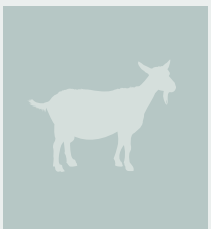
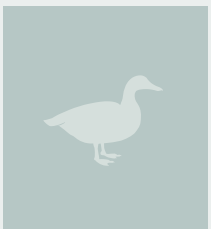
SECTION D

Developing straight-breeding programmes


Overview

RATIONALE

Because Sections D and E both deal with the genetic improvement of breeds, they have much in common. It is, however, intended that each section should be able to stand alone. Reading them in sequence will involve some unavoidable repetition.

Selection and cross-breeding are the two main tools used to achieve genetic changes in livestock populations. Selection implies genetic improvement based on variation among individuals within the population (breed). This process is often referred to as straight-breeding. In contrast, cross-breeding involves making use of variation among populations (breeds). Straight-breeding and cross-breeding programmes may represent components within a broader breeding strategy; they are not mutually exclusive and are often used in combination. However, such combinations depend on first developing the capacity to operate each element in a sustainable manner. Among the many factors that must be considered in the development of a breeding programme are:

- the animal species involved;
- the types of traits considered;
- the availability, accessibility and affordability of different breeds;
- the production environment;
- the time frame for the planned genetic improvement (improvement through straight-breeding usually takes longer than through cross-breeding); and
- the infrastructure of the livestock sector and the resources allocated to the programme.

The relevance of these factors is elaborated further in the descriptions of the various tasks in this and the following sections of the guidelines.

Figure 3 presents a simplified procedure that can be used to aid in making the decision as to whether a straight-breeding or cross-breeding programme should be chosen. This section deals with straight-breeding, while Section E focuses on cross-breeding and creating synthetic (composite) breeds.

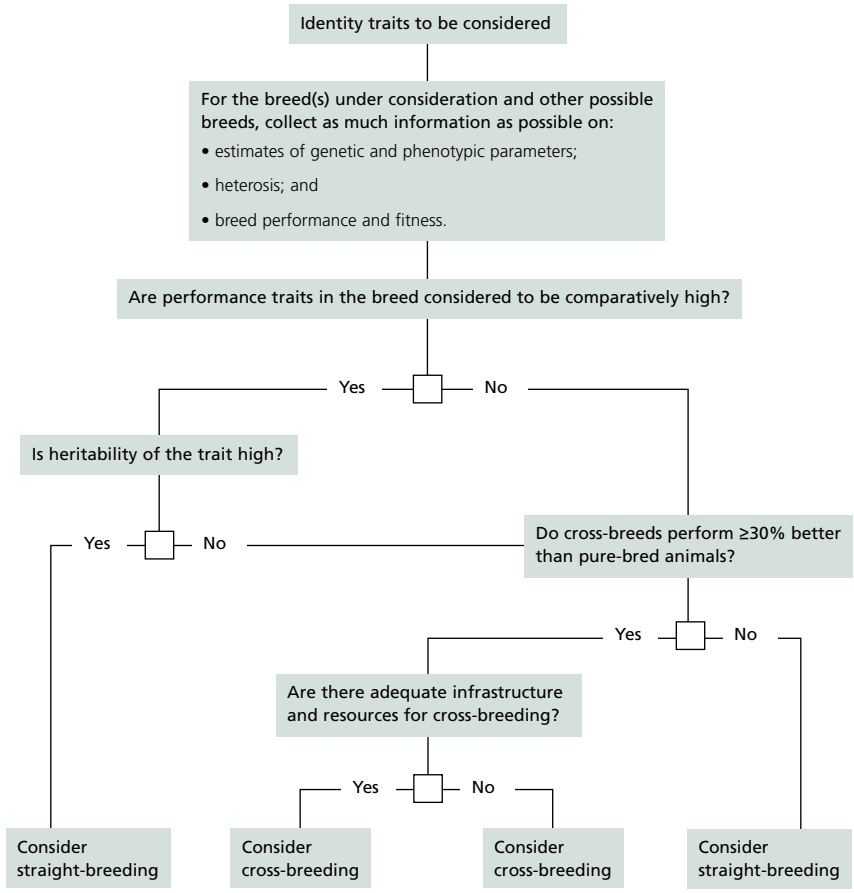
OBJECTIVES

Develop a sustained straight-breeding programme by using the genetic variation within the breed(s) being targeted.

INPUTS

The main inputs are the breed(s) that are the focus of the programme (identified by implementing Section C), the LDOs (Section B) and the overall breeding goal (Section C).

FIGURE 3
Simplified decision-making process for choosing a breeding programme



OUTPUT

The outputs will be:

- a well-planned straight-breeding programme and a detailed list of the tasks and actions that need to be undertaken at each stage of implementation; and
- a description of the roles that the various actors involved will play in all aspects of the programme (i.e. the institutional structure of the programme).

TASKS

The following tasks need to be undertaken:

1. Review the breeding goal and allocate responsibilities for planning and implementing the programme.
2. Assess the state of current breeding practices, capacity and infrastructure.
3. Prepare the plan for the start of the straight-breeding programme.
4. Set up the financial and organizational structures.
5. Implement the straight-breeding programme.
6. Open the nucleus to superior genetic merit.
7. Improve dissemination and distribution.
8. Improve recording and evaluation.
9. Optimize the selection intensity and the generation interval.
10. Ensure that the programme is delivering as expected.

Tasks and actions – phase I

Implementing an efficient straight-breeding programme will generally involve technical, operational and policy-oriented tasks. The programme needs to be operationally effective in each of its constituent actions and effective in coordinating these actions.

Tasks are divided into distinct phases:

- Phase I. Review the breeding goal and assign responsibilities.
- Phase II. Establish a simple breeding programme.
- Phase III. Establish a more advanced programme.

At the end of each phase, users should ensure that the elements necessary to move on to the following phase have been carried out.

TASK 1: REVIEW THE BREEDING GOAL AND ALLOCATE RESPONSIBILITIES

Action 1: Review the breeding goal and selection criteria

Traits to be considered for improvement (breeding-goal traits) will have been derived from the LDOs with due consideration having been given to the opinion of all stakeholders concerned (Section C). The list of traits should be:

- as complete as possible, covering all the traits that are important to realizing the development objective;
- succinct – as few as possible without compromising the developmental objective (the more traits considered, the less the genetic improvement will be realized in each); and
- mutually exclusive.

Two pieces of information are needed to establish a sound programme to improve the breeding-goal traits. The first requirement is to have estimates of genetic and phenotypic parameters for the traits (i.e. heritabilities and genetic and phenotypic correlations). In many situations, these estimates will be unavailable or inaccurate at the initial stage. However, their precision will increase as the programme proceeds and more data become available. The second requirement is to establish the weight of each goal trait relative to the others (i.e. the goal trait values). In their simplest expression, goal trait values measure the increase in revenue associated with one unit increase in the trait in question. The calculation assumes that, when the trait is increased by one unit, other traits remain constant.

Goal trait values for trait measures can be estimated in one of two ways. The first method is simple subjective estimation, which is recommended at the beginning of the programme when few socio-economic data may be available. The second method is objective derivation based on both concrete data on the socio-economic production environment and the use of advanced economic tools. Box 28 presents an example of how to derive goal trait values in a dairy genetic improvement programme using the subjective method. This example can be easily adapted to other situations.

Breeding-goal traits are not necessarily the same as the selection traits. In the example in Box 28, for instance, the goal trait is milk production. It is necessary to decide how this should be measured – i.e. what will the selection traits be? Options would include milk yield in 305 days or in 13 weeks. Costs and ease of measurement should be taken into consideration when choosing the selection criteria. When more than one trait is considered for selection, a means to aggregate them is needed. This is done using a selection index, which is a formula that combines all selection criteria into one figure, taking into account their heritabilities, genetic and phenotypic relationships and goal values.

Action 2: Allocate responsibilities for planning and implementing the straight-breeding programme

If a government decides to establish a straight-breeding programme, it is necessary to decide which institution(s) will be charged with implementing it. The institutions concerned might be livestock keeper cooperatives (possibly formed for the purpose), breeding companies, government farms, research institutes, breed societies or partnerships among such institutions. It must be ensured that the programme is in line with current official regulations and

BOX 28

Calculating goal trait value – an example

The breeding goal traits for a dairy genetic improvement programme are: milk production (i.e. annual milk yield) and beef production (i.e. calf weaning weight).

One hundred points are divided between these two goal traits by experts, preferably in a panel, who are aware of the cost and return structure in the dairy operation.

Assume that the consensus was 60 points for milk production and 40 points for beef production. This means that, to the producer, milk production is 1.5 times as important economically as beef production. If milk production is further subdivided into milk yield and fat content expressed as a percentage, the 60 points for milk are also subdivided between the milk yield and the fat content (e.g. 50 points for the yield and 10 points for the fat content). The ratio becomes 50:10:40 for milk yield, fat percentage and calf weaning weight, respectively. To standardize the units of measurement, these values must be inversely weighted by the additive genetic standard deviation σa (the square root of the numerator of the heritability) of each trait.

If σa for the traits are 260 kg, 0.8 percent and 10 kg, respectively, then the final breeding goal trait values would be 50/260 = 0.19, 10/0.8 = 12.5, and 40/10 = 4; or 1:66:21.

The lower value for milk production should not be interpreted as indicating that it is less important, as this value will be multiplied in the selection index by the much larger figure for annual milk production (in the thousands).

Objective but resource-demanding and sophisticated methods for deriving breeding-goal trait values are explained in the following publications: ICAR/FAO (2000d) and FAO (1992).

legislation. If this is not the case, effort should be made to establish the regulations and legislation necessary for the smooth running of the programme. Section B provides more details on this.

The institution(s) implementing the programme will need:

- resources located sufficiently close to the bulk of the animal population targeted by the programme;
- an efficient management structure;
- expertise in quantitative genetics and data management;
- good knowledge of the management practices and requirements of the livestock keepers who raise the targeted animal population; and
- capability to develop a marketing profile for the programme.

Tasks and actions – phase II

TASK 2: ASSESS THE STATE OF CURRENT BREEDING PRACTICES, CAPACITY AND INFRASTRUCTURE

Action 1: Gather detailed information on breeding practices and structure

Answer the following questions:

- To what extent are breeding animals currently exchanged among livestock keepers? Do some livestock keepers sell animals to others specifically for breeding purposes? Are there breeding nuclei whose sole purpose is to provide breeding stock to other livestock keepers?
- What are the ages of the breeding males and females, and what is the mating structure (the number of females per male)? Note that while the practical reasons for a particular age and mating structure in a herd or flock may be unrelated to breeding (e.g. members of an extended family often pool their animals together for efficient management), this structure will nevertheless have a bearing on breeding. What are the lower limits to the age of breeding stock? Does the number of females per male vary with the age of the breeding male?
- When and where do livestock keepers choose their replacement stock? Are breeding males kept with the females all year, or only during a tightly controlled season? If the breeding is seasonal, what happens to the breeding stock outside the season? If they are obtained from outside the holding, where and in what season are they purchased?
- Will any breeding practices need to be changed within the top tier of the improvement programme? (Box 29).
- How do livestock keepers select animals for breeding?
- Is there an artificial inseminaton infrastructure?

Action 2: Gather information on available human resources

The assessment of the state of human resources should include consideration of the extent to which owners and keepers of the local breed can be expected to participate in the programme and their knowledge of and agreement to the breeding goal.

Action 3: Assess the availability and suitability of technical support services

Resources to consider may include:

- the extension service;
- training support;
- research support;
- animal recording services; and
- artificial breeding (e.g. artificial inseminaton) services.

BOX 29

Tiers within a breeding programme – definitions

For convenience, the structure of breeding programmes is usually divided into tiers (i.e. layers or strata) as follows:

Top tier: where genetic improvement takes place and breeding animals are produced. (In a cross-breeding programme, this may be an introduced breed.)

Bottom, or production, tier: where improved animals are actually utilized for production (e.g. cross-bred cows used for producing milk or cross-bred males used for meat production).

Between these two tiers, there may be one or more additional tiers. In a cross-breeding programme, for example, there might be a multiplication tier to supply F1 animals (the first generation obtained by crossing animals from two breeds), a tier to produce more complex crosses (e.g. ½ A, ¼ B, ¼ C), and so on.

Capacity to deliver efficient services depends on human resources as well as on organizational matters. This includes gender awareness among the staff (particularly in extension services and training institutes) and a gender-balanced workforce. Some situations, however, do not permit women livestock keepers to interact with male extension agents or artificial inseminaton staff.

Action 4: Assess current market signals for animals

Review the production systems assessment (Section B) to recall how animals are traded and exchanged for production purposes. It is important to establish whether at the trading points there are favourable market signals (e.g. price rewards) that will provide benefits to livestock keepers in the production tier if they increase the quality or quantity of production as a result of the straight-breeding programme. This will promote livestock keepers' uptake of and involvement in the programme.

TASK 3: PREPARE THE PLAN FOR THE START OF THE STRAIGHT-BREEDING PROGRAMME

Action 1: Plan how to meet the personnel and management structure requirements

The type of personnel and management structure required will vary greatly depending on the scale of the programme. The following expertise should be available within or accessible to the programme structure, depending on its scale:

- a geneticist;
- a data and information manager;
- a veterinarian;

BOX 30

Cultural habits as ways to exchange germplasm – the example of the WoDaaBe of Niger

In livestock-keeping communities, social interactions often involve animals. Friendships are sealed with animal loans; marriages involve the payment of a bride price; animals are offered as wedding gifts; disputes and compensation claims are settled with animals. These and other traditional practices, such as animal exchanges, herd splitting and herding contracts (known locally among the WoDaaBe of Niger as *mafisa*, *haBBana'e* and *bulisana*, respectively) entail numerous movements of animals. The animals in any herd or flock vary greatly in terms of origin and how they entered, which is often indicated by the animal's name. The animals' histories reflect the extent of a household's social network and family relations.

Cultural customs are therefore of direct relevance to animal breeding. While breeding is rarely the primary motivation for such customs, they influence breeding because any movement of animals from one herd or flock to another implies an exchange of genetic material. This also becomes apparent from the characteristics required of animals that are given away as presents or offered as a bride price or compensation. These animals must invariably be in their prime, of productive age, in good health, well built and whole (not castrated).

Through social networks, traditional livestock keepers have access to a wide pool of genetic resources, which they consciously exploit. The following example is taken from Saverio Krätli's description of Jiima, a WoDaaBe pastoralist in northern Niger.

Jiima's herd was about 35 head of cattle. From the perspective of selection, this would be a very small population. However, neither the quality nor the variety of genetic material to which Jiima had access was ever limited by the size of his own herd. This was due to the WoDaaBe breeding system, which relies on borrowing bulls from relatives and making long-term herding arrangements known as *haBBana'e*. Assuming that each herd from which Jiima borrowed bulls is about the same size as his own, the cattle population involved in Jiima's cattle breeding over the last 20 years can be estimated at about 1 400 head. The potential gene pool network is many times larger. It includes a relatively stable set of herds belonging to Jiima's relatives (patrilateral, matrilateral and in-laws) as well a virtually endless set of additional herds available through friendships or at occasional meetings by wells and in the bush. Mobility is a crucial factor in expanding the gene pool network – moving from water point to water point increases access to genetic material.

Krätli concludes that cattle breeding among the WoDaaBe is a social enterprise: The actual scale of the gene pools to which breeders have access is to be measured in terms of the extent of their networks.

Source: Krätli (2007).

BOX 31

How do livestock keepers select animals for breeding? – example of the Maasai communities in the United Republic of Tanzania

A recent study of two Maasai communities in the United Republic of Tanzania, spon-sored by FAO within the framework of LinKS (Gender, Biodiversity and Local Knowledge Systems for Food Security), showed that these traditional livestock keepers have clear breeding goals, engage in purposeful and rational breeding and use a variety of technologies to achieve their goals.

Maasai keep their animals under harsh conditions. They have to deal with periodic droughts, marginal soils and diminishing rangeland resources. To obtain the highest possible production in these circumstances, they manipulate the three main resources at their disposal – the environment, labour and animals. The Maasai try to make the best of the environment by operating a mobile grazing system. They use a system of labour division based on age and gender. Men, women and children each have distinct responsibilities.

The Maasai try to get the best out of their animals by breeding for:

Adaptation to the environment: hardiness, sturdiness (small size), disease tolerance or resistance (e.g. dark skin for protection against tsetse flies and skin diseases), drought resistance (the ability to go without water for several days), the ability to walk long distances (short legs).

Reliable production: cows that easily become pregnant, calve regularly and without trouble, have steady milk production and well-formed udders. In the case of bulls for the market, the Maasai prefer larger animals with "much marrow in the bones". But for breeding bulls, family origin is rated higher than size; they will always prefer a bull whose mother was a good milker. Breeding bulls should be active and eager to mate.

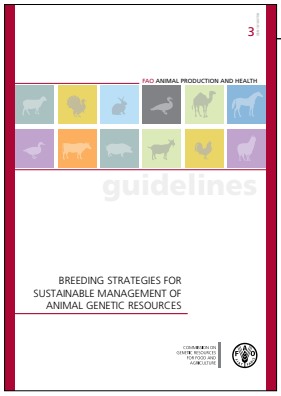
Behaviour that facilitates milking, management and herding: docility, obedience, good leadership qualities (positive influence in the herd). Cows with good mothering abilities are valued – animals that allow calves whose dams have no milk or have died to suckle and that have an "agreeable voice" with which to call their calves from a long distance.

The livestock keepers also mentioned aesthetic factors, such as the size and shape of the horns and the hump and the colour of the coat. However, when it comes to actual selection, the aesthetic factors play hardly any role.

To implement their breeding strategy, pastoralists use a variety of measures. Some aim to prevent mating (negative), while others aim to stimulate mating between selected animals (positive).

Positive measures include buying or borrowing animals with desirable traits, arranging a proper bull-to-cow ratio, timely detection of heat, "marrying" animals (once signs of oestrus are detected, the herder matches the cow with a particular breeding bull, either from within the herd or borrowed from another herder) and the use of fertility-enhancing medicines. Cross-breeding with animals of other breeds is always done in a controlled way. Cows from other breeds are usually welcome, provided they have some good qualities, but bulls are either immediately

(cont.)



Animal Production and Health GUIDELINES No. 3

Breeding strategies for sustainable management of animal genetic resources

CORRIGENDUM

The following text is missing between pages 76 and 79

...

- a reproduction specialist;
- a farm manager;
- a technician who can promote the programme among livestock keepers and advise on the use of improved stocks (gender expertise is necessary); and
- a financial manager.

Individuals may have multiple responsibilities, but responsibilities should not be shared.

Action 2: Plan the establishment of a breeding nucleus

In a nucleus breeding scheme, the genetic improvement takes place in a small segment (the nucleus) of the population and is then disseminated to the rest of the population directly or once improved animals have been multiplied in a multiplier structure to reduce costs. Nucleus breeding is utilized where recording at the grassroots level is not feasible. The smaller number of animals and the concentration of facilities in the nucleus make recording easier. The nucleus can be "closed" – no new animals are allowed in – or "open", where superior animals from outside the nucleus are allowed in (Box 32). The latter structure implies that some recording takes place in the rest of the population. After a few generations of nucleus breeding, the rates of the genetic improvement in the nucleus and in the breed population at large will be equal. The plan should address the following:

- the size of the nucleus (usually 5 to 10 percent of the size of the population it serves, including the multiplication units);
- whether there will be one nucleus or multiple nuclei;
- whether the nucleus will be centralized or dispersed (nucleus animals kept in the owners' herds or flocks) – a centralized nucleus is preferable for ease of transport and communication;
- the geographical location of the farm(s) that constitute the nucleus; and
- how to choose the nucleus animals, i.e. how to screen owners' animals for possible inclusion in the nucleus.

Action 3: Plan the transport and communication infrastructure within the breeding nucleus

An effective straight-breeding programme requires good transport infrastructure and communication. The plan needs to consider how transport and communication requirements will be met.

Action 4: Plan recording policies within the nucleus

Because recording is often one of the most expensive elements of a breeding strategy, it is important to be judicious and take only the necessary records. It is possible to begin with simple, low-cost recording (FAO, 1998b), then increase it as the programme proceeds (and possibly as revenues start to accrue). The traits to be recorded will have been chosen when the breeding goals and selection criteria were identified (Box 33). There is, however, a need to plan which traits will be recorded on which animals. Recording requires some form of animal identification. Options include tattooing, branding, ear tags, ear notching, necklaces ...

castrated or avoided altogether. Dowry animals are customarily female; in the case of males, they should be castrated.

Negative measures include castration, isolation, culling, use of aprons, sale, exchange and slaughter. Of all the bull calves born in a herd, some five to ten are earmarked for breeding, mainly on the basis of parental history in terms of milk production. The decision whether or not to castrate is made at the age of three to four years, when their potential can be properly evaluated.

Overwhelming evidence indicates that, even in traditional livestock production systems, reproduction is not left to chance. Analysis of births in two sample herds over a 20-year period showed that 99 percent and 96 percent, respectively, were the result of planned matching of sire and dam. Almost unfailingly, the owner of the dam remembered the circumstances in which the female animal was fertilized and the name of the owner of the sire. Only in a few cases was the name of the owner of the sire unknown or forgotten.

and electronic identification. In situations where mass selection (selection based on the phenotype of the individual animal) is practised for a simple trait, such as body weight, animals may be selected as they are weighed.

Women are often the traditional record keepers of animal performance and pedigree, and are knowledgeable about these issues. It is therefore a sensible choice to involve them in record-keeping. Literacy rates among women are usually lower than among men, which need not be a problem, however, if recording methods are designed accordingly.

Action 5: Plan the management of the stock within the nucleus

Basic parameters to consider include:

- ages at breeding and breeding lifetime (which will have great influence on the rate of genetic improvement);
- feeding of each management group (e.g. young males);
- housing of each management group; and
- locations of each management group.

It will also be necessary to plan disease control and management and to integrate the recording programme (including any performance tests) with the management of the stock. The selected animals are higher-producing and therefore have higher requirements in terms of feeding and husbandry.

Action 6: Plan the selection policies and selection targets within the nucleus

The selection policies will describe how replacements for breeding males and females in the improvement programme are to be chosen.

Action 7: Define the selection index

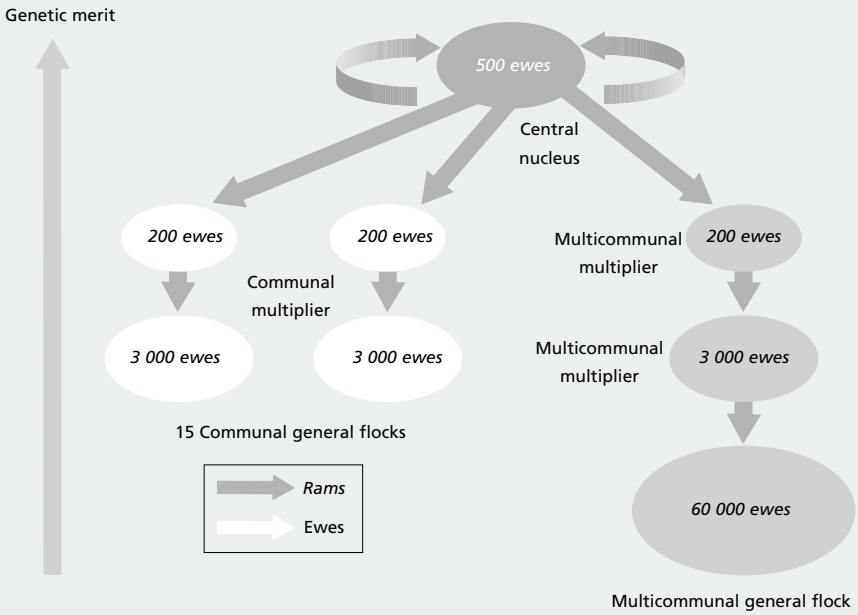
The selection index is defined in terms of the selection criteria and other parameters including heritabilities and genetic and phenotypic correlations. In many cases, these parameters will not be available for the breed that is to be the subject of the breeding programme. In

BOX 32

Open nucleus breeding – maximizing community involvement

In 1995, an agreement was signed between the University of La Molina and local sheep keepers in the Sierra Central in Peru to improve breeding efforts and produce superior rams. A year later, the Research and Training Centre for Rural Workers was established. A breeding structure was created based on an open nucleus with progeny-tested sires and 500 ewes. Two types of multiplication were established, the first involving a single tier of multipliers for single community flocks and the second involving two tiers for a general multicommunal flock.

Present breeding structure – an open nucleus with one- and two-tiered multiplying routes



In 1997, the villagers came together and defined the breeding goal. They allowed the 50 best ewes to be used in the open nucleus; 25 were returned to them when they were pregnant. Rams were selected from the best local and external sources. Performance is recorded in the nucleus, and the villagers visually appraise sheep.

This project shows that maximizing the involvement of livestock keepers in a breeding programme is a slow process, but pays off in the long term.

Provided by Joaquín Mueller.

such cases it is possible to use the equivalent values for the same trait(s) in a production environment that is closely comparable to that in which the breeding programme is to be undertaken. At this point there is a need to establish a formal selection index, which will involve a combination of goal traits and/or non-goal traits. (The latter provide information about the goal traits, but are easier or less costly to measure.)

Action 8: Plan the genetic evaluation procedure

The following questions should be considered when planning the genetic evaluation procedure:

- How will the evaluation be made? While mass selection is the form of evaluation that requires the least recording, it is generally less accurate than evaluation based on progeny testing and best linear unbiased prediction (BLUP). The plans for genetic evaluation should reflect the state of development of systems for recording performance and pedigree data (Action 4).
- Where are the evaluations to be done (e.g. at dispersed locations or a centralized location)?
- How will the recorded data be transferred to the evaluation site(s)?
- Will the data need to be entered into a computer before evaluation? If so, how will this be done?
- Are the available computing resources sufficient for the task?
- In the case of multiple nuclei, consideration should be given to whether the nuclei are genetically connected and whether a comparison can be made between animals in the different nuclei.

BOX 33

Animal records and recording

Animal records taken in the nucleus will relate to:

- performance;
- pedigree; and
- management (e.g. health, feed consumption and reproduction).

Keep recording simple. For example, if lamb weight at weaning is a selection criterion, lambs can be weighed a number of days before weaning age and the weaning weight calculated by extrapolation (which will allow for the fact that weighing all the animals will take some time). In the case of cattle, if 13-week milk yield is the selection criterion, measure milk production for that period only.

For complete pedigree recording, the sire and the dam need to be known. Recording the sire requires artificial inseminaton, hand-mating, separate mating pens during the mating season or close observation by the herder or caretaker. Recording dams is easier, as the young stay with their dams for some time after birth.

Recording may become more sophisticated as the programme advances and more accurate genetic evaluation is required. For a thorough treatment of recording, consult ICAR (2006).

- How will the timing of the evaluations relate to that of the recording and breeding schedules?
- How will the selection decisions be conveyed to the people concerned with managing the breeding stock?

Action 9: Plan the dissemination and marketing of improved stock

The plan for the dissemination of the improved germplasm (Box 34) should address the following questions:

- Will improved breeding stock be disseminated directly from the nucleus or via multiplier units?
- What germplasm will be disseminated – male, female or both?
- How will the germplasm be disseminated?
- How much improved germplasm will be available for dissemination?
- How will the improved germplasm be promoted?
- What are the targets for the use of improved germplasm by commercial livestock keepers?

Action 10: Carry out a SWOT analysis

Once the straight-breeding programme plan has been prepared, a SWOT analysis should be carried out. The results of this analysis should be used to fine-tune the programme plan.

Action 11: Obtain an investment appraisal

See details in Section F.

Action 12: Deliver the straight-breeding programme plan to the policy-makers and revise if necessary

When the straight-breeding programme plan is complete, deliver it to the policy-makers. Revisions may be required.

TASK 4: SET UP THE FINANCIAL AND ORGANIZATIONAL STRUCTURES

Action 1: Secure the necessary funding

Funding may come from the government, NGOs (including breed societies) or external funding (during the initial phase). In most developing countries, the government will need to play a significant role, at least at the start of the programme, so as to maximize the chances for its sustainability.

Action 2: Develop training programmes

Train extension service staff to show livestock keepers how to deal with the improved animals, meeting their needs for housing, feed and veterinary care. Emphasis should be given to including women livestock keepers because of their important role in animal management. It is also necessary to train programme staff in all aspects of running the programme.

TASK 5: IMPLEMENT THE STRAIGHT-BREEDING PROGRAMME

Action 1: Manage the implementation of the development plan on a daily basis

Two areas require close attention – problems unforeseen at the planning stage and disputes over the demarcation of responsibilities. The latter are likely to occur during the recording procedures. The precise demarcation of responsibilities among the farm manager, the manager of the information system and the geneticist should be carefully reassessed.

Action 2: Involve progressive and competent livestock owners

Such livestock owners should be identified. They will form the first group of customers for the straight-breeding programme. Ask for feedback from the livestock keepers, which should be collated and included in the progress report (Action 4) for consideration when the breeding goals are reviewed.

Action 3: Strengthen contact with the extension service

The extension service should explain to the livestock keepers that the improved animals, even though they are from local breeds, have higher requirements in terms of feeding and husbandry. Ask for feedback from the extension service concerning the performance of

BOX 34

Niche markets and the need for a marketing plan – an example from France

An interesting example of niche marketing comes from the Bresse Region in France. Breeders undertook the protection of a local chicken breed associated with a tradition of quality products. To achieve their objectives, the breeders set up a genetic management programme for the breed and developed a marketing strategy to distinguish the *"Poulet de Bresse"* from fast-growing commercial broilers. Image is an important marketing point – the Bresse breed standard includes white plumage, blue shanks and traditionally red earlobes and comb. A better match with the national flag is hard to imagine.

The birds are raised under specific growing conditions and are subject to a standard finishing period and regulated processing. The result is a unique product with a Protected Designation of Origin label. Revenues are often more than twice those obtainable with standard broilers. Because the *Poulet de Bresse* is sold almost exclusively via small retailers and restaurants and not via supermarkets, it has managed to establish a niche in a market dominated by large-scale poultry breeders.

It is apparent from the Bresse experience that it is possible to establish a niche market despite strong competition from highly selected breeds, provided that the livestock keepers agree upon a good marketing strategy and a unified genetic management programme.

Provided by Michèle Tixier-Boichard.

the improved animals in commercial conditions. This information should be collated and included in the progress report (Action 4) for consideration when the breeding goals are reviewed.

Action 4: Monitor and report on progress

Dissemination should be reviewed and a progress report prepared. The report should indicate whether targets for the sale of the improved germplasm have been met. It should also include collated feedback from customers and the extension service. A genetic review should consider selection intensities, recording accuracies, generation intervals in males and females and genetic gain.

Tasks and actions – phase III

TASK 6: OPEN THE NUCLEUS TO SUPERIOR GENETIC MERIT

Action 1: Carry out an empirical comparison of herds/flocks within and outside the improvement programme

If the nucleus of the improvement programme has had limited opportunity to select among its stocks, or if selection has been based on poor information, this task may be extremely important. The improvement programme will benefit from obtaining replacements from among the superior animals in the superior herds or flocks that may be identified.

TASK 7: IMPROVE DISSEMINATION AND DISTRIBUTION

Action 1: Ensure that market signals promote the use of improved stock

Incentives for using the improved stock are needed. These incentives will generally result from higher prices in the market. If incentives do not exist:

- lobby policy-makers for a change in the market structure;
- seek a marketing alliance further down the retail chain (branding); and
- seek ways to expand the market.

Action 2: Examine the case for improved dissemination methods

Reproductive technologies are continuously developing, and many can be used to expedite dissemination. In particular, because it dramatically increases the male reproductive rate and avoids the need for multiplier herds or flocks, the use of artificial inseminaton, where it is technically feasible, has proved very effective in disseminating genetic merit to commercial herds and flocks.

TASK 8: IMPROVE RECORDING AND EVALUATION

Action 1: Consider introducing pedigree recording

It is possible to proceed with the breeding programme without pedigree recording, but developments in Phase III will come about more easily if pedigrees are routinely recorded within the programme or at least in the nucleus. Seek expert advice if required. If pedigree recording is already being implemented, review the procedures and amend them if necessary. Set targets for reducing errors in the pedigrees.

Action 2: Consider the need for more structured recording

More structured recording implies taking more – and possibly more sophisticated – records. An example is performance testing of animals or their progeny; another would consist of

measuring traits that are not among the goal traits, but are included in the selection index because of their high correlations with the goal traits. The potential benefits achievable through the introduction of more structured recording should be reviewed by addressing the following questions:

- Will more structured recording produce significant genetic benefits?
- Will additional holdings need to be included?
- What other developments are required (e.g. additional housing for mature males during a progeny test)?
- What are the total additional costs likely to be?

Action 3: Consider the use of BLUP for breeding value evaluation

If full pedigree recording has been introduced, it is possible to improve genetic evaluation by using BLUP. If only partial pedigree records (through sire or through dam only) are available, BLUP can still be performed, but it will be less accurate.

If multiple nuclei are involved in the straight-breeding programme, effort should be made to use sires across the nuclei in order to provide the genetic connectedness required for accurate evaluation of breeding values.

TASK 9: OPTIMIZE THE SELECTION INTENSITY AND THE GENERATION INTERVAL

Action 1: Review selection and mating structure

The number of individuals selected as replacements within each age group affects both the selection intensity and the generation interval. A balance must be struck between the two. Breeding animals at younger ages, keeping parents for fewer years and avoiding reproductive failures can shorten generation intervals. Selection can be intensified by increasing the reproductive rate, reducing mortality among the young and keeping animals longer. The latter option leads to longer generation intervals, however.

Action 2: Consider ways to increase the female reproductive rate through improved management

One way of increasing selection intensity is to increase reproductive capacity. Review management procedures to determine how reproductive rates might be improved. Discuss the required measures with the persons responsible for managing the animals.

Action 3: Consider how to increase reproductive rates through the use of reproductive technology

Reproductive rates can be increased through the use of reproductive technologies. Consider whether there is a case for using them.

Action 4: Review the adequacy of the genetic links between dispersed locations

Without adequate genetic links, the relative merits of herds or flocks in dispersed locations are difficult to estimate. The genetic links between the herds or flocks that make up the

selection nucleus should be reviewed. If they are found to be weaker than desired, measures should be taken to strengthen them.

Action 5: Improve selection across age groups and locations
If BLUP evaluation is introduced, selection should take place across age groups and locations.

TASK 10: ENSURE THAT THE PROGRAMME IS DELIVERING AS EXPECTED

Action 1: Estimate the effective population size and consider ways to ensure that it is sufficiently large (greater than 50)
The effective population size determines the rate of loss of genetic variation from the breeding programme. Distinct from the actual population size, it depends on the number of both male and female animals used as parents, the selection intensity, the variation in litter size and the method of evaluation and selection. The effective population size and how it can best be managed should be reviewed.

Action 2: Consider the potential effects of differences between management in the top tier of the breeding programme and that in the production tier
If the herds or flocks within the top tier of the breeding programme are managed differently from those in the production tier, genotype by environment interactions may mean that the animals best suited to one system are not best suited to the other. The possibility of such effects should be explored during the early stages of the programme, which will help ensure that the breeding programme delivers benefits to the whole population. As the programme develops further, checking for such effects is a means by which to identify whether there is a need to reconsider the breeding goal or to provide advice to livestock keepers in the production tier on how they can improve their management in order to obtain greater benefit from the improved stock.