REPROSCOPE: the observatory of cattle reproductive performances in France

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Abstract

Reproduction is a key step to ensure proper management and profitability of a farm. The possible use of information from both National System of Genetic Information (SNIG) and National Identification Database (BDNI) offers the opportunity to provide new references to the whole French livestock sector. REPROSCOPE observatory is a web-based interface accessible for free. It allows displaying reproductive performances of 7 million female cattle that have calved in more than 180,000 dairy or beef herds. 20 parameters describe reproductive performances of a selected population in a uniform and exhaustive way using descriptive statistics. This observatory shows a large variability of reproductive performance among herds that highlights the scope for progress. REPROSCOPE observatory facilitates the definition of a consistent objective for a given farm in terms of reproduction, reflecting breeding system specificities and the expectations of cattle breeders.

Keywords: reproduction, livestock, herds, dairy cows, beef cows.

Introduction

Reproduction is the key step of the cattle production success. Calves birth is crucial for every farmer because it reflects the achievement of reproduction process and the farm income depends on it directly (beef herds) or indirectly (dairy herds). Neither milk nor meat production is allowed without animal reproduction. Several studies highlighted the important consequences of decreased reproductive performances on farm income (Coutard *et al.,* 2007; Seegers, 2008; Inchaisri *et al.,* 2010; Inchaisri *et al.,* 2011; Bovins Croissance, 2017). Reproductive disorders are the second production disease behind mastitis in terms of economic impact (Fourrichon *et al.,* 2001). However, this impact is often underestimated. Indeed farmers take into account direct costs due to infertility (additional insemination costs, hormonal treatments…) but they sometimes forget the shortfall due to reduced milk production, reduced calf sales and early culling. Reducing the number of unproductive days of the animals is an important point to increase the profitability of the farm. It means reducing the calving to insemination interval, managing animals culling and reducing age at first calving of the heifers. Few tools exist to help stakeholders to monitor the ongoing reproductive performances of French herds. Even if some existing decision-support tools are very interesting, they have been essentially developed at a regional scale. Stakeholders need widely accessible tools to help them to define reproduction objectives in relation to each

farming system. Supporting stakeholders (farmers, technicians, veterinarians, scientists, teachers…) on reproduction topics in dairy and beef herds is the challenge of REPROSCOPE observatory.

REPROSCOPE observatory

Underlying data

Birth, animal movement and insemination records have been used to provide reproduction data to the observatory. These records come from national databases (National Genetic Information System (SNIG) and National Identification Database (BDNI)) and are provided by Chambers of Agriculture, the National Institute for Agricultural Research (INRA), the French Livestock Institute (IDELE), Milk and Beef Performance Recording Organisations, Breeding Organisations and Insemination Centres. It was decided to provide only anonymous statistics for all the French cattle herds..

A BI (Business Intelligence) solution has been used to process information. After processing, and storage, the data are provided thanks to a free web-based interface: *www.reproscope.fr*.

The calving dates distributions reported in "Chiffres clés bovins, 2015" helped us defining 12-month periods we call campaigns. These campaigns start from the 1st July of the year and end the 30th June of the following year. The observatory counts more than 7 million calvings, 3.5 million inseminated cows and 180,000 cattle herds on average for each campaign (Table 1).

Population selection

REPROSCOPE provides references on reproductive performances at a national scale or for a chosen population. The chosen population is determined by both geographic area and type of production (dairy or beef).

Then, for a chosen campaign, some filters offer to the end-user the possibility to refine the selection:

- At the scale of an animal: performances can be compared between breeds

Table 1. Studied population description, campaign 2016-2017.

		Dairy herds	Beef herds
Number of animals	Cows that have calved	2 258 257	3 017 286
	Heifers that have calved	1 118 248	826 080
	Calves born	3 566 157	3 899 230
	Inseminated cows	2 297 386	402 220
	Inseminated heifers	873 780	212 606
Number of herds	> 10 calvings	58 635	75 666
	< 10 calvings	13 279	28 809
Mean (herds with at least 10 calvings)	Calvings / herd	57	49
	Cows in the herd	62	51

- At the scale of a herd: the choice of the population can be refined according to the main breed, the farm specialisation, the herd size and the dairy production level. Several reproduction management strategies can be taken into account: main calving season, use of artificial insemination and of crossbreeding, replacement rate, and 1st calving age objective.

Reproductive performances can be studied on the population of the females that have calved during the campaign (so the reproductive performances are those of the previous campaign), or on the population of females inseminated by artificial insemination during the campaign.

Available reproductive indicators

Twenty reproductive indicators have been calculated to study reproductive performances. These indicators provide an assessment of fecundity, cows' and heifers' fertility, replacement rate, practice of insemination and cross-breeding, calves mortality and culling (see Figure 1). They are desplayed by descriptive statistics (mean, distribution…) to highlight their variability (see Figure 2). This graphic representation makes it easy to see the expectable margins for improvement.

REPROSCOPE observatory counts 32 different webpages. The combination of twelve filters offer more than 2 billion possibilities of statistical delivery.

Data update

Due to the important volume of data and the IT possibilities of the project, the database is updated currently once a year. The frequency does not allow a real time monitoring of reproductive performances. The role of REPROSCOPE observatory is to provide an ex-post evaluation of reproductive performances.

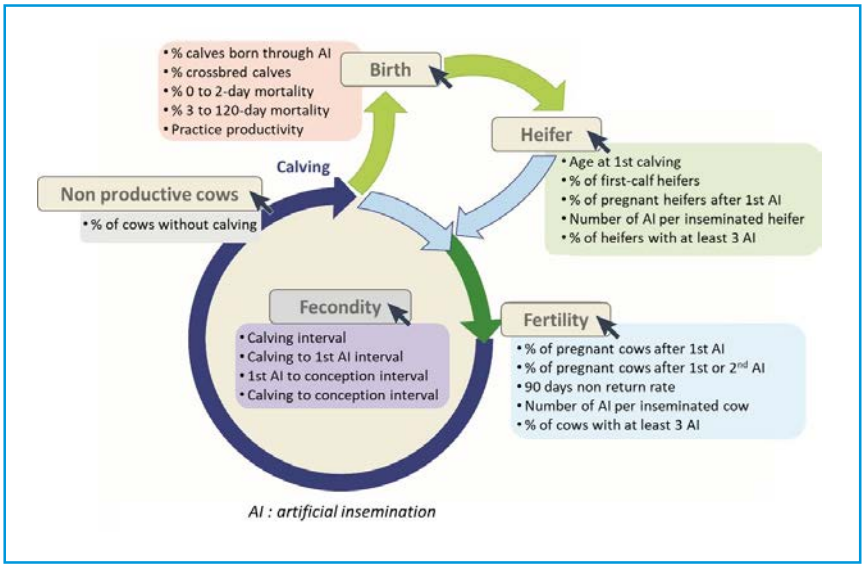

Figure 1. List of available reproductive indicators of REPROSCOPE observatory.

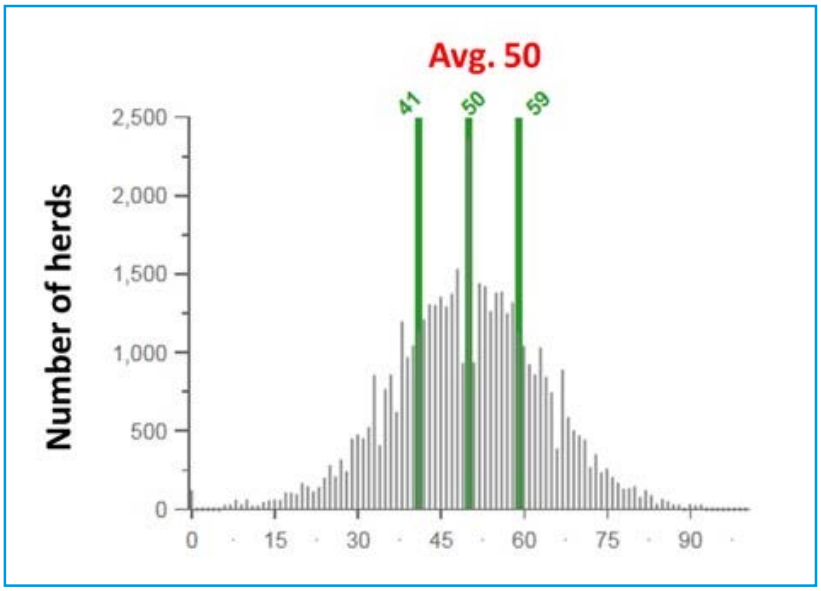

Figure 2. Percentage of pregnant cows after 1st artificial insemination – 48,151 French dairy herds (e" 10 calvings) – campaign 2016-2017.

Reproductive performances exploration

Describing reproduction management strategies

First, the observatory allows describing the different reproduction management strategies by counting the herds that fit selection criteria: main calving season, use of artificial insemination and crossbreeding, replacement rate, 1st calving age objective.

Figure 3 shows the percentage of calves born by AI among all the calves born in the herd during campaign 2016-2017. This information characterise the reproduction method used in the herds: natural mating, AI or both. Among the 51,263 dairy herds, in average 79% of the calves were born from an artificially inseminated cow. 100% of the calves were born from an artificially inseminated cow in 52% of the dairy herds. Only 9% of dairy herds do not use any AI. On the contrary, only 13% of the calves were born from an artificially inseminated cow in the 63,946 beef herds. Only 6% of the beef herds use exclusively AI, whereas 66% of the herds use natural mating only.

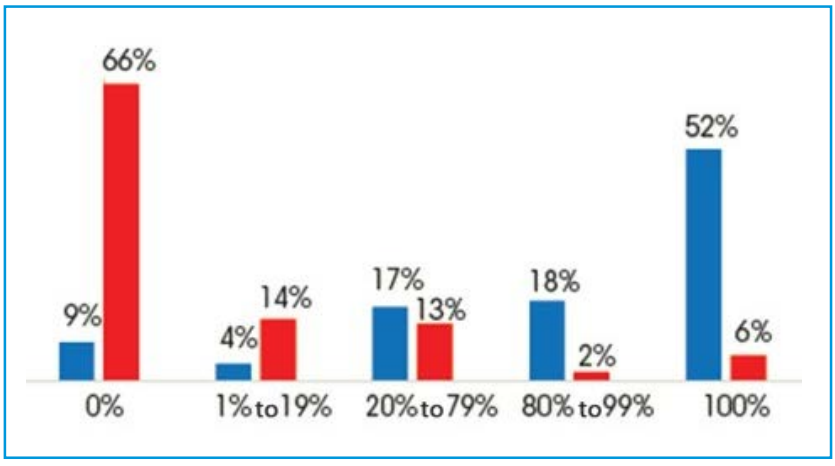

Figure 3. Percentage of calving from AI – 51,263 dairy herds (blue) and 63,946 beef herds (red) – campaign 2016-2017.

Showing performances variability

REPROSCOPE observatory shows the variability of reproductive performances thanks to the chosen graphic representation. Figure 2 and 4 show a difference between dairy and beef herds' performances in terms of percentage of calving after the 1st AI: on average 50% in dairy herds versus 57% in beef herds. Moreover, this representation offers a finer information about the herd performances' distribution around the mean.

The selection filters available offer the possibility to study the reproductive performances according to the reproduction method for example. In this case, the percentage of pregnant cows after 1st AI is higher in the herds where only AI is used exclusively than national mean: +1 percentage point in the dairy herds (51%) and +5 points in the beef herds (62%).

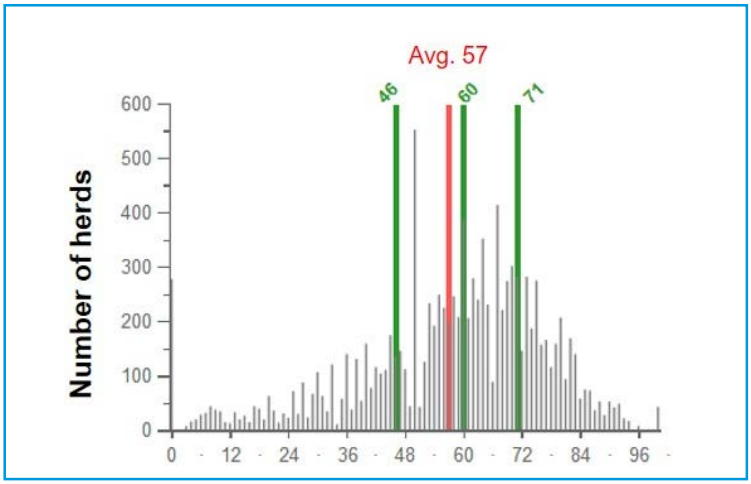

Figure 4. Percentage of pregnant cows after 1st artificial insemination – 11,432 French beef herds (e" 10 calvings) – campaign 2016-2017.

Assessing the differences between breeds, geographic areas, farming systems

Thanks to the selection filters of the observatory, it is easy to compare the reproductive performances of a variety of production systems. Table 2 shows the percentage of pregnant cows after 1st AI for 3 farming systems which vary in terms of the main breed, geographic area (see Figure 5) and calving pattern management.

The smallest percentage of pregnant cows after 1st AI (46%) has been observed in the Holstein dairy herds with spread calving strategy in Bretagne and Grand Est regions. On the contrary the dairy Montbeliarde herds of Auvergne-Rhône-Alpes region with

Table 2. Percentage of pregnant cows after 1st AI (%) for different breeding systems (main breed x calving pattern management) in 3 important geographic areas of dairy production in France.

Geographic area	Breed	Calving pattern management					
		Spread[1]		Semi-grouped[2]		Very grouped[3]	
		%	Number of herds	%	Number of herds	%	Number of herds
Bretagne	Holstein	46%	7 194	48%	538	50%	197
Grand-Est	Holstein	46%	2 698	47%	1 716	49%	354
Auvergne-Rhône-Alpes	Monbeliarde	55%	2 529	57%	734	57%	306

[1] Spread: calving all year long
[2] Semi-grouped: 4 months without any calving
[3] Very grouped: 60% of the calvings grouped on 3 months

Figure 5. Three important geographic areas in dairy production in France.

very grouped calvings have better results (57%). Comparing reproductive performances between different farming systems is also a good way to see that whatever the system, good reproductive performances can be attained.

Conclusion

REPROSCOPE observatory is an easy free tool to obtain updated references of reproductive performances for all the females and herds of bovine supply chain in France (Bidan *et al.,* 2018a). It offers the possibility for stakeholders to update their advisory strategies thanks to system-specific references. The observatory has shown a large variability of the reproductive performances of the herds that impact their profitability (Bidan *et al.,* 2018b), illustrating the expectable margins for improvement in many herds.

Please find all the results on *http://idele.fr/reseaux-et-partenariats/reproscope.html)* and/or visit the observatory on *www.reproscope.fr.*

Acknowledgements

The authors wish to thank UMT maîtrise de la santé des troupeaux bovins, UMT eBIS, UMR PRC, Agrocampus Ouest, Ecole Nationale vétérinaire d'Alfort, Bordeaux Science Agro, Chambres d'agriculture, Entreprises de conseil en élevage, Bovins croissance, Entreprises de sélection et de mise en place, Groupements de défense sanitaire, Groupements techniques vétérinaires, Atol CD.

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