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COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

INTERGOVERNMENTAL TECHNICAL WORKING GROUP ON ANIMAL GENETIC RESOURCES FOR FOOD AND AGRICULTURE

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DEVELOPMENT OF COUNTRY-BASED EARLY WARNING AND RESPONSE SYSTEMS FOR ANIMAL GENETIC RESOURCES

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TABLE OF CONTENTS

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I.   INTRODUCTION

1.   The Commission on Genetic Resources for Food and Agriculture (the Commission) has on a number of occasions expressed concern regarding the rapid erosion and loss of animal genetic resources for food and agriculture. The Commission's Intergovernmental Technical Working Group on Animal Genetic Resources for Food and Agriculture (the Working Group), at its Second Session in 2000, recommended that the Food and Agriculture Organization of the United Nations (FAO) identify options for establishing a country-driven early warning and emergency-response mechanism for animal genetic resources, including decision-support tools.[1]

2.   In 2002, the Commission at its Ninth Session, endorsed the recommendations of the Working Group, and expressed concern regarding the erosion of animal genetic resources. It agreed on the need for further urgent action to address this erosion. At its Tenth Session in 2004, the Commission requested FAO, in collaboration with other relevant organizations, to prepare a proposal for a monitoring system for animal genetic resources, with options for establishing a country-based early warning and response mechanism, as part of the further development of the Global Strategy for the Management of Farm Animal Genetic Resources.[2] At its Eleventh Session in 2007, the Commission requested the Working Group to recommend the form and content of future status and trends reports on animal genetic resources, and options for responding to the identification of breeds at risk.[3]

3.   Since 2000, the FAO Global Focal Point for Animal Genetic Resources has focused its main activities on supporting the preparation of Country Reports for Animal Genetic Resources (Country Reports), the first report on *The State of the World's Animal Genetic Resources for Food and Agriculture* (*State of the World*) and the *Global Plan of Action for Animal Genetic Resources* (*Global Plan of Action*).

4.   The *State of the World* provides, for the first time, a comprehensive global assessment of livestock biodiversity. The report indicates the importance of animal genetic resources as the essential raw input for the further development of livestock breeds. Despite being so essential, animal genetic resources are eroding and the rate of loss is likely to be accelerating. The *State of the World* reports that over a recent six-year period, 62 breeds became extinct – a rate of almost one breed lost per month[4] – and that urgent action is required to prevent further uncontrolled erosion of these resources.

5.   FAO's Global Databank for Animal Genetic Resources contains information on 7 616 livestock breeds from around the world. Approximately 20 percent of all reported breeds are classified as being at risk. This may underestimate the actual number of breeds at risk, as population data for about 36 percent of all livestock breeds remain unavailable. In other cases, information is inadequate or out of date, preventing the identification of trends. While, given significant gaps in breed population data and information, it is difficult accurately to estimate the rate of erosion of animal genetic resources, the available information clearly indicates significant erosion of animal genetic resources.

6.   Country Reports indicated several primary factors that contribute to the erosion of animal genetic resources, including: changes in production systems, market demand, mechanization, the

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[1] CGRFA/WG-AnGR-2/00/Report, paragraph 36 (xii).
[2] CGRFA-10/04/Report, paragraph 49.
[3] CGRFA-11/07/Report, paragraph 23.
[4] www.fao.org/docrep/010/a1250e/a1250e00.htm

loss of rangeland grazing resources, natural calamities, disease outbreaks, inappropriate breeding policies and practices, inappropriate introduction of exotic breeds, loss of livestock keepers' security of tenure on land and access to other natural resources, changing cultural practices, the erosion of customary institutions and social relations, the influence of population growth and urbanization. The failure to assess the impact of genetic improvement practices and programmes in terms of sustainability and the failure to develop adequate policies and economic measures to achieve sustainability and conservation were also reported as underlying factors.

7.   Specific action to address the erosion of animal genetic resources is called for under several Strategic Priorities of the *Global Plan of Action*, including *inter alia* Strategy Priorities 1–2 and Strategic Priorities 7–11. In 2007, the FAO Conference, in considering the outcomes of the International Technical Conference on Animal Genetic Resources for Food and Agriculture, called for prompt action to conserve animal breeds at risk, due to the alarming rate of erosion of animal genetic resources.

II.   GLOBAL EARLY WARNING AND THE ROLE OF THE DOMESTIC ANIMAL DIVERSITY INFORMATION SYSTEM (DAD-IS)

8.   A global early warning system is an important complement to country-based systems. As well as being essential to the planning of any international-scale conservation efforts, the availability of global data on breeds' risk status allows country-level conservation measures to be better targeted and more efficient. For example, when a breed is abundant on a global scale there will generally be little need for a country to devote resources to national conservation programmes even if the breed's population within the country itself is small.

9.   A first prerequisite for a global early warning system is a means of classifying country-level breed populations according to whether or not they can be considered part of a larger breed population existing in more than one country. To this end, the analysis undertaken during the preparation of the *State of the World* included the development of a new breed classification system: breeds found only in once country are termed "local", while those occurring in more than one country are termed "transboundary". Within the latter category, a further distinction is drawn between "regional transboundary breeds" (present in only one region of the world) and "international transboundary breeds" (present in more than one region of the world). Regions are defined as to include geographical or political regions.

10.   A second prerequisite for a global early warning system is that data on breeds' population size and structure in all the countries where they occur can be integrated and analysed to provide a global picture of risk status and trends. This requires first that the data are collected at country level, and then that they are made available globally. FAO's Domestic Animal Diversity Information System (DAD-IS), and the network of country- and regional-level information systems of which it forms a part (FABIS net), offer a means by which breed population data from countries throughout the world can be reported in a consistent manner. DAD-IS is the only global-scale information system that systematically records data on breed population size and structure. More information on reporting options within the global network are provided below in Part III of this document.

11.   The national breed population data reported to DAD-IS provide the basis for an "early warning tool" that can be accessed by any user of the system. The tool shows both the national and the global risk status for all the breed populations for which the necessary data have been reported. Currently, the risk status for many breeds is recorded as "unknown". The tool also indicates the last year for which population data were reported for the breed in question. For many breeds, a long period of time has passed since the last population data were entered into DAD-IS; this inevitably reduces the accuracy of the information made available to the user.

12.   The early warning tool also indicates the population trend for the breed population (whether upwards or downwards and, where the trends are in the relevant direction, the number of

years that it will take for the population to reach the 1 000 breeding females and 100 breeding females thresholds). Clearly, population trends can only be calculated if national breed population data in DAD-IS are periodically updated. The document *Format and content of future status and trends reports on animal genetic resources* [5] highlights the importance of regular updating of national level breed data, while the document *Status and trends report on animal genetic resources – 2008* [6] provides a first global report after the publication of the *State of the World*.

13.   In conclusion, global early warning is dependent on timely availability of national-level data on the size and structure of breed populations. In turn, the availability of global data will help to inform national decision-making. Thus, when designing country-based early warning and response systems countries should ensure that procedures are in place for regularly reporting data on breed population size and structure to the global level, and ensure that these procedures are followed once the system is operating. In the immediate term, countries should ensure that breed-related data already available at country level are entered into DAD-IS (or a national or regional information system that exchanges data with DAD-IS).

III.   IMPORTANT ELEMENTS OF A COUNTRY-BASED EARLY WARNING AND RESPONSE SYSTEM

14.   With the improved understanding of the status and trends of animal genetic resources resulting from the preparation of the *State of the World*, and with international endorsement of the *Global Plan of Action*, it is now timely to further consider the establishment of country-based early warning systems for animal genetic resources, as a part of national efforts to implement the *Global Plan of Action.*

15.   This document has been prepared to assist the Working Group to consider the possible elements of a country-based early warning and response system for animal genetic resources for food and agriculture, in order for the Working Group to advise the Commission on how to proceed with further efforts to establish these systems in individual countries.

16.   To gather information on the current state of country-based animal genetic resources monitoring and reporting systems, an informal survey was conducted in 2008 through the Domestic Animal Diversity Network (DAD-Net). A brief questionnaire requested members of the network to indicate whether an early warning and response system for animal genetic resources had been put in place in their country to assess changes in the population size and structure of national breed populations. Members of the network were also asked whether a systematic approach with which to respond to such changes had been established, and if so to describe it and share their experiences. Thirty-eight responses were received.

17.   The majority of respondents from developing countries indicated that their countries do not have a monitoring and early warning and response system for breeds of livestock. However, a number of respondents from developed countries, primarily in Europe, indicated that their countries have established monitoring and response systems. The results of the survey helped to identify a number of issues that should be considered in the development of country-based early warning systems for animal genetic resources.

The national policy and legislative framework

18.   A national early warning and response system should be considered in the context of the development of national strategies and action plans for the implementation of the *Global Plan of Action*. Document *Draft guidelines to assist the preparation of national strategies and action*

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[5] CGRFA/WG-AnGR-5/09/3.2.
[6] CGRFA/WG-AnGR-5/09/Inf. 7.

plans for animal genetic resources for food and agriculture[7] aims at guiding countries in this process. Existing national policy and legislation for animal genetic resources are important elements to consider in establishing a country-based early warning system. A number of respondents to the informal DAD-Net survey indicated that their countries have established a monitoring and early response system based on national policies, and in some cases, national legislation. This has involved both specific animal genetic resources legislation and other regulations, such as those in the fields of animal breeding, as well as broader biodiversity-related legislation.

19.   Breed registration appears to be an efficient way to monitor animal genetic resources, particularly pure breeds, with the monitoring being undertaken by breeder organizations through agreements with the ministry responsible for livestock. Registration systems are established both through the application of voluntary policies and through legislation. In some countries, incentives are used to encourage livestock keepers and breeders to maintain herd books and submit their data for national collation. Breed registration is required in some countries in order to participate in particular conservation support programmes, which provides a strong incentive for registration.

20.   Some countries have regulations regarding the content and methods of maintaining registers for livestock breeds, which provide a methodology for gathering the information required for a comprehensive monitoring programme. Legal animal identification and registration is required in a number of countries for reasons other than monitoring the status of breeds and participation in conservation programme, for example, to meet food safety standards and disease control requirements.

21.   Some countries have policies in place that prescribe the responses to be implemented immediately in cases where breeds have been identified as being at risk. Both *in situ* and *ex situ* conservation measures are employed. Legislation underpinning conservation programmes generally appears to be enabling in nature, rather than restrictive or punitive. When a breed is classified as being at risk, breeders or their organizations may be provided with financial resources for implementing conservation programmes. Non-governmental organizations are active in some countries in implementing conservation programmes for rare breeds.

22.   In summary, supportive legislation and policies can play a key role in promoting the participation of livestock keepers, breeders and their organizations in the establishment and implementation of an early warning and early response system for animal genetic resources. Particularly important are legislation and policies that promote ongoing monitoring of breed populations and enable the provision of financial resources to respond when breeds are identified as being at risk.

Institutional arrangement for country-based early warning and response systems

23.   Adequate institutional arrangements seem to be crucial for the development of an effective country-based early warning and response system for animal genetic resources. Replies to the informal DAD-Net survey also indicate that monitoring and conservation may benefit greatly from the full involvement of relevant organizations and stakeholders. Based upon approaches currently being implemented in various countries, the following institutional arrangements should be considered to support the operation of a country-based early warning and response system for animal genetic resources.

24.   **Establish a responsible government ministry for the country-based early warning and response system**: The ministry responsible for livestock appears to play a major coordinating role in most existing country-based early warning and response systems for animal genetic resources. The ministry may have a number of important functions, such as establishing expert or advisory groups, development and maintenance of a national data and information system on the

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[7] CGRFA/WG-AnGR-5/09/Inf. 6

status of animal genetic resources, promoting and coordinating the monitoring of livestock breeds, providing incentives for livestock keepers and breeders to monitor and implement conservation programmes, and developing policies that promote the sustainable use and conservation of livestock breeds.

25.   **Establish a national advisory group**. Existing country-based early warning and response systems often include a national animal genetic resources advisory body. Various responsibilities are usually assigned to the advisory body, such as determining risk-status levels, preparing reports on status and trends, recommending monitoring and conservation priorities, preparing emergency response or recovery plans, and guiding the implementation of monitoring and conservation projects and evaluating their impacts. The national advisory body is often supported by and provides advice to the ministry responsible for livestock.

26.   **Establish and maintain breeder and livestock keeper organizations**: Replies to the informal DAD-Net survey suggest that a well-developed network of breeder and livestock keeper organizations that maintain basic data on population size, location, breed risk status, etc., and the active participation of the members of such networks in conservation programmes and projects, primarily *in situ*, are in many cases an important element of early warning and response systems. A lack of breeder organizations would seem likely to be a major constraint to the development of country-based early warning and response systems in many countries, especially developing countries.

27.   In conclusion, a country-based early warning and response system may be established within a fairly simple institutional framework, provided support and coordination by a government ministry or similar public authority responsible for livestock is provided, an advisory body with stakeholder representation is established to oversee the system, and networks of breeders and livestock keepers are willing to participate actively in monitoring and conservation and provide data and information.

A monitoring system for breeds at risk

28.   Monitoring breeds at risk is an essential element of a country-based early warning and response system for animal genetic resources. It appears from the responses to the informal DAD-Net survey that monitoring programmes for breeds at risk are well established in a number of countries, often with breeder organizations and livestock keepers maintaining breed registration books (herd books). Data and information collected by the breeder organizations are in some countries submitted on an annual basis to the ministry responsible for livestock and maintained in a national database; data and information are also provided to FAO through DAD-IS.

29.   At least for active populations of pure breeds, a breed registration system would appear to be extremely valuable in underpinning a country-based early warning and response system for animal genetic resources. Registration of pure-bred populations in stud books, herd books or flock books, typically maintained by breeder organizations, provides a cost-effective monitoring approach and enables rapid identification of significant changes in population size and structure.

30.   In countries that do not have well-developed systems of breeder organizations and animal identification and registration, where characterization of breeds is incomplete, where livestock population data are weak, and where random breeding is commonly used, identifying and monitoring breeds at risk will be extremely challenging.

31.   While in the long term, it may be beneficial to establish structured breeding programmes and systematic approaches to livestock monitoring and breed registration, the current rate of erosion of animal genetic resources calls for immediate action, and thus for creative breed monitoring approaches that can be implemented in the short and medium term. Possible interim measures for the identification and monitoring of breeds at risk are further explored below.

32.   **Enhance the use of the national livestock census**: According to the Country Reports on Animal Genetic Resources submitted during the preparation of the *State of the World*, most

countries are in possession of some data or information from national livestock censuses. Unfortunately, most livestock census data are limited to species level. Moreover, data and information are often not up to date.

33.   Countries preparing for future national livestock census programmes may consider using the census to collect enhanced data and information that would allow better estimation of the breed composition within each species, and thus provide a basis for a monitoring system. This approach could help to identify populations that are significantly declining in size, and possibly identify breeds that are already at risk. The national livestock census could also reveal particular regions within the country where there are significant changes in the structure of the livestock sector – for example, where significant cross-breeding is occurring, and indicate the need for additional census work to be undertaken to identify population changes. Geographic areas with high levels of endemism could also be recorded.

34.   While in most countries the national livestock census is unlikely to be taken frequently enough to provide a reliable basis for the identification and monitoring of breeds at risk, the census may be used as an indicator for the need for more detailed, targeted, assessments and monitoring programmes for particular breeds or for areas where there are significant shifts in livestock populations.

35.   **Establish a network of scientists, livestock keepers and breeders**: A network of scientists, livestock keepers and breeders could considerably assist in the establishment of a country-based early warning system for animal genetic resources. In the absence of a comprehensive monitoring programme, expert opinions of scientists, livestock keepers and breeders on the status of particular breeds may offer valuable information until more systematic and objective monitoring is established.[8] A national advisory committee could, for example, cover all the main livestock species and establish working groups that would then give expert advice on specific breeds that are most at risk. The advice would be based the experience and knowledge of the experts involved rather than on an objective monitoring programme. Community-based monitoring programmes could also contribute to the monitoring and assessment network. If rare breed societies exist in a country, they should clearly be involved in assessment and monitoring activities.

36.   **Focused breed assessments and status reports**: Based on the knowledge and experience of its members, a national committee could also commission focused breed assessments and status studies, to confirm the status of breeds that are believed to be most at risk. Small teams of committee members or other experts could undertake the assessments, including field trips as necessary, to confirm the status of some breeds. Status reports could be prepared for each breed of concern and submitted to the national committee which would report to the responsible ministry.

37.   In conclusion, an effective early warning system requires a reliable system to identify, assess and monitor breeds, and to determine their status. The establishment of an effective system for the assessment and monitoring of breeds will be a major challenge for many countries, particularly developing countries. In the absence of a comprehensive breed monitoring system, targeted efforts are required in order to monitor particular populations that are believed to be at risk or in decline, and/or particular regions within the country where significant shifts in the livestock sector appear to be occurring.

38.   While financial resources are required to establish and maintain a national committee and subcommittees, and to enable them to undertake focused breed assessments and prepare status reports, this approach may be the most feasible in the short term for many countries. The work should build on the national livestock census and involve livestock keepers and their communities. Research organizations can also play important roles in monitoring and conservation efforts. Involving non-governmental organizations that are already active and

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[8] CGRFA/WG-AnGR-5/09/5.

involved in animal genetic resources conservation will also be important in preparing status reports.

A risk status classification system for animal genetic resources

39.   Another key element of a country-based early warning and response system for animal genetic resources is to establish **an endangerment or risk classification system**. A risk classification system is extremely important to communicate the status of a country's breeds of livestock to policy-makers, stakeholders and members of the public, and to assist in the identification of appropriate action at various levels of threat. A breed endangerment or risk classification system helps to translate numerical data on breed status into a message understandable by decision-makers, stakeholders and the general public. Over time, the classification system can also be used to evaluate and communicate the effectiveness of conservation measures. For example, a breed may be moved into a higher risk category if its numbers continue to decline, or it may be moved into a lower risk category following the implementation of effective conservation measures.

40.   Existing breed endangerment classification systems typically allow breeds to be allocated to categories corresponding to various levels of endangerment. In some countries, the action that should be undertaken at each level of endangerment to prevent the loss of the breed is predetermined and described as part of the system. For example, a breed allocated to a high risk category may be subject to immediate conservation measures, whereas a breed that is in decline but still consists of several large populations, may be subject to enhanced monitoring. In some countries, legislation requires specific action when a breed reaches a particular level of risk.

41.   Countries should carefully shape their breed risk classification system so that it best meets their needs. Criteria for each level of endangerment should be determined, and stakeholders should be involved in the process of developing the classification system if the risk criteria and classification levels provide the basis for legislative response measures.

42.   In deciding upon a classification system for animal genetic resources, countries might wish to consider using existing systems. FAO has established a risk status classification system that is used to prepare global reports on the endangerment status of breeds of the main livestock species. The following levels are recognized:

- **Extinct:** a breed is categorized as extinct when there are no breeding males or breeding females remaining. It is recognized that extinction may be realized well before the loss of the last animal or genetic material.

- **Critical:** a breed is categorized as critical if the total number of breeding females is less than or equal to 100 or the total number of breeding males is less than or equal to five; or the overall population size is less than or equal to 120 and decreasing and the percentage of females being bred to males of the same breed is below 80 percent, and it is not classified as extinct.

- **Critical-maintained:** are those critical populations for which active conservation programmes are in place or populations are maintained by commercial companies or research institutions.

- **Endangered:** a breed is categorized as endangered if the total number of breeding females is greater than 100 and less than or equal to 1 000 or the total number of breeding males is less than or equal to 20 and greater than five; or the overall population size is greater than 80 and less than 100 and increasing and the percentage of females being bred to males of the same breed is above 80 percent; or the overall population size is greater than 1 000 and less than or equal to 1 200 and decreasing, and the percentage of females being bred to males of the same breed is below 80 percent, and it is not assigned to any of above categories.

- **Endangered-maintained:** are those endangered populations for which active conservation programmes are in place or populations are maintained by commercial companies or research institutions.

- **Breed at risk:** a breed that has been classified as critical, critical-maintained, endangered or endangered-maintained.

43.   Some countries have adapted the FAO breed risk status classification system to meet their specific needs. Other countries base their assessment of the risk of the potential loss of genetic variability on the basis of the predicted increase in inbreeding, which is directly dependent on the effective population size (N_e). Conservation measures based on the estimation of effective population size have been implemented in a few countries. This approach requires reliable information on the number of breeding males and females for each breed.

44.   The European Union has defined thresholds below which breeds are considered to be in danger. These thresholds for endangered breeds are the basis of eligibility for supported conservation measures. The number of breeding females of a breed, aggregated over all Member States, is used to estimate the demographic risk. The endangerment thresholds are intended to ensure early identification of breeds that may require conservation measures while the population size is still large enough to maintain the full genetic make-up of the breed. The threshold levels vary among the main livestock species. For example, the threshold level for cattle breeds is when the number of breeding females is lower than 7 500. The threshold level for pig breeds is 15 000 breeding females, and the threshold for sheep and goat breeds is 10 000 breeding females.

45.   Breed status classification systems are also employed by non-governmental organizations that are involved in breed conservation activities. The Rare Breeds Survival Trust of the United Kingdom has established a breed risk classification system that specifies critical, endangered, vulnerable and at risk categories. Each category is based on the number of breeding females, varying by species. For example, in 2008, a breed endangerment status of critical is assigned if there are 100 breeding females or fewer for goats and pig breeds, 150 or fewer for cattle breeds, and 300 or fewer for horse and sheep breeds.[9]

46.   Rare Breeds International uses a system that takes into account numerical scarcity and species differences. The focus is on breeds that possess distinctive characteristics (genetic distance from most other breeds, and performance or type), have special adaptation (adapted to an extreme or unusual environment), and are numerically scarce based on the number of breeding females.

47.   Breed risk status classification systems are of pivotal importance for the establishment of properly functioning early warning and response systems for animal genetic resources. Considering existing classification systems may assist countries to design their own systems. Some existing systems are of a purely descriptive nature, and serve merely to enable reporting on erosion and changes in the status of breeds. Other systems are designed to provide a basis for deciding on conservation measures or thresholds for providing incentives. Countries should formulate their own classifications to meet their specific needs and circumstances.

Data and information management

48.   Another important element of a country-based early warning and response system for animal genetic resources is the management of breed status data and information. A number of respondents to the informal DAD-Net survey indicated that their countries maintain a national data and information system for animal genetic resources, and that they also provide data to DAD-IS. Some respondents from Europe indicated that their countries contribute data to a European regionally linked database, the European Farm Animal Biodiversity Information System (EFABIS), which exchanges data with DAD-IS.

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[9] http://www.rbst.org.uk/watch-list/main.php

49.   **Establishing a national database for animal genetic resources** should be an early task in the development of a country-based early warning and response system. Countries should benefit from the experience gained by other countries that have already established national databases for animal genetic resources.

50.   The *Global Plan of Action* calls for the use of inter-operative information systems as a means to facilitate the exchange of data and rationalize the assessment of breed risk status; the importance of making national-level data available for global analysis is discussed in Part II of this document. To address these requirements, as well as to meet national objectives, countries may wish to consider using the facilities offered within DAD-IS and FABIS net as a basis for the data and information aspects of their early warning and response systems.

51.   The FABIS net global network of information systems can automatically exchange data and synchronize content. All the systems are accessible through the Internet using standard Web browsers. National Coordinators are authorized to update their national datasets, and any user can view information. Translation of all screen texts allows countries to create their own national Web-based information systems, where the interface is displayed in the national language and character set. The data content can be adapted to the national level and all data items can be translated to any national language.

52.   Importantly, FABIS net provides countries with the opportunity to expand the database structure and to collect data on additional animal species important for food and agriculture production that are not included at the higher levels of the network. This option of including data and information on locally important species ensures the system can be adapted meet specific country needs. National data provided in any of the FAO official languages will be automatically uploaded to DAD-IS, making the information available worldwide and supporting national reporting to FAO.

53.   In summary, a data and information system for animal genetic resources is a key element of a country-based early warning and response system for animal genetic resources. National breed-related data are also the basis for global early warning, and should be made available for this purpose. Countries can decide to develop independent national database systems that synchronize data with regional systems (where present) and the global system DAD-IS. Alternatively, they may choose to enter data directly into DAD-IS.

Priority setting for breed conservation

54.   Once countries have determined the status of their breeds and classified them into various risk categories, they are in a position to consider appropriate response measures for breeds that are at risk of being lost. Determining how best to respond to a breed being at risk or in decline is a complex matter. A number of publications and guides are available to assist countries to consider response mechanisms.

55.   If several breeds are found to be at risk, the setting of conservation priorities will be a key challenge. The process for setting priorities should be both objective and transparent. A national advisory committee with the relevant expertise, and representative of the major animal genetic resources stakeholders, could provide recommendations on priorities to the ministry responsible for livestock. This approach should achieve both objectivity and transparency. Establishment of clear and objective criteria for setting breed conservation priorities will be extremely valuable. Some guides suggest that the following seven criteria be considered in setting breed conservation priorities:

- **The degree of endangerment** – this should take into account, among other things, the current population size, the rate of population change and the distribution patterns.

- **Adaptation to a specific environment** – the suggestion is that breeds adapted to specific environments are very important and, thus, should be a conservation priority.

- **Traits of economic importance** – this requires evaluation of both current and potential importance of particular breed characteristics and performance.

- **Unique traits** – breeds with special behavioural, physiological or morphological traits should be given high consideration for conservation.

- **Cultural or historical values** – breeds with special cultural or historic values merit consideration for conservation.

- **Genetic uniqueness of a breed** – conserving breeds that are genetically distinct is an important criterion for establishing conservation priorities. Understanding the genetic history of a particular breed or genetic distance measures will assist in determining breed uniqueness.

- **Species a breed belongs to** – there is a suggestion that while the above criteria are important in selecting breeds within species, some consideration should also be given to the species to which the breeds belong, to ensure that some financial resources are allocated to all important livestock species.

56.   Existing country-based early warning and response systems appear to place significant emphasis on the level of endangerment. In Germany for example, when the effective population size of a breed is 200 or lower, a range of conservation measures are initiated. For breeds that have an effective population size between 200 and 1 000, a monitoring programme is initiated, and if the adult male population falls below 100, a semen cryoconservation programme is established. A German Advisory Council on Animal Genetic Resources oversees the classification of breeds and provides expert advice on the appropriate conservation measures.

57.   The recent outbreaks of infectious animal diseases, such as foot-and-mouth disease and highly pathogenic avian influenza have highlighted the importance of animal genetic resources considerations being an integral part of risk assessments and of disease preparedness and contingency planning.

Establish breed recovery teams and prepare breed recovery plans

58.   As conservation is complex and various options exist, it will be desirable to establish a breed recovery team and to prepare a breed conservation plan. One approach would be for the national advisory committee on animal genetic resources to establish breed subcommittees or breed recovery teams, and assign them the responsibility of producing a breed recovery plan. The plan could be submitted to the national committee for final approval, and the national committee could then recommend the plan to the responsible ministry for implementation. Reference guides are available to assist countries to prepare breed recovery plans and select the most appropriate conservation methods.

59.   Countries may also wish to consider establishing breed rescue centres to provide options for *in situ* conservation should it be determined that a breed is in imminent danger of being lost, for example, as the result of a disease outbreak. The European Livestock Breeds Ark and Rescue Net (ELBARN)[10], is an example of an initiative aimed at establishing emergency sites for endangered genetically important livestock.

Regional and global collaboration

60.   Country-based early warning and response systems will ideally include a regional and global collaboration element. The *Global Plan of Action* calls for development of regional and global long-term conservation strategies; it recommends, *inter alia*, integrated support arrangements to protect breeds and populations at risk from emergency or disaster scenarios, enabling restocking after emergencies, in line with the national policy (Strategic Priority 10

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[10] www.save-foundation.net

Action 2); establishing regional and global gene banks for animal genetic resources; and harmonizing approaches to conservation in gene banks and to facilitating exchange (Strategic Priority 10 Action 3). Strategic Priority 23 Action 3 calls for *ex situ* backup systems to protect animal genetic resources against the risk of emergency or disaster scenarios.

61.   Limited capacity to undertake conservation programmes for breeds at risk is a major barrier in many developing countries. Under such circumstances, breed recovery plans should especially consider regional and global collaboration as a means to implement the necessary conservation measures. *Ex situ in vitro* cryoconservation or cryopreservation – the maintenance of germplasm in the form of semen, oocytes, DNA, embryos or tissues, in long-term storage at ultra-low temperatures – is an approach that is useful for particular livestock species. Such measures require considerable expertise and investments in infrastructure. Therefore, regional gene banks for animal genetic resources may offer the most cost-effective approach to conserving breeds at risk and preventing the loss of genetic resources in countries that currently lack a gene bank facility.

62.   Establishment of regional gene banks will provide important backup collections for national gene banks. Backup collections are particularly important for highly endangered breeds that could be lost due to a sudden or unexpected event, such as a disease outbreak. Areas experiencing war and conflict should consider regional and global collaboration to conserve high risk breeds.

63.   An emergency response could involve the transfer of a live population to a site outside the affected country. The concept of a global gene bank for animal genetic resources – as has been established for plant genetic resources – should be given serious consideration, as it appears that global response mechanisms for animal genetic resources at risk are far less developed than those for plant genetic resources. Regional safe sites for *in situ* conservation should also be considered. Appropriate policies and material transfer agreements need to be developed to enable transfer of genetic material from countries lacking the capacity for long-term storage to host facilities, and to enable the transfer of live animals, if required. Consideration should be given to such agreements as country-based early warning and response systems for animal genetic resources are being advanced.

National, regional and global reporting and communications

64.   Reporting and communication are another important element to be considered when establishing a country-based early warning and response system for animal genetic resources. As discussed above, inter-operative systems will enable seamless breed status and trends reporting at the national, regional and global levels. Determining how often to report nationally and to whom to report, should be an important consideration in the establishment of a country-based early warning and response system.

65.   Breed status and trends reports will provide a valuable opportunity to communicate conservation needs and progress made (success in preparing and implementing recovery plans). The responsible ministry may use status and trends reports to inform stakeholders of progress made, and may also use the reports to request continuation of, or increases in, financial and technical resources for the work. Status and trends reports might assist developing countries to engage with donor countries and organizations to address unmet financial needs.

66.   Breed status and trends reports can be used to promote broader public involvement and engage media interest in conservation efforts for animal genetic resources. In some countries, public awareness of the importance of conserving livestock breeds may be important to achieving investment in conservation. Additionally, awareness of breed conservation needs could lead – as it has in many countries – to livestock keepers, individuals and organizations making significant voluntary contributions to the conservation of animal genetic resources.

IV.   GUIDANCE REQUESTED FROM THE WORKING GROUP

67.   The Working Group may wish to recommend to the Commission that:

i.   it reaffirm the need for the establishment of country-based early warning and response systems for animal genetic resources, taking into account the relevant Strategic Priorities and Actions in the *Global Plan of Action for Animal Genetic Resources;*

ii.   it encourage the development of country-based early warning and response systems as an integral part of national strategies and action plans;

iii.   efforts be enhanced to exchange experiences among countries that have already established country-based early warning and response systems for animal genetic resources and those countries planning to establish such systems, including through workshops and training sessions;

iv.   countries consider the importance of data inter-operability to enable national, regional and global breed status and trends reporting, as they establish country-based early warning and response systems for animal genetic resources;

v.   countries seek to establish regional and global backup storage of animal genetic resources, particularly those resources that are at high risk of being lost or significantly eroded; and

vi.   it request FAO to assist in planning and facilitating the establishment of regional and global backup storage arrangements for animal genetic resources at risk, including the possible preparation of material transfer agreements.

Appendix A: **Recommended reading**

FAO. 1998. *Secondary Guidelines for the Development of National Farm Animal Genetic Resources Management Plans: Management of Small Populations at Risk*. Rome.

FAO. 2007. *The State of the World's Animal Genetic Resources for Food and Agriculture*, edited by B. Rischkowsky & D. Pilling. Rome.

Oldenbroek, J.K. (ed.) 1999. *Genebanks and the management of farm animal genetic resources*. Lelystad, the Netherlands, Institute for Animal Science and Health.

Oldenbroek, K. (ed.) 2007. *Utilization and conservation of farm animal genetic resources*. Wageningen, the Netherlands, Wageningen Academic Publishers.