

Milk recording in sheep and goat: state of the art using the data from the ICAR on-line yearly survey

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From the nineties, the working groups in charge of small ruminants in ICAR carried out surveys on topics related to milk recording and breeding programs in sheep and goats. These surveys were manual from 1988 to 2006, before being replaced by a yearly on-line questionnaire available to accept submission of data from ICAR countries having an activity in the field of dairy sheep and goats recording. This paper aims to analyse the evolution of milk recording in sheep and goats over the years, using the database (developed and maintained within the umbrella of ICAR Secretariat) updated by the responses from the on-line surveys. The database includes data on milk recording activities (by countries and by breeds), milk recording designs, average milk yield per lactation, recording devices, breeding schemes and selection criteria, and molecular information in sheep and goats. The valorisation of the on-line survey constitutes one of the main terms of reference of the sheep, goats and camelids working group and a synthesis is regularly presented at the working groups meeting. An overlook of the main evolutions of the milk recording activities in sheep and goats are presented, over the last 35 years. Ten to twelve countries filled out the questionnaire in each species. The number of animals in official milk recording reached 890,000 ewes and 410,000 does in 2021. In the large populations of Mediterranean countries, the impact of qualitative recording remains low, due to its cost. Use of simplified designs, which has been recommended by the working group has strongly increased over the years to exceed 90%.

Abstract

Keywords: Dairy sheep, dairy goats, milk recording, recommendations.

One of the objectives of the terms of reference of the Sheep, Goat and Camelid Working Group (SGC-WG) of ICAR is to conduct and report the results of periodic international surveys on sheep, goat and camelid performance recording and genetic evaluation. In its history, the SGC-WG was created in two steps. The first step was the creation in 2016 of the sheep, goat and small camelid working group from three existing working groups (WG): the Performance Recording of Dairy Sheep WG created in 1988, the Goat Performance Recording WG and the Animal Fiber WG (dedicated to mohair goats

Introduction

and small camelids). With this first step, meat sheep and goats were included in the scope of the new working group. The second step occurred in 2020 with the inclusion of the dromedaries and Bactrian camels.

The first survey in dairy sheep was carried out “manually” in 1988 and was followed by several manual surveys every 2 years until 2004. Meanwhile, the same type of survey was conducted in goats between the nineties and 2006. From 2006 (dairy sheep) and 2008 (goat), an on-line database with on-line submission of data was set up at the ICAR secretariat level. This survey could be filled in on a yearly basis. Since 2021, a new platform for collecting data was implemented, permitting a more friendly submission of data and allowing easy extractions and statistics for ICAR members.

So far, no such questionnaire has been implemented neither in meat sheep and goats, nor in camelids.

This paper aims at proposing a synthesis of the main results of the database, by giving a current vision of the situation of milk recording, while also giving an overview of the evolution of milk recording over the last decades in small ruminants.

The ICAR on-line survey

The ICAR on-line survey follows the same pattern in dairy sheep and goats, with the same sections and the same data to submit. The enquiry is divided in 9 sections, representing 7 different items.

- Basic information on population, milk recording and management of the lactation.
- Methods of milk recording.
- Type of lactation calculation for milk yield.
- Milk yield results.
- Optional test for milk composition.
- Recording of non-milking traits.
- Milk recording equipment used in case of machine milking
- Breeding programs using artificial insemination (AI).
- Molecular information.

The objective of the survey is to have a state of the art of the situation of milk recording in ICAR countries. It also allows to follow the different recommendations of the working group (use of simplified recording method, type of lactation calculation) as they are mentioned in the ICAR guidelines.

Few countries filled the questionnaire. Over the last 2 years, 7 countries filled out at least once in sheep (France, Italy, Spain, Slovak Republic, Czech Republic, Slovenia, Croatia) and 9 countries filled out at least once in goat (France, Italy, Spain, Slovak Republic, Czech Republic, Slovenia, Croatia, Serbia, Latvia). In addition, between 10 and 2 years ago, 4 countries submitted data in sheep (Canada, Germany, Greece, Portugal) and 4 countries in goat (Canada, Germany, Switzerland, Portugal).

We will specifically focus in this paper on the following topics: sheep and goats in milk recording, recorded breeds, recording methods, lactation calculation methods.

On the whole, if we aggregate data from all the countries that have submitted data for the last 10 years, 877,896 sheep and 457,324 goats were recorded. 86% and

88% (respectively in sheep and goats) were recorded in the following three countries: France, Spain and Italy. The percentage of recorded females is 8.5% in sheep and 9.6% in goats, which is much less than in dairy cattle. The detail by country is given in the table 1 (dairy sheep) and 2 (dairy goat).

The evolution of the number of recorded females varies across countries, as shown in the figures 1, 2, 3 and 4. In dairy sheep, the trend is quite stable in France, increasing in Spain. In Italy, after a growing period between 1988 and 2012, the number of recorded ewes dramatically decreased over the last 10 years and has been divided by 3. The evolution is stable in Czech, Slovenia and Croatia, decreasing in Slovak.

In goat, the depth of history is less important: the number of recorded females is stable in Spain, Italy, Latvia, Slovak, Czech, slightly decreasing in France, increasing in Slovenia, Croatia and Serbia over the last 10-15 years.

Recorded sheep and goats in milk recording and evolution over the last decades

Table 1. Size of population of dairy sheep, impact of quantitative and qualitative recording in ICAR member countries (2020-2021).

Countries	Population size (*)	Quantitative recording. Number of recorded does (official milk recording)	Qualitative recording	
			Yes/Not	Number of recorded ewes
Croatia	95,000	7,235	Yes	7,020 (~100%)
Czech Republic		1,494	Yes	All
France	1,604,000	334,685 (**)	Yes	104,606 (31%)
Italy	4,851,000	161,711	Yes	10,895 (7%)
Portugal	263,000	18,052	No	-
Slovak Republic	163,000	6,643	Yes	6,643 (100%)
Slovenia	5,000	4,624	Yes	4,624 (100%)

Table 2. Size of population of dairy goats, impact of quantitative and qualitative recording in ICAR member countries (2020-2021).

Countries	Population size (*)	Quantitative recording. Number of recorded does (official milk recording)	Qualitative recording	
			Yes/Not	Type of recorded does
Croatia	66,000	3,621	Yes	All
Czech Republic		5,152	Yes	All
France	1,193,000	227,955	Yes	All
Germany		1,517	Yes	All
Italy	826,000	60,326	Yes	All
Latvia	7,900	1,296	Yes	All
Portugal	247,000	7,771	Yes	-
Serbia	119,000	4,846		82%
Slovak Republic	33,000	346	Yes	Parities 1-3
Slovenia	4,800	2,575	Yes	All
Spain	1,890,000	113,934	Yes	-

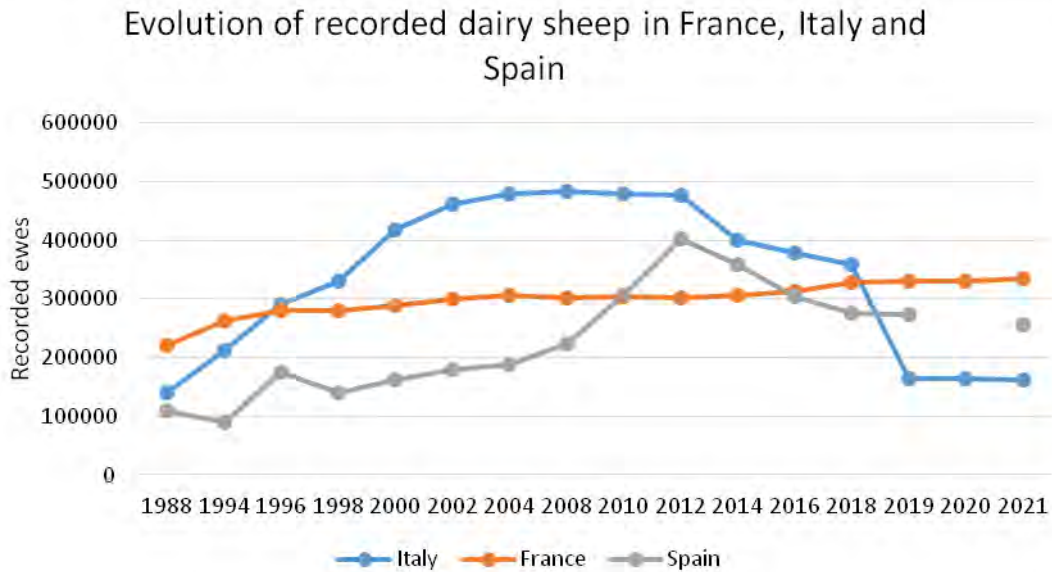


Figure 1. Evolution of recorded dairy sheep in France, Italy and Spain since 1988.

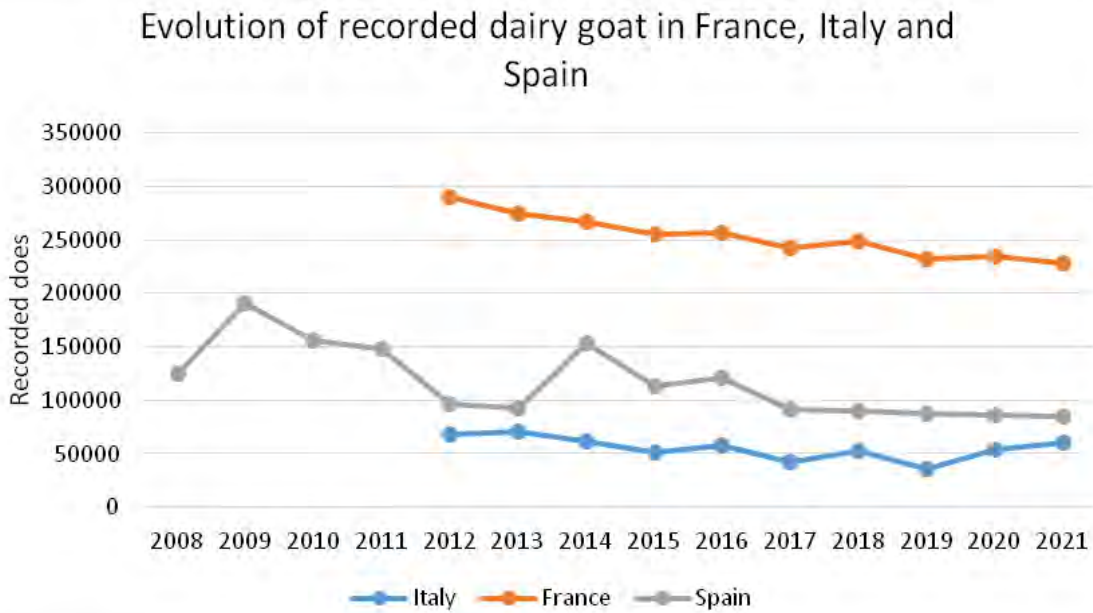


Figure 2. Evolution of recorded goats in France, Italy and Spain since 2008.

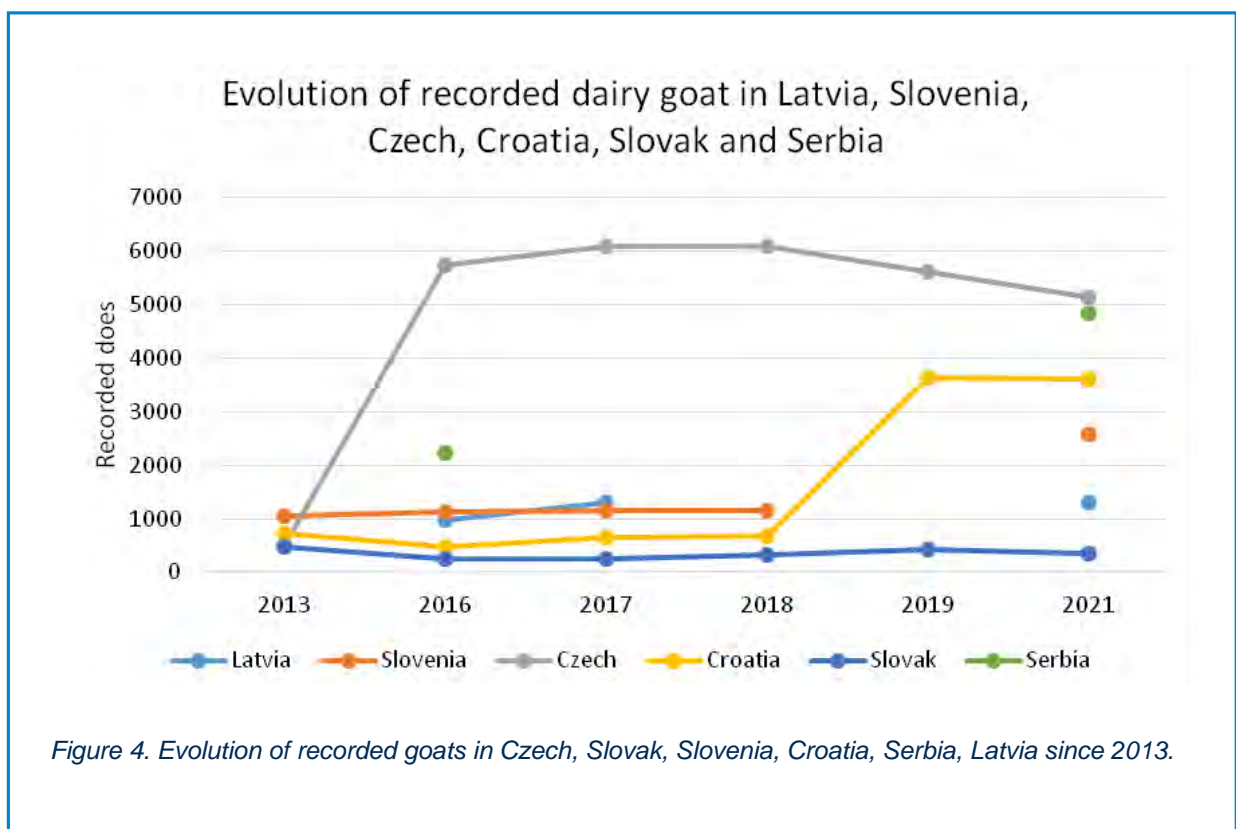
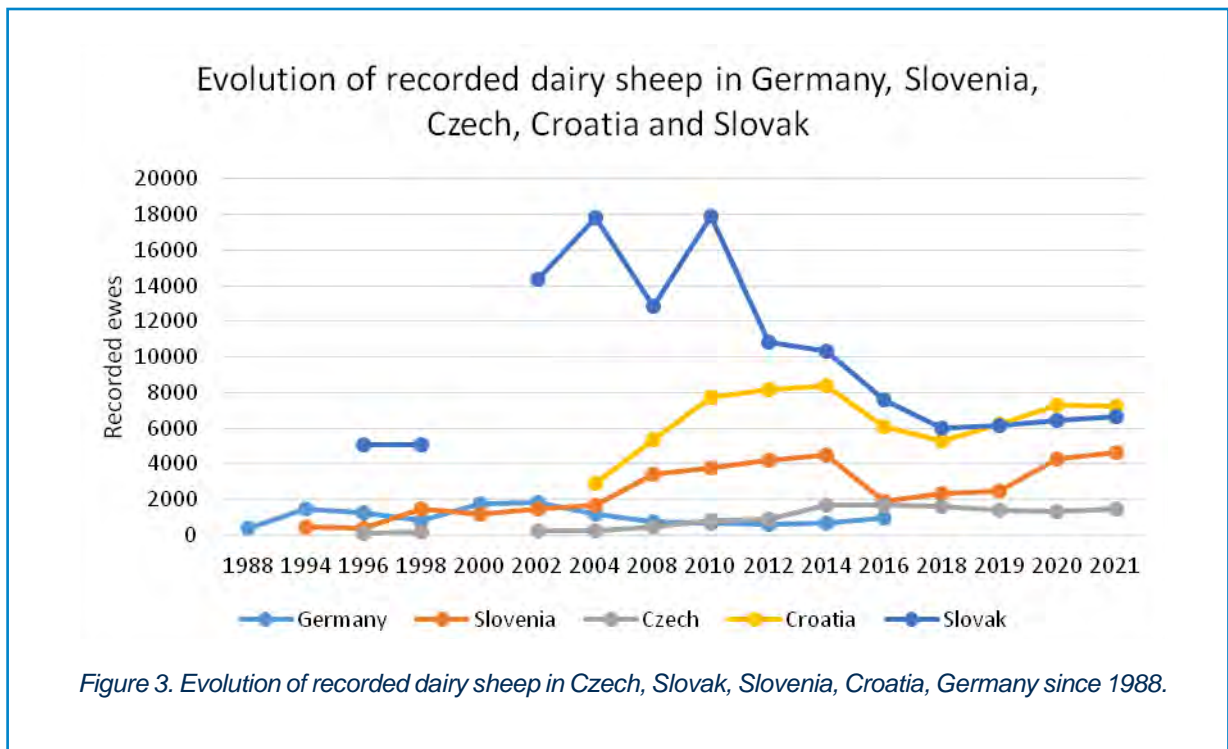


Table 3. Main recorded breeds in sheep and goat in ICAR member countries (2020-2021).

Species	Breed	Country	Number of recorded females
Goat	Alpine	France	146,854
	Saanen	France	80,750
	Murciano-Granadino	Spain	67,543
	Malaguena	Spain	12,863
	Florida	Spain	14,676
	Saanen	Italy	11,606
	Camosciata delle Alpi	Italy	13,573
Sheep	Lacaune	France	192,900
	Assaf	Spain	141,000
	Manchega	Spain	136,000
	Sarda	Italy	115,500
	Manech tête rousse	France	84,300
	Latxa	Spain	72,000
	Churra	Spain	26,000

A great variety of local breeds, few international breeds

The description by breeds shows a variety of local breeds: 40 goat and 35 dairy sheep breeds have been reported in only one country. Besides all these local breeds, some breeds have an international dissemination: in goat, the number of countries in which the breed is recorded reached 6 in Alpine, 5 in Saanen, 2 in Murciano-Granadino and Malagueña. In sheep, this number is 6 (Lacaune), and 3 (Assaf and East Friesian).

The table 3 shows the number of recorded females in the most important breeds within country. Alpine in France is the most recorded goat breed, while Lacaune in France is the most recorded dairy sheep breed.

Recording method and lactation calculation

The table 4 describes the recording designs used in the different countries, as well as the types of lactation calculation that are set up.

Recording methods

As milk recording is more time-consuming and more expensive in sheep and goat than in cattle (size of the flocks/herds, rapid milking routine), the working group has recommended to implement simplified method of recording. Current simplified methods are AT (alternated one-milking recording), AC (one recorded milking per day) while current non simplified method is A4 (or B4) and their derivatives for sampling (AY, AZ, CY, CZ are on the basis of A4 methods, but with 1 sample per day). Simplified methods are quite generalised in sheep (almost 99% in AT or AC), less used in goat (58% in AT or AC). In France, the commercial flocks that are not in selection but want to get a service of milk recording practice the B method which is very flexible and does not result in EBV calculation. In Italy, in the Sarda breed, the procedure of AC method quality control based on one A4 recording along the milking period (as described in the ICAR guidelines) started in 2021.

For qualitative recording, while more or less all the goats submitted to milk recording are sampled, in dairy sheep the situation is more contrasted. Central Europe and Balkan countries (with a small number of recorded ewes) sample all the ewes, while Spain, France, Italy only sample a part of the ewes (part of the flocks in qualitative recording; part of the ewes within flock, according to some parities). The ratio of ewes submitted

Table 4. Recording methods and expression of milk yield in sheep and goat in ICAR member countries (2020-2021).

Countries	Species	Recording methods	Type of lactation calculation	
			Lactation	Production of reference
Croatia	Goat	AT(most) - A4	TSM, TMM	
	Sheep	AT(most) - B4	TSM, TMM	
Czech Rep.	Goat	AC - E		
	Sheep	AT		
France	Goat	A4, AY, AZ, CY, CZ - AT	TMY	
	Sheep	- AC	TMM	
Italy	Goat	AT	TSM, TMM	TSM, TMM
	Sheep	AT - AC (Sarda)	TSM, TMM	
Latvia	Goat	A4	TMY	TMM (350)
Portugal	Goat	A4(most) - AT	TMM	TMM (90-120)
	Sheep	A4(most) - AT	TMM	TMM, TMY (150)
Serbia	Goat	AT	TSM, TMM, TMY	TSM, TMM, TMY
	Goat	AT	TSM, TMM, TMY	TSM, TMM, TMY
Slovak Rep.	Goat	AC	TMM	TMM (240)
	Sheep	AC	TMM	TMM (150)
Slovenia	Goat	AT	TSM, TMM, TMY	
	Sheep	AT	TSM, TMM, TMY	
Spain	Goat	A4 - AT - AC	TMM, TMY, TSM	TMM (150 or 254), TMY (210 or 274), TSM (210) TSM (116 or 120), TMY (163), TMM (120)
	Sheep	AT - AC (Latxa-part)	TMM, TMY, TSM	

to sampling is 31% in France, 7% in Italy, and is estimated to hardly above 50% in Spain. In addition, it exists protocols to sample only a part of the lactation, either the most representative part on a genetic point of view (part-lactation sampling within AC method) or one out of two successive test-days (case of AT method in Spanish Manchega breed).

The definition of the lactation calculation derives from the exploitation of the lactation in sheep and goat. There are 2 main systems, according to the presence or absence of a suckling period where the lambs/kids remain with their dam and where there is no milking or a mixed milking plus suckling. In goats, the main system is without suckling period, at least in the international Alpine and Saanen breeds. But the system with a suckling period is still important in local, less productive breeds. In sheep, in most breeding systems, the lactation is divided into two parts: a suckling period (of about 1 to 2 months) either without any milking or with a partial milking - once a day for example - and a milking-only period after the weaning of the lamb(s).

When there is no suckling period, the lactation is de facto calculated from the lambing: this is the Total Milk Yield (TMY). When there is a suckling period, there are two kinds of calculation: the Total Milked Milk (TMM) or the Total plus Suckled Milk (TSM). Besides these methods, it is possible to calculate the lactation on the actual lactation length or on a reference length.

The table 4 shows the diversity of situation across country and sometimes breeds, rendering impossible the comparison of the production of the different breeds. Some countries have one type of calculation (case of France or Slovak). Slovak calculates on the same way the lactation of sheep and goats, whereas France calculates TMY

Lactation calculation

in goats and TMM in sheep. Spain has a large variety of calculation, across breeds, and also within breed.

Conclusion and perspectives

On-line survey is a relevant tool to follow the state of the art in dairy sheep and goat milk recording and related topics. However, countries with a large number of small ruminants are missing (Greece, some of Balkan countries). These countries should be stimulated and encouraged to submit data to the on-line questionnaire. Milk recording in sheep and goat represents a small proportion of the populations: 8.5% in sheep and 9.6% in goat. Simplified methods (recording, sampling) are key to increase milk recording. Finally, we suggest that such a survey should be proposed in meat sheep/goat and in wool recording in the future. It might be an objective of the SGC WG.

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ICAR on-line database for cow, sheep and goat milk recording.
<https://my.icar.org/>