ARIMNet2 Call 2016

Project PERFORM : Breeding and management practices towards resilient and productive sheep and goat systems based on locally adapted breeds

Guidelines to assess productivity of egyptian local sheep and goats breeds using 12MO method

Technical note

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1. Introduction

The project PERFORM aims to improve the knowledge on local adapted breeds and farmer practices evolutions in the mediterrean area. In summary, the project is divided into 3 main points.

1. Provide new elements on the farmers' breeding practices.

2. Provide **new elements on the resilience** of small ruminants farming systems at several time scales (long term and short term) and following several changes (extreme climate events, market evolution, sanitary crisis etc.), and the role played by **locally adapted breed** in such a resilience.

3. Participatory approach will be developed with public and private stakeholders, so as to share the comprehension of the current situation and use the knowledge built during the project in order to design the evolution of the practices.

The assessment of adaptive capacities of local breeds (reproductive and survival rate) will be performed through existing data (from performances recording and/or genetic evaluation) but also by collecting new data based on both farm questionnaires and retrospective demographic 12MO survey. We recall that the investigations of animal productivity (various productive and other functional traits will be considered like for example capacity to use rangeland vegetation,

heat and disease resistance) are part of the following task 1.3: Capabilities of the animal populations to produce in the local context from the work package WP 1: Breeding practices at flock and population levels.

2. Presentation of 12MO retrospective survey

CIRAD-SELMET has developed several approaches for collecting and estimating the animal productivity. Nous presentons la méthode **12MO method:** 12mo (say the "twelve-month" method) which is a retrospective method for estimating annual demographic parameters in ruminants livestock herds. It consists to enumerate exhaustively the animals present in the herds at the date of survey, and then record all the demographic events (births, natural deaths, slaughtering, loans, purchases, etc.) that have occurred in the last twelve months.

The 12MO method provides annual results (the year prior to the survey) except for the estimation of females' full-year calving rate. It is well suited to characterize the demography of a herd at a given moment, the short-term impact of a project, a trial, or occasional events such as droughts or epidemics.

12MO can also be used in a longitudinal way, by repeating annually the surveys on the same sample or area. In such a case, data capture the between-years variability and can also be aggregated to evaluate average herd productivities over longer periods.

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The objectives of task 1.3 of PERFORM project (assessment of adaptive capacities of local breeds) indicate the production of a zootechnical referential on local populations of small ruminants. Assuming that there are few or at least very partial surveys of these animal breeds for this area in the literature, **demographic information evaluated for several years is required to capture average data** (years more or less favorable to animal performance) to estimate the intrinsic traits of these populations.

12MO method can be repeated annually to evaluate the inter-annual variability and the average value of the demographic parameters. Although less reliable than individual animal based follow-up surveys because of the memory of the person being interviewed. 12MO is faster and easier to implement.

In addition, the complete chain of implementation of the 12MO method (planning, implementation, supervision, data collection and analysis) has been formalized (see Lesnoff et al.,

2010: http://livtools.cirad.fr/12MO) to be easily transferable. This is an important argument for the choice of the 12MO method in view of the internalization of the method by the APRI team.

3. Demographic parameters estimated with 12MO

It is useful to remember that the 12MO method only allows estimation of population parameters (reproduction, survival and off-take). There is no direct assessment of milk and meat production performance. To do this, we can use the demographic parameters estimated in a demographic projection model that allows us to evaluate the production and productivity of a herd in different units (number of animals, milk, meat) under certain assumptions.

Dynmod is a Excel spreadsheet interface developped by Cirad and available in http:/livtools.cirad.fr/dynmod simulates the dynamics of the size of a livestock population and the number of animals produced per year. Dynmod also calculates live weights, meat production and secondary productions (milk, skin and hides, manure) at population level, as well financial outputs that can be used in more integrated financial calculations (e.g. benefit-costs ratios).

3 main type of parameters are evaluated with 12MO :

- The "state variables", describing the state of the herd at time of survey;
  - Herd size (number of animals);
  - Sex-and-age structure (proportion of sex and age categories);

- The annual "basic demographic rates", describing the demographic events occurring in the herd over the year;
  - Natural rates, referring to the natural performances of the herd (reproduction and mortality);
  - Management rates, referring to the events directly related to farmers decisions (slaughtering, sales, purchases, etc.);

- The annual "global demographic rates", summarizing the dynamics and production (or productivity) of the herd over the year:
  - Annual growth rate;
  - Production (or productivity) rates.

Table 1: *Basic demographic rates estimated with 12MO.*

(a) Natural rates	
Abortion rate	Annual instantaneous hazard rate of abortion (expected number of abortions per female when spending all the year in the herd). An abortion is a gestation that has not reached its term.
Parturition rate	Annual instantaneous hazard rate of parturition (expected number of parturitions per female when spending all the year in the herd).
Prolificacy rate	Average number of offspring (stillborn or born alive) per parturition.
Stillbirth rate	Probability that an offspring is a stillborn. An important point is that stillbirth is not included in the mortality rate, which only concerns animals born alive.
Mortality rate	Annual instantaneous hazard rate of natural death (natural deaths refer to all types of death except slaughtering).
(b) Management rates	
Offtake rate	Annual instantaneous hazard rate of offtake (slaughtering, sales, loans, gifts, etc.). Slaughtering include slaughtering for emergency (e.g. due to diseases, injuries or droughts).
Intake rate	Annual instantaneous hazard rate of intake (purchases, loans, gifts, etc.).

Table 2: *Additional demographic rates that can be derived from the basic annual demographic rates.*

Name of rate	Definition
Net prolificacy rate	Average number of offspring born alive per parturition, calculated directly or by: Prolificacy rate * (1 – Stillbirth rate)
Fecundity rate	Average number of offspring (born alive or stillborn) per reproductive female and year, calculated directly or by: Parturition rate * Prolificacy rate
Net fecundity rate	Average number of offspring born alive per reproductive female and year, calculated directly or by: Parturition rate * Net prolificacy rate

More information :

http://livtools.cirad.fr/12mo
http://livtools.cirad.fr/dynmod

4. Management herds

The herd unit must be precisely and unambiguously defined prior to the survey, particularly if animal entries and exits are to be quantified. 12MO surveys defined the herd unit as the "management herd" at the farm level. The farm can be composed of one or several households. This type of herd involves all the animals **in charge of the farmer** (head of family) at the time of the interview. It includes the animals entrusted to the farm (loaned animals or under contract) by

people outside of the farm. It does not include the owned animals that have been sent (entrustments or contracts) by the farmer to other farms. If the farmer manages several species, each species represent a separate herd and shoud be surveyed independantly.

5. Functional flocks

There is no minimum herd size requirement to complete the 12MO survey, but sufficient numbers of animals are needed to estimate natural population parameters. On the other hand, herds of a size larger than 60 heads are to be excluded. In addition to the difficulty of the survey, the large size of the herd causes a decrease in the reliability of the information collected, given the memory of the herd manager. In the Egyptian context, it seems that medium size herds of small ruminants is less than 10 heads. it can be assumed that the data will be less altered by the breeder's memory but it will be necessary to ensure that surveys target functional flocks, i.e. herds containing enough females to be self-renewable by births.

Presentation of the area study

The 12MO surveys will be conducted in the villages of 2 localizations: NCWZ (Coastal Zone Western Desert) and Upper Egypt. They concern the local breeds of sheep and goats: Barki and Seidi.

	Region	
	NWCZ	**Upper Egypt**
Breed (goats and sheeps)	Barki	Seidi

6. Conduct of the investigation

The maximum duration of a 12MO survey is 30 to 45 days for the farms surveyed. This duration is imposed by the fact that the period of the "last twelve months" considered for the different farms surveyed must be about the same. Otherwise, the retrospective information is not comparable. The investigation period must exclude periods of seasonal transhumance, large births or mass slaughter (eg religious event).

Two species can be investigated for the same farm. It will then be necessary to carry out 2 independent surveys for each species.

12MO must always be carried out in the presence of all the animals of the herd. The number of herds that can be surveyed each day depends on the ability to see all the animals in the same herd in one place.

Two 12MO surveys are planned every 12 months. It is necessary to determine a period of investigation under the following conditions:

- Outside periods of intense agricultural activities,
- Out of birth periods,
- Outside the periods of large slaughter of animals (religious event),
- During a period when the team of investigators is available and mobilizable because the investigation must take place within a maximum period of 45 days.

7. Herd sampling

The main objective is to construct a zootechnical referential for each breed of interest (barki and Seidi) of the sheep and goat species. Except for the agro-ecological zone factor corresponding to the 2 study areas, it is necessary to identify other potential factors of variability in the productivity of small ruminants. This may be for example the flock size factor. This factor will be used to construct strata for herd sampling.

Random sampling:

- In each village, make an exhaustive list of farms (one farm = one herd of one specie) by species for herds of less than about 60 animals. 60 is the maximum size of herds of small ruminants that can be investigated with 12MO retrospective method.
- If a criterion (i.e. herd size) can be considered varying demographic parameters, then for each farm it is necessary to determine its classification in the 3 strata.
- make a random selection of farms proportionally to the size of the previously defined strata.
- Draw a supplementary list of holdings which will be used by the interviewers in case of defection of the holdings selected during the first draw.

Purposive sampling :

If farm lists are not available, the investigator or supervisor selects the farms to be surveyed according to pre-determined selection conditions. For example, within each village, the investigator select herds by species and (if justified) by a known factor of productivity variability (eg herd size) so as to obtain an equivalent number of sheep and goat herd's.

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