



LEARNING ABOUT
2 **5.1** **5.2**
INDICATORS

SDG Indicators 2.5.1 and 2.5.2 – Plant and animal genetic resources

Lesson 7: Interpreting and communicating results on animal genetic resources

Text-only version

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Food and Agriculture
Organization of the
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working for Zero Hunger

In this lesson

Learning objectives	3
Introduction	3
Viewing Data from DAD-IS	3
SDG Indicator 2.5.1: Review	4
SDG Indicator 2.5.1: Interpret	5
SDG Indicator 2.5.2: Review	5
SDG Indicator 2.5.2: Interpret	6
SDG Indicator 2.5.2: Interpret: "Unknown" Risk Status	8
SDG Indicator 2.5.2: Interpret: "Not At Risk" Status	8
SDG Indicator 2.5.2: Interpret: "At Risk" Status	9
Summary of Actions for Each Risk Category	10
Using the information in DAD-IS	10
FAO's use of DAD-IS information	11
Developing a Conservation Strategy	12
Factors affecting conservation efforts	12
FAO Recommendations for developing a conservation strategy	14
National Conservation Strategic Plan	16
Implementing the National Strategy	17
Communicating the need for Conservation of Animal Genetic Resources	17
Communicating via Websites and Livestock Shows	18
Conclusion	19
Summary	19

This lesson illustrates how to retrieve information from DAD-IS, and how to interpret it for the animal component of Indicators 2.5.1 and 2.5.2.

The lesson also introduces the process of creating a National Conservation Strategy for Animal Genetic Resources.

It describes how to use Indicators 2.5.1 and 2.5.2 in national policymaking, and how to communicate with various stakeholders about conserving animal genetic resources.

Learning objectives

At the end of this lesson, you will be able to:

- interpret SDG Indicators 2.5.1 and 2.5.2 from DAD-IS;
- identify factors affecting the choice of conservation measures;
- understand how to develop a conservation strategy and plan;
- identify ways of communicating about animal genetic resources to various audiences.

Introduction

FAO's Domestic Animal Diversity Information System (DAD-IS), www.fao.org/dad-is/en/, contains a wealth of data on animal species and breeds. It allows users to view and extract data on livestock breeds around the world. These data have two main uses:

1. Enabling the country to comply with international agreements, including reporting information for the Sustainable Development Goals (SDG).
2. Helping each country to make informed decisions about its own animal genetic resources.

As you know, data provided in DAD-IS is needed to **calculate SDG Indicators 2.5.1 (animal component) and 2.5.2**.



You can find an introduction to the SDG Indicators (animal component only) in Lesson 5. You can review the data needed to calculate these indicators in Lesson 6.

Riza: *“As the national coordinator, I need to submit my country's annual update on animal genetic resources to FAO. Information and data on the animal species in my country have been inserted into DAD-IS. How can I view the results of SDG Indicators 2.5.1 and 2.5.2?”*

Viewing Data from DAD-IS

You can search and filter the information on a specific breed or aggregated data for a specific country or region. It also lets you generate various standard reports and figures on the SDG

indicators. The Data page provides information available to everyone and is easily accessible. On this page, you can view and extract data on livestock breeds around the world.



DAD-IS Data page: www.fao.org/dad-is/data/en/

SDG Indicator 2.5.1: Review

As you may recall, the animal component of SDG Indicator 2.5.1 is the number of animal genetic resources for food and agriculture secured in either medium- or long-term conservation facilities.

These are the four types of genetic materials that are stored.

1. Somatic cells
2. Sperm
3. Embryos
4. Oocytes

The genetic material is conserved through **cryoconservation**¹, which is an *ex-situ in-vitro* method of animal genetic conservation.



What are the limitations of cryoconservation?

Cryoconservation is an efficient way to **conserve genetic variability**. But it **should not be the only conservation method**.

A limitation in freezing the genetic material is that it prevents a breed from evolving in response to a changing environment. When reintroduced to their environment, the animals may have difficulties coping with the changed conditions there



To review the advantages and disadvantages of this method, please refer to Lessons 5.

Each country's genebank management or national coordinator must decide **how much genetic material must be deep-frozen to be able to reconstitute a breed**. The indicator estimates whether the stored genetic material can be considered to be **sufficient to reconstitute a breed**.

¹ The process of deep-freezing various types of tissues. These include: semen, embryos, eggs or other types of tissue in liquid nitrogen.

SDG Indicator 2.5.1: Interpret

Analysing Indicator 2.5.1 involves identifying if the genetic material fits into one of the categories below.

The national coordinator can decide whether breeds fall into these categories. In many cases, there is a lack of information on the breed status for Indicator 2.5.1. These cases fall into the "no information" category.

Sufficient

Enough materials are deep-frozen to reconstitute a breed.

Not sufficient

Not enough materials are deep-frozen to reconstitute a breed. Even if it is not sufficient to reconstitute the breed in the event of extinction, the material is valuable, e.g. to answer certain research questions.

No material

No genetic material of a breed is stored. This is valid information. Of course this also means that there is insufficient material to reconstitute the breed in the event of extinction.

No information

The country did not provide data on whether a breed is cryoconserved. Therefore, the formula used to determine whether the material stored is sufficient, cannot be applied.

If the National Coordinator cannot decide whether the material stored is sufficient, the DAD-IS system uses a formula to estimate the breeds category. It then generates pie charts to show **how much material is cryoconserved** at a global, regional and national level.



DAD-IS SDG Indicator 2.5.1 data: www.fao.org/dad-is/sdg-251/en/

SDG Indicator 2.5.2: Review

Indicator 2.5.2 focuses on **live animals** that are conserved via *in-situ in-vivo*, or *ex-situ in-vivo* programmes.

Respectively, these conservation programmes refer to animals kept on farms or in the field, and, animals that are kept in zoos.

Although DAD-IS uses several categories to identify the risk of extinction of a local breed, we will focus on the categories that the SDG indicator uses.

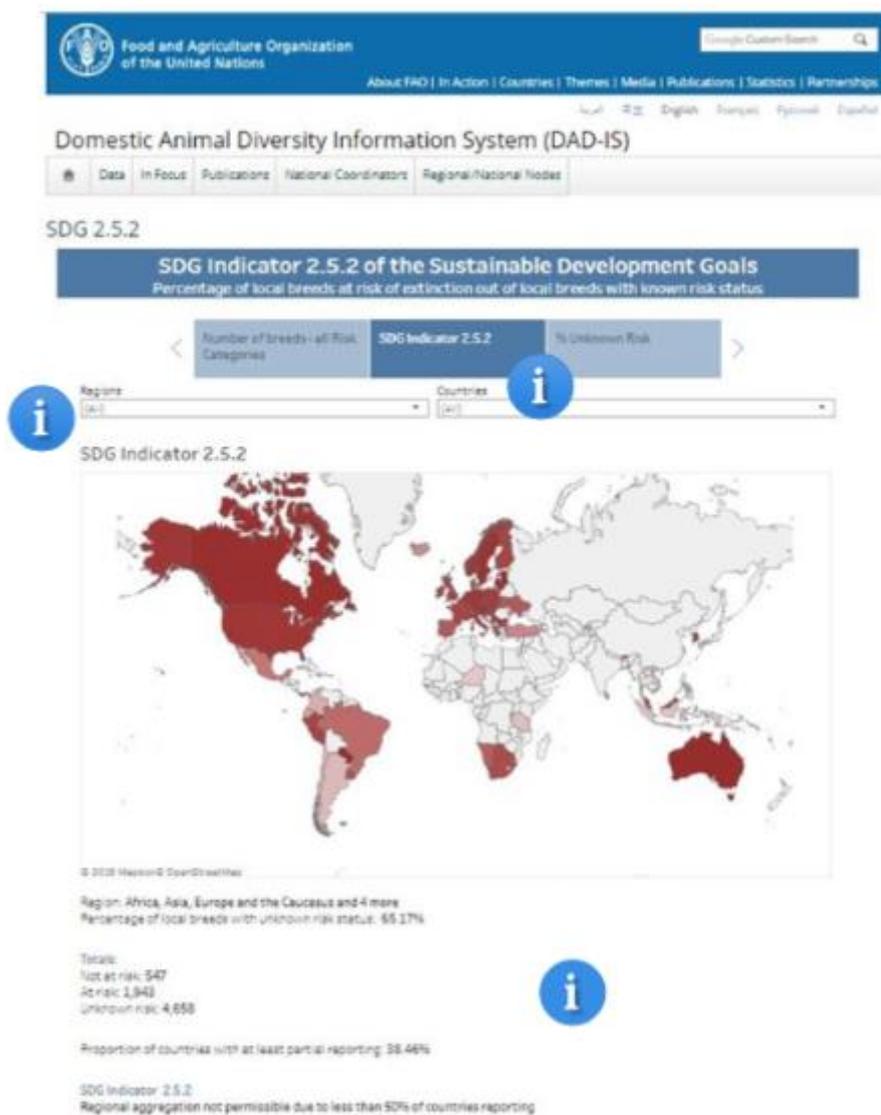


To review risk categories, please refer to Lessons 6.

SDG Indicator 2.5.2: Interpret

With the information and data provided in DAD-IS, the system generates a global map where you can view the proportions of risk.

Below the map, the value for the SDG indicator for the selected country or region is presented.



- *First “info” on top:* Choose the tab SDG Indicator 2.5.2 To view this map choose the tab “SDG indicator”2.5.2 in the middle
- *In the second “info” from top:* Here you can select results for a specific region or country by using the drop down menus
- *In the third “info” on bottom:* Here you find the results on the indicator for selected region or country. Note that global or regional aggregation results are not provided if proportion of countries with at least partial reporting for their local breeds is less than 50%

The importance of analysing the status of breeds is that it allows countries to **take action in conserving animal diversity** by implementing appropriate conservation measures.

Riza: “What conservation measures can I apply to breeds at risk?”

Riza asks a very good question.

Let's examine how each of these risk statuses can be interpreted, and the **actions that countries can take to conserve breeds in each status.**



DAD-IS SDG Indicator 2.5.2 data: www.fao.org/dad-is/sdg-252/en/

SDG Indicator 2.5.2: Interpret: "Unknown" Risk Status

Breeds are classified as "unknown" for two reasons.

- The first is that **countries do not provide DAD-IS with relevant data** on breeds.
- The second is that DAD-IS automatically assigns that breed to the unknown category if **data are more than 10 years-old.**

Data in DAD-IS shows the **risk status of 4 760 local breeds as "unknown"**. Although it is known that these breeds exist, it is not known if they are at risk.

This is a **major problem in efforts to conserve livestock diversity.**

Riza: *"What action can I take?"*

If a given breed in your country is "unknown", it is recommended that you take the following actions.

- Keep data on breeds updated in DAD-IS.
- Conduct livestock censuses at breed level.
- Implement surveys to gather population data.

SDG Indicator 2.5.2: Interpret: "Not At Risk" Status

Breeds classified as "not at risk" should be monitored to prevent them from becoming endangered.

Data in DAD-IS shows the **risk status of 865 local breeds as "not at risk"**. You can use **DAD-IS as an early warning tool** to spot breeds that are in decline, and take action if necessary.

In addition, it is still necessary to monitor the population trends. This way, countries can **maintain their breed populations** as far as possible.

Riza: *"What action can I take?"*

If a given breed in your country is "not at risk", it is recommended that you take the following actions.

- Keep data on breeds updated in DAD-IS.
- Conduct livestock censuses at breed level.
- Implement surveys to gather population data.

SDG Indicator 2.5.2: Interpret: "At Risk" Status

Breeds classified as "at risk" are **very worrying**. Countries should focus on **identifying why they are at risk**, and should **decide on and implement appropriate conservation measures**.

Data in DAD-IS shows the **risk status of 1 448 local breeds as "at risk"**. Breeds in this category should be considered **candidates for conservation**.



Importance of evaluating actions based on a specific "at risk" DAD-IS category

As you know, **some of the DAD-IS risk statuses** combine to make the SDG indicator "at risk" status. For ease, they have been categorized into three groups.

Evaluating actions at these different levels is important, because the higher the risk category...

- ...the more likely the breed is to become **extinct**.
- ...the more likely **diversity** within the breed will be lost.
- ...the more **urgent** the need for action.
- ...the more frequently genetic defects will appear.
- ...the more susceptible the breed will be to random events, such as a drought or disease outbreak.

Riza: "What action can I take?"

Depending on the level of risk, it is recommended that you take the following steps.

Vulnerable	Animals in these breeds are at medium risk of extinction . They are still numerous enough to be selected or bred for improved productivity or other desirable traits. If data reveals the risk category of the breed to be "vulnerable", conservation measures to enlarge the population and manage diversity are recommended. In addition, cryconservation may be advisable to preserve the genetic material in the long term.
Endangered	Such breeds are at a higher risk of extinction , so conservation must take priority . Conservation methods are necessary in order to enlarge the population and manage diversity . When managing diversity, it is important to maintain as much of the existing gene pool as possible. Cryoconservation is a higher priority .
Critical	These breeds are at very high risk of extinction . There are so few animals in this breed that each animal is vital . Priority must go to maintaining and enlarging the population and cryoconserving genetic material .

Summary of Actions for Each Risk Category

- Plus signs represent important objectives. The larger the number of plus signs, the more important the respective objective.
- Minus signs indicate that the activity should be avoided.
- Absence of a sign means that the activity can be practised, but it should be balanced with other factors, such as cost.

Risk category	Enlarging the population	Managing diversity	Selection for traits of interest	Cryo-conservation	Breed inventory /survey
Unknown					+++
Not at risk		+	+++		+
Vulnerable	+	+	++	+	+
Endangered	++	+++	++		+
Critical	+++	++	-	+++	+

Using the information in DAD-IS

The data and information provided by DAD-IS can be used in various ways, from raising public awareness to evaluating the effectiveness of conservation efforts. Here are some common uses.

➤ Monitoring

Comparing the values of an indicator over time. An improvement in the indicator reflects an improvement in the conservation of animal genetic resources.

For example, you can see whether the number of local breeds in your country considered to be "at risk" of extinction has risen or fallen over time.

➤ Benchmarking

Setting a target for the indicator, and then trying to achieve it.

For example, for breeds at risk of extinction you might plan to start storing genetic material in genebanks.

You might aim to have sufficient material stored for 20 percent of such breeds in five years.

➤ Comparison

Comparing the indicators for your country with those of one or more **similar** (neighbouring) countries.

➤ Evaluating

Checking how well **resources** have been used to achieve the goals.

➤ **Foresighting**

Looking at trends to **predict** the future.



Note that this is part of the risk classification.



DAD-IS SDG Trend in Risk Status: www.fao.org/dad-is/trend-in-risk-status/en/

➤ **Analysis**

Analysing the **reasons for a change** in the situation, or for the **success or failure** of an action.

Note: The indicator itself does not say why a breed is at risk of extinction. You will need to investigate the reasons separately.

➤ **Policymaking and planning**

Determining policies or planning activities. You can **decide on breeding and conservation strategies**.

DAD-IS alerts you to take action before a breed is at high risk.

➤ **Lobbying and advocacy**

Persuading officials to adopt a particular course of action.

You can use the figures and graphs provided by DAD-IS to explain the situation in your country by showing trends over years, or providing comparisons with other countries.

➤ **Public awareness**

Raising the awareness of the public about animal genetic resources, **demonstrating progress** (or lack of it), and calling for **support** for a course of action.

FAO's use of DAD-IS information

FAO uses the data in DAD-IS to prepare various global reports on the state of the world's animal genetic resources.

- Calculating and comparing SDG **Indicators** 2.5.1 and 2.5.2 on animal genetic resources at a global level.
- Providing biennial reports to the **Commission on Genetic Resources for Food and Agriculture**. This is the body that **coordinates the conservation and sustainable use of genetic resources**.
- Creation of periodic reports on the **state of the world's animal genetic resources**. These were published in 2007 and 2015. They draw on DAD-IS, reports from member states and international organizations, and inputs from individual authors and reviewers.

Developing a Conservation Strategy

Julian: “Now that we have interpreted how the data for both SDG indicators can be used, we can use this information to develop a coherent conservation strategy.”

Riza: “Yes! This will help us decide on appropriate conservation measures. Could there be factors that affect conservation efforts?”

Factors affecting conservation efforts

The factors below **influence a breed's conservation value and priority**. They must be taken into account when deciding on appropriate conservation measures, and they should be included in the national strategy.

- Genetic variation within the breed

Genetic variation enables a breed to adapt, and allows breeders to select desirable traits.

The Nordland Lyndgen horse breed has undergone strong genetic bottlenecks in the past. A conservation scheme is now in place to maintain its genetic variability.

- Traits of economic importance

A very productive breed is likely to have **superior genetics**. Conserving this breed can make its genes available for breeding programmes.

The Garole sheep of Bengal, India, is well known for its prolificacy. **Females frequently give birth to twins and triplets.**

This trait is due to a **gene known as Booroola**. Breeding programmes have incorporated this trait into about 40 breeds around the world.

- Unique traits

Breeds with **special behavioural, physiological or morphological traits** should be given **high priority for conservation**. Such traits are likely to have a genetic basis.

The Blanco Orejinegro cattle, which were bred in the central foothills of the Andes in Colombia, are **genetically resistant to botfly (*Dermatobia hominis*), a skin parasite.**

These genes makes the Blanco Orejinegro a valued breed in areas where the fly is endemic.

The Araucana chicken from Chile is a rustic breed of chicken that can **tolerate diseases and extreme temperatures**. In addition, its most valued feature is its blue-shelled eggs.

- Adaptation to a specific environment

Many breeds evolved in a particular environment are well adapted and thrive. Some environments are particularly extreme: **too hot, dry, cold or wet for most livestock to survive.**

Eastern Siberia has long, dark, very cold winters, where the temperature can fall to -60 °C.

Yakutian cattle are well adapted to this extreme environment. Conservation programmes aim to save this breed from extinction.

➤ Cultural or historical value of the breed

Some breeds are culturally significant for particular groups. Losing the breed would mean a significant loss of cultural value. Similarly, breeds may be of particular historical interest.

The native ponies of Dartmoor in southwestern England were used in farming and to carry heavy loads of tin from nearby mines. They were later used as pit ponies in coal mines.

Their numbers declined as a result of mechanization and the use of their rangelands for military training during the World Wars. They are **now recognized as a rare breed; several organizations are promoting its survival.**

Nguni cattle, raised by Zulu, Sotho and other peoples for their meat and milk, were long disparaged by the South African authorities.

They are a medium-sized breed that is known for its fertility and resistance to ticks. They fatten well on natural pasture. **Their patterned hides are now the basis of a valuable industry.**

For example, the traditional Toraja culture in Sulawesi, Indonesia, measured **wealth in the number of water buffaloes a family possessed.**

Spotted and albino animals are especially valuable. They form a major **part of funeral ceremonies**, when they are ritually slaughtered to feed guests.

➤ Probability of success in conserving the breed

Resources are best invested if the conservation efforts are likely to succeed.

Milk from the Tarentaise cattle, a breed native to the valley of the same name in the high Alps of southern France, is used to make the distinctive Beaufort cheese. The cattle are **adapted to high altitudes and to foraging on steep slopes.**

Since 1968, cheese made from their milk (and from another alpine breed, the Abondance) in the Tarentaise and nearby valleys has been protected by a PDO (protected designation of origin) -a Europe-wide label.

➤ Status of the breed at regional level

A breed may be at risk in one country, but not in another. Priority should go to those **breeds that are only found in a single country**, or are at **risk in all the countries** where they occur.

Aubrac cattle are classified as "endangered" in Hungary: in 2012 there were only 9 breeding males and 122 females.

But Aubracs are not originally from Hungary, and they are no longer at risk in their native France.

Conserving the breed should be a higher priority in its country of origin than in Hungary.

FAO Recommendations for developing a conservation strategy

When developing national strategies and action plans for animal genetic resources, it is crucial to **involve all the main stakeholders**. FAO provides nine phases to guide you when developing your country's conservation strategy.

Phase 1 Establish the institutional Framework

Establishing or maintaining a multistakeholder National Advisory Committee to **oversee and coordinate preparatory activities** is strongly recommended.

The establishment or maintenance of a National Focal Point to **provide secretariat functions** during the preparatory process and ongoing support to implementation is also highly recommended.

Phase 2 Formulate major elements

The preparation by the National Advisory Committee of a **national vision statement and goals for animal genetic resources at this early phase** in the preparatory process is recommended.

Preparation of a prospectus that describes the need for a National Strategy and Action Plan and outlines the preparatory process is suggested as a means to **facilitate early communication with senior government officials and stakeholders, and to solicit their support** for the process.

The development of an outline and a communication plan of the National Strategy and Action Plan is recommended.

Phase 3 Prepare assessment

Drawing up a **compilation of the background information needed** to underpin preparation of the National Strategy and Action Plan is recommended. This will include:

- information on the roles and values of animal genetic resources;
- demands and trends for animal products;
- threats to animal genetic resources; and
- national and international agricultural biodiversity strategies, plans, legislation and policies.

If information is not available in any of these areas, **assessments to address the gaps are recommended**.

Phase 4 Update national priorities

An approach to **identifying or updating national level strategic priorities and actions** is proposed. It is recommended that all available sources be drawn upon, in particular:

- country Reports;
- current national strategies and plans, assessments and expert reports;

- the Global Plan of Action; and
- inputs received during stakeholder consultation processes.

A **detailed methodology is proposed**, which emphasizes the use of a framework comprised of the strategic priority areas of the Global Plan of Action.

Phase 5 Prepare the draft consultation document

Preparation of a draft consultation document is recommended as a key step in the preparatory process, and **suggestions are provided** regarding its content.

Advice on the drafting of the consultation document is also provided.

Phase 6 Consult with government and stakeholders

Several guiding principles for stakeholder consultations are proposed.

The aim is to **ensure full and effective participation of government and other key stakeholders**, including **local and indigenous communities**.

Phase 7 Complete National Strategy and Action Plan

It is recommended that after the consultation process is completed, the **National Advisory Committee** prepare a first **complete draft of the National Strategy and Action Plan** that includes a vision statement, goals, strategic priorities and the action plan component.

A methodology for preparing the action plan component is provided.

Phase 8 Establish evaluation mechanism

The establishment of an evaluation mechanism for the National Strategy and Action Plan is recommended.

Emphasis is given to the importance of **regular progress reviews and reporting**. A schedule for reviews and reporting is proposed.

Phase 9 Obtain official endorsement of the National Strategy and Action Plan

Official endorsement of the National Strategy and Action Plan by the government and key stakeholders is recommended.

It is also recommended that the **endorsement process be used as an opportunity to generate public awareness** of the National Strategy and Action Plan, and of the **requirements for its implementation**.



Preparation of National Strategies and Action Plans for Animal genetic resources

www.fao.org/elearning/Course/SDG251-252/en/story_content/external_files/ak523e .pdf

National Conservation Strategic Plan

A strategic plan is needed to **implement the national strategy**. This can vary from one country to another, as shown in these three national strategies.

A suggested outline of what should be included, and which can be adapted according to the country, is provided at the link:

www.nda.agric.za/doaDev/sideMenu/geneticResources/docs/National%20Plan.pdf

Components of a National Conservation Strategic Plan

➤ **Current Situation of Animal Genetic Resources**

The National Strategy begins with the **identification of the need for it**.

In this section, you should **present the breeds** in your country, as well as the **institutions** that contain information on these breeds.

➤ **National Strategy**

Next, the national strategy is outlined. In this section, you need to include the following information:

- characterization, inventory and monitoring of breeds;
- sustainable use and development;
- conservation approaches; and
- policies, institutions and capacity development.

You can include information from the previous page here.

➤ **Implementation of the Strategy**

Once the strategy is outlined, you should examine how to implement it. In this section, you need to include the following information:

- implementation;
- stakeholders' roles;
- communication;
- monitoring; and
- funding.

➤ **Annexes**

No strategy is complete without a list of annexes

This includes:

- process of preparing the strategy;
- legislation related to animal genetic resources;
- list of relevant organizations;
- list of breeds; and

- references.

Implementing the National Strategy

Riza: “Working with other stakeholders can assist in implementing the national strategy. We should raise awareness of the importance of conserving breeds. Can you think who would be part of our audience?”

Julian: “Well, our stakeholders are definitely part of our audience. They include farmers and livestock keepers, breed associations, and the Ministry of Agriculture.”

Riza: “Yes, these are some of our key audiences. Since each of these audiences will need different types of information, we will need to communicate with them in different ways.”

Communicating the need for Conservation of Animal Genetic Resources

Resources

The specific audience, channels and messages will vary from one country to another. It is important to keep in close contact with these stakeholders to obtain their input and feedback.

This will help to ensure conservation, and an effective implementation of the national strategy.

	Channels	Messages
Farmers and livestock keepers	Radio, TV, Newsletters, Meetings, Livestock shows	<ul style="list-style-type: none"> • Value and use of breeds • Why we should conserve breeds
Ministry officials	Briefings, Information Materials, Presentations	<ul style="list-style-type: none"> • Importance of conserving breeds • The need for policy and funding support
Scientists	Briefings, Information Materials, Presentations	<ul style="list-style-type: none"> • Status of breeds and their threats • Conservation efforts • Need for research
Breed associations	Livestock shows, Field visits, Social Media, Websites	<ul style="list-style-type: none"> • Support for conservation efforts • Need to share information
Mass media	Press releases, Interviews, Field visits	<ul style="list-style-type: none"> • Value of breeds • Conservation efforts • Success stories
General public	Radio, TV, Press, Social media, Websites, Videos	<ul style="list-style-type: none"> • Value of breeds • Importance of conservation

Communicating via Websites and Livestock Shows

It is important to communicate via websites and livestock shows. These two are excellent channels for communicating the need for breed conservation. In particular, **they both reach a wide range of people**. A website on breed conservation can serve various purposes: **publicize breeds** that are in danger, **encourage livestock keepers** to maintain them, and **stimulate public and government support** for conservation. Non-governmental organizations such as breeding associations often have excellent websites.



Examples of useful websites

The Gesellschaft zur Erhaltung alter und gefährdeter Haustierrassen (GEH), or **Society for the Conservation of Old and Endangered Livestock Breeds**, is an association of over 2 000 members.

It coordinates a network of "Arche" (Ark) farms that maintains breeds at risk.



Gesellschaft zur Erhaltung alter und gefährdeter Haustierrassen (GEH):

<http://g-e-h.de/>

Races de France (Breeds of France) is a federation of breeding societies for cattle, sheep, goats, pigs, dogs, cats and equines. One of its goals is to conserve biodiversity.



Races de France: www.racesdefrance.fr/

The **Rare Breed Survival Trust** is a British organization devoted to conserving rare and native breeds of livestock. Since it was founded in 1973, no breed native to the United Kingdom has become extinct.



Rare Breed Survival Trust (RBST): www.rbst.org.uk/

Livestock shows **attract a range of visitors**: farmers and livestock keepers, the general public, policy-makers and the media. They can be a good place to **inform people** about rare breeds, and the importance of conserving them.



Examples of livestock shows

Livestock and farm shows are held during the summer months throughout Europe.

They offer an **opportunity to display endangered breeds, increase awareness of the needs for conservation**, and sell artisanal products such as cheese, sausages, hides and soap.

The traditional purpose of animal fairs is to **buy and sell animals** - and a great deal of trading still goes on.

But such fairs have become much more than this: they also serve as **social gatherings, cultural celebrations and tourist attractions**.

The Pushkar camel fair, held in October or November each year in Rajasthan, India, is one of the world's largest camel fairs.

Conclusion

Riza: *"I can now complete the annual update on animal genetic resources in my country for FAO.*

I know how SDG Indicators 2.5.1 and 2.5.2 can be calculated, inserted in DAD-IS and interpreted. I will make sure to involve my stakeholders, who play a crucial role when discussing conservation methods for animal genetic resources."



To complete the plant genetic resources portion of the course, start with Lesson 2.

Summary

DAD-IS data are an excellent resource for each country to monitor its own progress, set targets, evaluate the effectiveness of conservation efforts, set policy, and raise awareness about breed conservation.

Sustainable Development Goals Indicator 2.5.1 focuses on cryoconserved materials. DAD-IS uses a formula to calculate if sufficient genetic material is cryoconserved to reconstitute a breed.

Sustainable Development Goals Indicator 2.5.2 focuses on the conservation of live animals, measuring the risk of extinction of each breed. The risk status of a breed is the most important factor in guiding conservation efforts.

There are many factors that should be considered when evaluating conservation efforts.

Conservation involves the joint efforts of many different stakeholders. Results have to be shared in order to obtain buy-in and resources. Countries need a coherent national strategy for conserving their breeds.

Communication about breed conservation must be tailored to suit different audiences.