has elaborated and published it in its web, an index system for each of the three species: cow, sheep and goat ((<http://www.inlac.es/>). Goat indexes have been developed by the authors of this paper (Mena *et al.* 2014a, 2014b; Camúñez *et al.* 2016), which guarantees their transparency and impartiality.

The aim of this contribution is to explain how the indexes have been created and which are these indexes.

II – Material and methods

Through a questionnaire, the opinion of operators (producers and processors) and experts were collected. The objective of this questionnaire was to know their needs regarding the indexes, as well as to know which were the factors that, in their opinion, could be influencing the monthly variation of milk price.

After reviewing and discussing the factors that could be influencing the Useful Dry Extract of goat's milk price, and taking into account the sector's demands for the immediacy of the publication and the officiality of the resources, those that were considered relevant where selected. In all, five factors were used (Table 1).

Table 1. Factors constituting the two reference indices for Useful Dry Extract (UDE) price of goat's milk

Factor	Abreviation*	Source
Market price of UDE	PI-UDE-FEGA t-2	FEGA
Price or standard ration for goat	PI-Feeding.SILUM t-1	MAPAMA
Cheese consume at home	QI-cheese consume t-2	MAPAMA
Cheese import	Index-cheese import t-2	DataComex
Milk export	Index-milk export t-2	DataComex

* PI = Price index; QI = Consumption index

t-1 = data of the previous month; t-2 = data of the two previous months

FEGA : Fondo Español de Garantía Agraria

MAPAMA: Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente

DataComex: Foreign trade statistics

In order to have an index as up-to-date as possible (for example, the March index is available in April), it was decided to use the factor data corresponding to one or two previous months. That is, the index published in April, which will be used to establish the price of milk sold in the month of March, will have been created with the data of factors corresponding to the previous January or February.

Once the factors were selected, the next step was to establish which weight would have each factor in the index, since not all have the same importance. This was decided taking into account the opinion of the operators, making simulations and comparing the evolution of the index that we are constructing with the price of the ESU in the last former years, looking for the best possible adjustment. The adjustment mechanics used for the construction of a weighted average index were the following:

- Method of Ordinary Least Squares (OLS) and Minimum Squares with Correction of Autocorrelation of type AR (1)
- Autoregressive methods with delays in 1, 2, 3 or 4 periods.
- Data of 4 years (2012, 2013, 2014 and 2015) of 2 operators.

Finally, using the information given by a goat farm in Andalusia, a simulation was carried out in order to compare the variation between the real incomes and the simulated incomes using both indexes.

III – Results and discussion

Although there has been no unanimity in this issue, some of the operators surveyed demand a system of indexes that provide price stability, through mechanisms that reflect the reality of the markets, but that includes factors that prevent sudden price fluctuations. Other operators, however, call for indexes that accurately reflect the evolution of the goat milk market.

Finally, it has been decided to propose two indexes, both referred to the price of the Dry Extract Usefull grade. Index No. 1, which is a reflection of the variation of goat milk market prices, and the Index No. 2 that also includes factors that have been considered to make an influence on the variation of the goat's milk price.

In case of deciding to use the index system, the parties will freely decide which of these indexes best fits their needs, with the possibility of using a combination of both. The two proposed indexes are presented below.

Index 1 = $0'7017 \times \text{PI-UDE-FEGA } t-2 + 0'1885 \times \text{QI-cheese consume } t-2 + 0'1098 \times \text{PI-Feeding.SILUM } t-1$

being PI = Price index and QI = Consumption index.

This index, which could be called "simplified", reflects the market trend, although with two months of delay.

Index 2 = $0'3618 \times \text{PI-UDE-FEGA } t-2 + 0'1763 \times \text{QI-cheese consume } t-2 + 0'2123 \times \text{PI-Feeding.SILUM } t-1 + 0'1635 \times \text{Index-milk export } t-2 + 0'0861 \times \text{Indice- Index-cheese import } t-2$

being PI = Price index and QI = Compsumption index.

This index also reflects the market trend, but this is tempered by the fact that the PI-UDE-FEGA t-2 factor has less weight, and includes in its formation more factors than the index number one.

Given that the price published by FEGA 82016) is used for the construction of both indexes and that its value depends on the information provided by the different operators, it is necessary to review the price used as the starting point of the series, at least once a year, which must be negotiated between the parties, and must be reflected in the contract.

Figure 1 compares the real monthly income of selling the milk from an Andalusian goat milk farm, with the simulated incomes from using the index number one and the index number two. The real income for the year 2016 was 72432 €, using Index 1, it would have been 71809 € and using the Index 2, it would have been 71027 €, being the differences of -0.87 and -1.98% respectively.

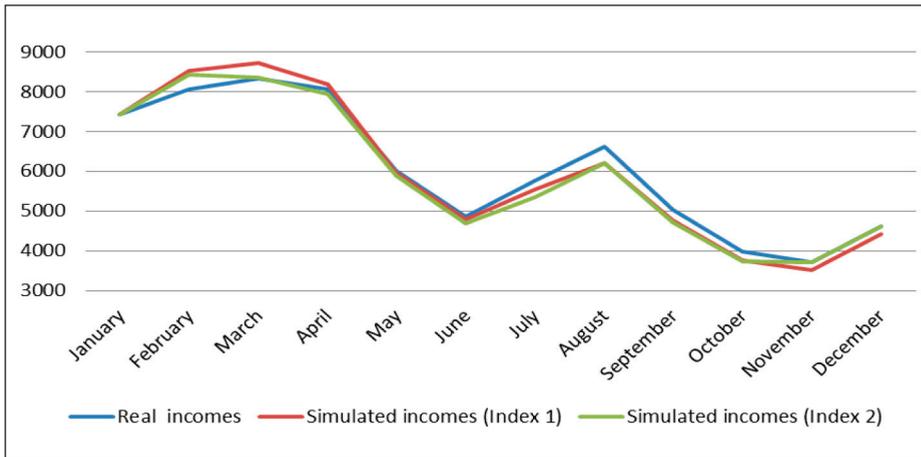


Fig. 1. Comparison of the monthly variation of the milk sale farm incomes (in euros).

As can be seen in the figure, the adjustment between real and simulated variation is very good. Nevertheless, in order to generalize these results, it is necessary to have a significant number of farms.

IV – Conclusions

Two indexes are proposed, both referring to the Useful Dry Extract of goat's milk.

The first one mainly reflects the variation of the price of the Useful Dry Extract of goat's milk in the market, also including a factor related to the price of the ration for the goat and a factor related to the consumption of cheese.

The second includes two more factors, related to the foreign market, removing weight at the Useful Dry Extract of goat's milk market price.

All indexes can be published with a maximum of 2 months of delay.

A simulation performed for the year 2016 indicates a good adjustment between the indexes and the reality of the market. However, a more exhaustive analysis is necessary to conclude.

All this information should serve as a basis for dialogue between the parties, both at the individual negotiation level and at the sectoral level. Indexes should not replace such dialog.

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