

SECTION C

# Matching animal genetic resources with production systems





# Overview

## RATIONALE

This section is based on the assumption that the procedures described in Section B have led to a decision to implement a breeding programme as part of the LDS. The development of the programme needs to take clear direction from an overall breeding goal, which should be in line with the LDOs for the production system. AnGR can be used in different ways to fulfil an overall breeding goal. Options include straight-breeding or cross-breeding schemes, using locally available breeds and/or introducing breeds from elsewhere.

Matching AnGR with production systems means looking for the optimal breed to satisfy the needs of the production system. Research on production systems and local and indigenous knowledge systems during the last 10 to 15 years has yielded ample evidence that in many cases the locally available breeds represent the “best fit” in terms of adaptability to the physical and animal husbandry environment. If this is the case for the production system(s) under consideration, and unless there is clear evidence for the benefit of using an exotic breed, a decision to use the locally available AnGR would be a reasonable outcome of the decision-making process.

Straight-breeding and cross-breeding programmes can differ substantially in terms of their potential gains, the risks involved and the level of organization they require. The decision-making process must weigh the level of organization required and the risks involved against the potential benefits, which mandates rigorous evaluation of breeds and crosses. This costly and challenging process will require great attention.

The following description of the tasks involved in matching AnGR to production systems is intended to help decision-makers grasp opportunities while minimizing risks. The process must be repeated for each production system for which breeding strategies are to be implemented.

## OBJECTIVE

Define the overall breeding goal. Describe locally available breeds and possible alternative ones. Provide arguments on the basis of which decisions can be taken regarding which breeds should be used and what type of breeding programme should be developed.

## INPUTS

The main inputs are the LDOs and the description of production systems (Section B). Other important inputs are information on AnGR and the views of the stakeholders on the breeding goals and the breeds considered.



## OUTPUTS

The outputs will be a concise overall breeding goal that addresses traits to be improved and a clear decision, taken with the support of key stakeholders, as to the breed(s) and the breeding programme to be used.

## TASKS

In order to achieve these objectives, the following tasks need to be undertaken:

1. Define the overall breeding goal for the production system of interest.
2. Collate available information on experiences in the conduct of breeding programmes.
3. Collate available information on the roles and characteristics of locally available breed(s).
4. Examine possible alternative breeds.
5. Decide whether the breeding programme will be based on locally available or alternative breeds.
6. Conduct a feasibility study for the introduction of alternative breeds and take a decision.
7. Prepare the germplasm introduction plan.
8. Implement the germplasm introduction plan.



# Tasks and actions

## TASK 1: DEFINE THE OVERALL BREEDING GOAL FOR THE PRODUCTION SYSTEM OF INTEREST

### **Action 1: Consult relevant stakeholders to identify traits of interest**

The stakeholders who should be consulted at this point will be chosen from the inventory established earlier in the planning process (Section A). The most relevant stakeholders are those who represent livestock keepers, marketing and retail chains and breeding support services. These stakeholders should provide a list of major traits relevant to:

- the LDOs for the target production system;
- the inputs and outputs of the production system; and
- the characteristics of ideal animals for this production system.

In this crucial phase of the decision process, it is essential that both men and women livestock keepers have their say. The hierarchically layered system of representation often used in consultative fora may not be appropriate in this case. Therefore, it is recommended that participatory group discussions be conducted right at the grassroots, focusing on the question: What is the ideal animal and why? (Boxes 21 and 22).

### **Action 2: Synthesize traits to define the breeding goal**

Define a small number of trait groups, each of which contains a few traits. For example, the groups could represent production traits (e.g. milk yield, weaning weight) or functional

#### BOX 21

### **The importance of consulting livestock keepers to identify traits of interest**

Goats have been well adapted to the Korean Peninsula for more than 700 years. With increasing demand for goat meat in the early 1990s, Boer goats were imported into the Republic of Korea and widely used for cross-breeding with the native black goats. Even though the Boer cross-breeds had a better growth rate than the native goats, they were not popular with the livestock keepers because they did not have the same black coat as the local goats. This prompted the importation of the feral Black Australian breed, which has the same colour as the native animals.

The appraisal by livestock keepers – the end users of the breeding programme – of a new breed or cross-breed is thus an essential step in establishing the breeding goal.

Source: adapted from FAO (2007).



## BOX 22

**Breeding criteria of the Karamoja pastoralists**

East African pastoralists of the Karamoja cluster have a detailed list of traits that they value highly in breeding bulls and cows. Both cows and bulls should be adapted to the harsh environment (resistant to diseases and parasites, tolerant of heat and cold and able to retain body weight during periods of drought and feed shortage). They should also have a good temperament. The coat colour and horn configuration of bulls are identified with owners or communities. Coat colour, body size and conformation should be suitable for marketing. Bulls should stay in the herd and not show aggression towards other herd members. The milk yield of breeding cows – regardless of the season – should be high, tasty and have an ample butterfat content. The cows should also calve regularly, produce quick-growing offspring and have wide udders with complete teats.

This example illustrates that livestock keepers have their own breeding criteria. It is therefore important to take their opinions into account when defining the breeding goal.

*Source:* adapted from FAO (2007).

traits (e.g. fertility, health, behaviour). From among the traits suggested in the consultation (Action 1), choose those for which there is broad stakeholder agreement. If there appear to be large differences between or within different categories of stakeholders, consider repeating the consultation until broad agreement is reached. Be aware that such consultation may entail a negotiation process in which there may be a danger that the interests of certain categories of stakeholders are neglected.

**Action 3: Define the breeding goal**

Write a concise sentence outlining goal traits agreed upon by stakeholders. An example might be: improving productivity while maintaining adaptability to the local environment. Other examples of breeding goals are presented in Box 23.

**TASK 2: COLLATE AVAILABLE INFORMATION ON EXPERIENCES IN THE CONDUCT OF BREEDING PROGRAMMES**

Collate positive and negative experiences on breeding programmes for the species of interest, which have been implemented in similar production systems in this and other countries.

**TASK 3: COLLATE AVAILABLE INFORMATION ON THE ROLES AND CHARACTERISTICS OF THE LOCALLY AVAILABLE BREED(S)**

It is essential that the current socio-economic uses of the locally available breeds and the cultural values associated with them be documented before considering any change, because this will provide the baseline for an assessment of their suitability for inclusion in



## BOX 23

**Examples of breeding goals**

**LAMBPLAN™** In its early stages, LAMBPLAN, a scheme designed to improve lamb performance in Australia, chose the following as its default breeding goal:

*Lean growth: designed to give equal (in genetic standard deviation units) improvement in weight at a constant age and fat depth at a constant weight.*

**N'Dama** The directors of the livestock/veterinary services and of the research organizations dealing with livestock in the Gambia, Guinea, Guinea-Bissau, Senegal and Sierra Leone made the following qualitative statement on breeding goals:

*The N'Dama will remain the cattle breed of choice for the low-input system from the Gambia southwards. Throughout the region, the breed is regarded as triple-purpose (for milk, meat and traction), and emphasis for improvement will be on milk and meat without the loss of disease-resistance and other adaptive traits.*

After further consultation and analysis to set the goal values, the breeding goal was defined as  $0.22 \times$  (breeding value in daily gain in grams) +  $0.52 \times$  (breeding value in milk in kg), without loss of disease resistance.

*Note:* The absolute values of the weighting factors are irrelevant, because the same animals will be selected as long as the ratio of the two weighting factors (0.22:0.52) stays the same.

*Sources:* ICAR/FAO (2000b), ICAR/FAO (2000c).

the breeding programme. Any change will cause significant upheaval in the production system, and thus it may be appropriate to regard the use of locally available breed(s) as the default option.

### **Action 1: Review the socio-economic and environmental characteristics of the production system**

This section will ultimately involve making comparisons between locally available and exotic breeds. It is important to ensure that such comparisons are fair. Both the current production system and the production system envisaged for the future of the local area need to be taken into consideration. Therefore, before describing locally available breed(s), review the descriptions of the local production system(s) drawn up when implementing Section B. If this is not available, describe these production systems in as much detail as possible.

To compare locally available breeds with those from other areas, it will be necessary to compare their production environments (geographic location, terrain, climate, etc.). A description of the production environment that can be used for interarea comparisons is therefore needed. This will require relevant technical expertise. The set of production environment descriptors developed for inclusion in the Domestic Animal Diversity Information System (DAD-IS at <http://www.fao.org/dad-is>) provides a common framework intended to



facilitate comparisons among production environments, both nationally and internationally (FAO/WAAP, 2008). It may, of course, be feasible to collect more detailed descriptions than those outlined, but this framework provides a standard baseline for such work.

***Action 2: Describe the breeds present in the production system and their roles within it***

The description should include the distribution, population size, roles and functions in farming and livelihood systems, morphological and performance traits, longevity, adaptability and special features of the breed. Collect livestock keepers' views on the strengths and weaknesses of the locally available breeds. The views of women livestock keepers and livestock keepers' wives will complement those of the men and must be sought. Use the information to identify what roles each breed might play in meeting livestock keepers' needs in the current and future production systems. Note that because of the long time frames of breeding strategies, careful consideration must be given to potential changes in the production system. Identify whether any roles and objectives are envisaged in the LDOs that are not currently filled by a locally available breed – for example, an opportunity to use a terminal sire breed. Note whether any of the breeds under consideration have weaknesses that are likely to affect their abilities to fulfil their proposed roles.

**BOX 24**

**Matching animal genetic resources with production systems – the case of the Indian Chilika buffalo**

Many local breeds have unique characteristics that enable them to perform functions within the local production system that cannot be matched by any other breed. Chilika buffaloes, for example, are prevalent in the islands and periphery of Chilika Lake on the coast of eastern India (Khurda, Ganjam, and Puri districts in the State of Orissa). The animals are well suited to the backwaters of the lake and enter the knee-deep waters to feed on weeds and grasses, generally during the night. During the daytime they rest on the shore, under the trees. The Chilika buffaloes have an important ecological role – their dung and urine support zooplankton, which support the lake's fish population, which in turn supports livelihoods around the lake. Other breeds are not well adapted to the local production system and introduced animals have proved unable to meet the multiple roles performed by the Chilika buffaloes. Murrah buffaloes or Murrah-Chilika crosses, for instance, do not survive in this environment, because they are less well adapted to the humid conditions and the absence of non-saline drinking water.

Provided by Devinder K. Sadana.





#### TASK 4: EXAMINE POSSIBLE ALTERNATIVE BREEDS

The introduction of AnGR from outside the locality should be considered. Such breeds may offer benefits that cannot be provided by those currently kept within the production system. There is a need to decide how widely the search for alternative breeds should extend, and then to collate and evaluate available information on all the breeds that might be introduced.

##### **Action 1: Set criteria for the search for alternative breeds**

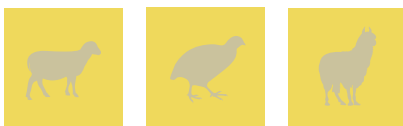
It is important that the requirements of the alternative breed should neither overstretch local resources nor disproportionately increase livestock keepers' workloads, especially those of women. The following requirements, *inter alia*, need to be considered:

- **Nutrition.** Is the area into which the breed is to be introduced able to produce the quantity and quality of feed needed? Is the expertise needed to grow the feed locally available? What would be the impact on land allocation?
- **Health.** Depending on the alternative breed's level of resistance to prevailing diseases and parasites, a higher level of preventive and curative treatment may be necessary.
- **Management and care.** Additional requirements might include shelter, stall-feeding, better care of young animals, or more monitoring and protection of the herd/flock. Larger or less docile animals may be more difficult to handle.
- **Reproduction.** External resources, such as a breeding bull or artificial insemination (artificial insemination), may be needed. Animals may need assistance when they give birth.
- **Investment (e.g. shed, concrete floor, chaff cutter, dip tank and the animals themselves).** High prices may make it difficult for poor households to acquire and maintain animals belonging to the alternative breed.

Given that many breeds might be examined as potential candidates for introduction, it is necessary to set criteria with which to narrow the search. Use the information collected during the earlier phases of the planning process to identify livestock functions that may need to be strengthened through the introduction of an alternative breed and possible roles for introduced breeds in the future breeding programme. The search for alternative breeds should take account of current policies and perceived risks that may restrict the locations and production environments from which the alternative breeds can be sourced.

The following should be considered:

- diseases to which the alternative breeds would be exposed in their new production environments;
- diseases endemic in the alternative breeds' home regions that need to be kept out of their new production environments;
- attributes of the alternative breeds that may have unwelcome consequences for the country's key agricultural products (see Box 25 for an example); and
- capacity to access funds and properly evaluate and manage germplasm from alternative breeds (e.g. the ability to handle germplasm stored in liquid nitrogen or to manage quarantine procedures).



## BOX 25

**Avoiding negative consequences of introducing an alternative breed**

Australia maintains a strict policy on importing alternative breeds of sheep. One policy objective is to protect the quality of its wool clip, where one black fibre per million is sufficient to reduce value considerably. Therefore, the proportion of black fibres in the fleece is a critical attribute of an imported breed. A second policy objective is to keep scrapie (a sheep disease) out of the country. Therefore, no breeds that might introduce the disease are considered for importation.

**Action 2: Gather information on alternative breeds**

Using a variety of information sources (e.g. DAD-IS), pay particular attention to the degree of adaptation of the alternative breed to the production environment into which it would be placed and to how the breed might be accessed (e.g. live animals or embryos). Because information on alternative breeds and their traits may come from a variety of sources and studies, trait values may need to be pooled together. Seek technical advice on this if necessary.

**TASK 5: DECIDE WHETHER THE BREEDING PROGRAMME WILL BE BASED ON LOCALLY AVAILABLE OR ALTERNATIVE BREEDS**

This task involves a pivotal decision within the process: Will the breeding programme be based on locally available breeds only (improving them by using a straight-breeding programme) or should alternative breeds be used, either as pure breeds or in a cross-breeding programme with the locally available breeds? Development of straight-breeding and cross-breeding programmes are described in Sections D and E, respectively.

The following *key question* needs to be answered: Is there sufficient information to predict whether an alternative breed from outside the locality will provide an increase in overall economic performance greater than 30 percent? At this point in the process, attention must be paid to possible trade-offs – better performance but at what cost and to the detriment of what or whom? Although to some extent the 30 percent value is arbitrary, it is the figure generally recommended as a basis for such decisions and should only be reduced where a high level of technical capacity is available. Introducing new breeds can be costly. It requires a managed implementation programme, including testing, over a period of years and involves a variety of risks that may lead to failure. A substantial projected benefit is therefore considered necessary to justify investment. While it is important to be very aware of the costs and risks associated with introducing an alternative breed, there is also a need to recognize that a straight-breeding programme with local breeds will also generate additional costs, because the higher-producing animals will have greater requirements in terms of feeding and husbandry.

If this key question is answered in the negative, then it is recommended that a straight-breeding programme be developed for the locally available breeds. No alternative breeds



are needed. Summarize the reasons for reaching this recommendation and initiate a wider consultation process to ensure its wide support among stakeholders. If the stakeholders support the decision, proceed to develop the straight-breeding programme (proceed to Section D). If the decision is not supported, the working group should review it, but still must take the final responsibility and decide.

A positive answer to the key question indicates that the introduction of alternative breeds from outside the locality is a possibility. A more detailed evaluation is therefore needed. Proceed to Task 6 in this section.

## **TASK 6: CONDUCT A FEASIBILITY STUDY FOR THE INTRODUCTION OF ALTERNATIVE BREEDS AND TAKE A DECISION**

If it is decided that one or more alternative breeds may have a role in the breeding strategy, it will be necessary to conduct a feasibility study for its or their introduction. The study should be completed within a short time and address the following questions:

- Do veterinary regulations allow the introduction of germplasm from the alternative breed?
- Is it feasible to access sufficient germplasm for an effective introduction?
- Can the local infrastructure within the production system sustain the introduction?

### **Action 1: Review regulations and capacity**

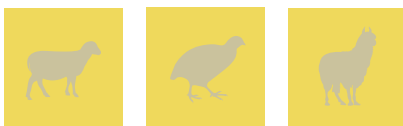
Review zoosanitary regulations to establish whether live animals or preserved germplasm can be brought into the local administrative area and, if so, under what conditions. Review the justification for any restrictions. If the candidate breed is available in several countries, identify any differences in the regulations affecting imports from the various potential sources. If the introduction of live animals is being considered, document the requirements for safe transport and quarantine, and determine whether the required facilities are available in the local administrative area. If frozen germplasm is available for import, document whether the local administrative area has the facilities and capacity to store, manage and use the material effectively. List and prioritize options for:

- the form and source of the genetic material;
- any improvements to infrastructure that may be required; and
- any additional skills and training that may be required.

### **Action 2: Assess the feasibility of the introduction**

Attempt to answer each of the questions listed in the introduction to this task. If the answers are not immediately clear, seek further information or clarification from the relevant sources and revise the answers accordingly. Address the following issues:

- If veterinary regulations pose barriers to the introduction of the genetic material needed to implement the envisaged programme, seek legal advice regarding the possibility of having the regulations changed or obtaining an accommodation that allows the introduction to take place within the framework of the present regulations.
- If problems obtaining sufficient germplasm are foreseen, investigate whether they can be overcome. For example, if direct substitution does not appear to be feasible



because of the number of live animals required, examine the feasibility of upgrading (repeated backcrossing to the introduced breed).

- If problems with sustaining cross-breeding in the production system are foreseen, investigate whether they are surmountable. For example, problems resulting from an insufficient number of female animals to sustain a two-breed crossing system might be resolved by encouraging specialized keepers to become established within the production system. (See Box 26 for a description of the role of specialized keepers in Merino production systems in Australia.)

Decide whether the introduction of the candidate breed(s) is feasible and under what circumstances. If the study indicates that feasibility is limited (i.e. the answer to one or more of the above questions is negative), do not opt for an alternative breed – use a locally available breed instead.

Initiate a wider consultation to ensure support among stakeholders for the decision taken and any developments that will be required in the production system. The consultation must be conducted in a manner that is appropriate to the circumstances of the stakeholders. For example, while commitment is needed from both livestock keepers and retailers of livestock products, the approaches required to obtain an informed response from these two groups of stakeholders will differ. Particular attention needs to be paid to this issue when livestock keepers' associations and breeders' cooperatives are poorly developed or absent and when the livestock keepers are largely smallholders or pastoralists.

***Action 3: Organize a study tour to appraise the candidate breed visually in its own production system***

The person responsible for this action should ensure that the plans for the study tour are appropriate to its objectives. The visiting livestock keepers (both men and women) should be able to meet and hold discussions with their counterparts who actually own, use and manage the alternative breed in comparable circumstances. The person

**BOX 26**

**Specialized livestock keepers – an example from Australia**

Australian Merino ewes are straight-bred for most of their productive lifetime. Some keepers specialize in purchasing draft Merino ewes (culls from the straight-bred flocks) and crossing them to a terminal sire breed for the production of lambs for slaughter. The reproduction rate of the Merino ewes in their production environment is low. Moreover, the production system is extensive, making it difficult for the Merino keepers to cross to the terminal sire breed and manage the lambs appropriately. The specialized keepers make this element of the production system feasible. The benefits are shared – the specialized keepers obtain a return on the lambs sold and the Merino keepers have a developed market for their draft ewes.



responsible should also identify livestock keepers who are willing to join the study tour (possibly with financial aid) and who are committed to participating in and supporting the evaluation of the alternative breed in the local production system (see Task 7). This commitment is necessary because the evaluation will be expensive and risky and will require livestock keepers' direct involvement. Livestock keepers need to share ownership of the decisions taken.

#### **Action 4: Decide whether to introduce the candidate breed**

Based on the outcome of the feasibility study, the degree of support expressed by the stakeholders consulted and the number of livestock keepers willing to participate in the evaluation within the local production system, decide whether to proceed with an introduction or to use locally available breeds. In the case of the latter decision, proceed to Section D; otherwise continue with Task 7 in this section.

### **TASK 7: PREPARE THE GERMLASM INTRODUCTION PLAN**

Introduction of a breed from outside the locality requires the coordination of many actions. The germplasm introduction plan should be prepared to serve as a reference for all concerned. The plan should indicate who is to carry out which actions, how and when. An essential element of the plan will be an evaluation of the breed in its envisaged role within the local production system. The detailed plan, which will serve as a basis for attracting funds for introducing the breed, should consist of two phases:

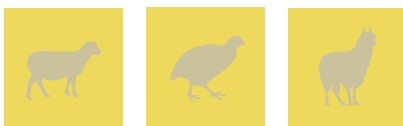
- Phase 1: Introduce a limited quantity of germplasm for evaluation purposes.
- Phase 2: Make a larger-scale introduction based on the results of the evaluation.

#### **Action 1: Plan how to access germplasm from the alternative breed**

The following issues, which have been considered from the perspective of their feasibility, must now be considered from an operational point of view:

- **Veterinary regulations.** These will have been documented as part of the previous task.
- **Costs of acquiring germplasm.** Costs vary for different options. The amount of germplasm initially required will be determined by the design of the evaluation in Action 3, which follows.
- **Sources for initial and subsequent acquisition.** Options for obtaining germplasm should have been identified and recorded during the study tour. Will the sources identified provide enough germplasm for both phases? Note that the method used to acquire the initial, relatively small, amounts of germplasm may be different from that envisaged for acquisitions in the longer term, and the plan should account for this.
- **Facilities for using the germplasm.** If frozen germplasm is to be used, are the facilities needed to handle and store it available in the local area?
- **Technical capacity for using the germplasm.** Is the technical capacity needed to use fresh or frozen semen, oocytes or embryos available in the local area?

Based on these considerations, determine the most viable option for the initial acquisition of germplasm and for sustained access over the longer term.



### **Action 2: Plan how to manage the risks associated with the introduction of the alternative breed**

Risks associated with introducing an alternative breed need to be managed, as do uncertainties regarding the breed's performance.

**Risks to the locally available breed(s).** Risks may arise because of the potential for diseases to be brought in with the introduced breed. These risks should be managed by applying the relevant veterinary regulations when the breed is imported. If risks that have not been identified in the feasibility study come to light, alert the policy-makers and document the risks in the plan. Another risk to be aware of is that uncontrolled crossing with the locally available breed may undermine its genetic integrity.

**Risks to the introduced breed.** The following risks are relevant if the introduced breed is acquired in the form of live animals or embryos:

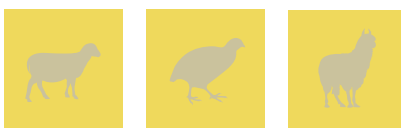
- **Disease risks.** Management of disease risks will require veterinary advice. Methods to minimize risk might include vaccination or isolating the introduced breed from other animals.
- **Climatic risks.** The introduced breed may require more elaborate shelter than is normally provided to animals in the local production system. Seek advice from a livestock specialist or veterinarian.
- **Nutritional risks.** Feeding practices may need to be adapted to ensure that the nutritional needs of the introduced breed are met. Nutritional advice may be required, including expert advice from the native region of the breed.
- **Animal welfare issues.** If animals are introduced into an area where conditions (parasites, temperature, drought, humidity, feeding, housing, handling, etc.) differ greatly from those that they are used to, the animals will suffer stress and will not thrive.

Take special note of any measures followed in order to reduce the risks faced by the introduced breed (e.g. providing them with housing) that may introduce bias into the evaluation of the performance of these breeds relative to that of the locally available breeds.

### **Action 3: Plan the evaluation of the alternative breed in the local production system**

Ideally, decisions as to which breed(s) should be introduced and for what use (pure-breeding or cross-breeding, and in the case of the latter what grade) should be based on an evaluation of the alternative breeds and their crosses in the production environment in which it is intended that they be kept. This very lengthy and expensive process requires expertise in design and planning (Box 27). The following approach can help to narrow the options and facilitate the evaluation:

- Decide which traits are to be improved. (They will have been identified during the completion of Task 1 of this section.)
- Define the production environment under which the improved stock will perform (Section B and Action 1 of Task 3).
- For the trait of interest, critically review the literature on breeds and crosses used in similar production environments; pay attention to adaptability traits (e.g.



reproduction and disease tolerance). Based on the review, select the breed or cross-breed to include in the evaluation.

- If a decision is made to use crosses, approximate the performance level that the production environment can sustain and calculate the expected performance of cross-bred animals assuming an additive mode of inheritance between the breeds. For example, if the performance of the locally available breed (B) is 1 000 kg per lactation and that of a potential breed for cross-breeding (A) yields 6 000 kg, then the half-bred cows would be expected to yield 3 500 kg and the  $\frac{3}{4}$  A  $\frac{1}{4}$  B cows would yield  $\frac{3}{4}(6\ 000) + \frac{1}{4}(1\ 000) = 4\ 750$  kg. Ensure that the prospective production environment can sustain this level of production.
- Review your decision as you continue with the programme.

Be aware that in addition to technical and statistical aspects of the evaluation, there is also an equally important subjective element. The evaluation should therefore also expressly seek to evaluate the experiences of the end users.

#### ***Action 4: Plan conservation actions for local breeds that will be affected by the introduction of alternative breeds***

A conservation plan must be considered if a locally available breed may be placed at risk by an upgrading programme or the creation of a synthetic breed that includes its genes. Active conservation of the breed should be a high priority, especially if the production environment suffers sporadic disasters, such as droughts, which may not have been encountered during the evaluation period.

The conservation plan should be proactive, as the best animals in the best-managed herds are likely to be among the first to be used for crossing. For conservation options, see FAO (1998a).

#### ***Action 5: Collate and cost the germplasm introduction plan***

Use the outputs of the previous actions to draw up a draft plan. The costs of completing all the above actions will need to be estimated.

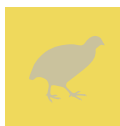
#### ***Action 6: Seek funding for the germplasm introduction plan***

Once the plan is satisfactory, seek funding and carry out a cost-benefit study (Section F). The costs of the plan must meet with stakeholder agreement. If necessary, seek to refine the plan to address any constraints that come to light. If the plan cannot be properly funded, it may be necessary to use locally available breeds only.

#### ***Action 7: Review the draft germplasm introduction plan and approve it if appropriate***

Once the plan is drafted, review it and check it for consistency, practicality, resource needs and costs. Before approving the plan, ensure that feasibility and long-term implications have been fully taken into account. Some issues to consider are:

- If long-term access to germplasm is necessary, can it be ensured?
- Have any costs not been recognized?



## BOX 27

**Exhaustive evaluation of alternative breeds in the local production system**

It is recommended that the evaluation be carried out following a sequential two-step approach. In Step 1, evaluate whether the benefits that the introduced breed is projected to provide in terms of production traits are actually obtained in practice under local conditions. In Step 2, evaluate the fitness traits (e.g. reproduction and adaptation) of the introduced breed in comparison to those of the locally available breed.

The rationale for this sequence stems from the fact that the differences in production-related traits are likely to be large and only a small number of animals will need to be tested in order to confirm the projected benefits. If, during Step 1, the projected benefits do not materialize, an immediate decision can be taken not to proceed with the introduction of the breed, and thus Step 2 will not be necessary. Step 2 involves testing for the small but important differences in fitness that may undermine the benefits that appear to be achievable in terms of production. Testing for these small differences will require a much larger number of animals. However, proceeding with the introduction without implementing Step 2 of the evaluation may have very serious consequences.

The following points should be considered when planning the evaluation:

- **Facilities for evaluation.** It is highly desirable that the evaluation take place on real farms or holdings within the local production system. If the evaluation does not take place in the normal production environment of the locally available breed, the whole process may be undermined, and costly mistakes with long-term consequences may be made.
- **Recording traits for evaluation.** Only production traits need to be recorded in Step 1. However, in Step 2, key fitness traits in the local production environment must also be recorded. In addition to identifying which traits to record, the following questions should be addressed: Who will record the traits? How will they be recorded? Who will collate, document and store the data? How will the data be stored (electronically or on paper)?
- **Procedures to avoid preferential treatment.** The design of the evaluation should aim to minimize the potential for preferential treatment of the introduced breed. Failure to eliminate preferential treatment (e.g. additional shelter, better quality feed) will certainly lead to an overestimation of the benefits associated with the introduced breed and may lead to incorrect decisions regarding recommendations for its wider use.
- **Time scale for the evaluation.** Draw up a detailed and realistic schedule for the evaluation, indicating the number of animals to be evaluated over time.

(cont.)





Seek technical advice on the following:

- **Breed types to be involved in the evaluation.** Key comparisons among breed types must be identified and described in detail in order to clarify how conclusions are to be drawn. For example, the locally available breed that traditionally occupies the intended role should be evaluated under the same management conditions as the introduced breed.
- **Validity of the comparisons.** The design should not confuse genetic comparisons with environmental factors (e.g. years, farms, feeding regimes or housing conditions). Avoid confusion.
- **Number of animals required.** The precision of the evaluation will increase as the number of animals included in the sample increases. A total of 40 animals from the introduced breed may be sufficient for evaluating production traits. This recommendation is based on the assumptions that the potential benefit must be 30 percent or more in order for the introduction to be considered and that these traits have a relatively low coefficient of variation. However, for evaluating fitness traits, a total of 1 500 animals may be appropriate.
- **Sampling procedure within breeds.** The animals evaluated should represent a random sample from the introduced and the locally available breeds rather than a highly selected sample. Ensure that the test animals are derived from a minimum of five sires per breed for the first step (production traits) and 25 sires per breed for the second step (fitness).

- Is the time scale for the plan realistic?
- Is the conservation element of the plan properly integrated with the introduction of the new germplasm?

Bear in mind that, even though the benefits of success may be substantial, the introduction of an alternative breed is a costly and risky procedure and that failure will have long-term consequences.

If the plan is satisfactory, approve it subject to the availability of funding. If it is unsatisfactory, further work will be necessary to address and resolve the problems.

## **TASK 8: IMPLEMENT THE GERMPASM INTRODUCTION PLAN**

If a decision has been taken to introduce a breed, the introduction plan will need to be implemented and its progress monitored and evaluated. If the results of interim evaluations clearly indicate that the introduced breed is unlikely to deliver the expected benefits, however, a decision should be made to terminate the plan and review the strategy.

### **Action 1: Assign responsibilities for plan implementation and progress reporting**

Examine the elements of the plan and decide who will be responsible for each one. After taking these decisions, brief those responsible on their responsibilities, the time scales, the procedure for reporting and those for resolving unforeseen difficulties. Clarify any



ambiguities regarding areas of responsibility, and obtain formal agreement to discharge these responsibilities from those involved.

**Action 2: Introduce the germplasm**

Manage the introduction according to the plan.

**Action 3: Evaluate the introduced germplasm**

At the end of Phase 1, draft a comprehensive report presenting results, both encouraging and disappointing, on production and fitness traits. Make a recommendation as to whether the introduction should be encouraged or stopped. Irrespective of reporting schedules, alert the policy-makers if the introduced breed has serious problems with disease or in adapting to other aspects of the production environment.

**Action 4: Implement conservation measures**

Ensure that the conservation measures envisaged in the plan are implemented. Review progress regularly and check that the plan is being fully implemented. Document these reviews in interim reports. For guidance on technical aspects of conservation, see FAO (1998a).

**Action 5: Monitor and report on progress**

Interim reports should be prepared regularly throughout the process of introducing the breed. The reports should address all the issues covered in the previous actions, documenting the degree to which objectives set out in the plan have been achieved. If objectives are not being met or not being met on time, obtain clear explanations of the problems from those concerned, list options for overcoming the problems, evaluate them and decide on the best way to address them. Where disputes over responsibilities arise, identify areas of ambiguity and clarify them. Amend the plan and its schedules accordingly.

