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PRIMA SCALA-MEDI

PRIMA
PARTNERSHIP FOR RESEARCH AND INNOVATION IN THE MEDITERRANEAN AREA

Deliverable D8.2

Report on biobanked material and biobank network management

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Lead contractor: NGBT

Partners involved: CNR-IBBA, IDELE, INRA-Maroc, NGBT

Dissemination level: PU (public)

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EXECUTIVE SUMMARY

Background

SCALA-MEDI project aims at optimizing the sustainable use and conservation of local genetic resources (Chicken, Sheep) from the Mediterranean region. The development of gene banks is one component of the sustainable use of local genetic resources, in particular for cryopreservation of semen of local breeds. However not all countries have an established gene bank for farm animals.

Objectives

• To map the existing facilities and the collections currently stored for Animal Genetic Resources (AnGR)

• To enrich collections for sheep or chicken, depending on expertise and available logistics.

• To exchange information between gene banks of SCALA-MEDI partners

• To learn from the gene bank network established by the European Focal Point (ERFP) for Animal genetic resources

Methods

• Collection of information from partners

• Training on cryopreservation of chicken semen and chicken primordial germ cells

• Collection of new rams from Tunisian breeds

• Visits of national gene banks established in France and Italy

• Meeting with ERFP secretariat

Results

Tunisia has a well-established national gene bank (NGBT) whereas Algeria is launching its national gene bank in 2026 and Morocco is setting up a multi-domain National Gene Bank, starting with plant genetic resources, including animal genetic resources by the end of 2027. Collections of NBGT were enriched for one sheep breed, with 500 semen straws from 3 rams of Noire de Thibar breed, known for its small population size. A training was organized in France on cryoconservation methods for chickens but could not be applied yet in Northern African countries.

Visits of the French National Gene Bank and the Italian National Gene bank, respectively, were organized in 2025 and 2026, respectively. It was an opportunity to discuss about cryoconservation methods and sampling strategies for gene banks.

ERFP was presented during the visit of the French National Gene bank and discussed again at the Final SCALA-MEDI conference in Milan, Feb 20, 2026. The ex situ working group of ERFP is organizing a workshop just before the next meeting of the European Association of Animal Production for the Mediterranean region, to be held in Sassari, Italy, May 20-22. Attending this event is a great opportunity for SCALA-MEDI partners from Tunisia, Algeria and Morocco to continue networking with European gene banks. In addition, the documentation working group of ERFP is also organizing a workshop on data collection on animal genetic resources in the Mediterranean region, which would be an opportunity to present the work done in SCALA-MEDI using ODK to collect phenotypic data on the field.

1) Mapping existing collections

a. Tunisia

The National Gene Bank was created in 2003 as a public institution under the authority of the ministry in charge of agriculture, environment and water resources (décret n° 2003-1748). It is now placed under the single authority of the ministry in charge of environment. At the beginning of Scala-Medi, its collections included 2674 DNA samples, 802 blood samples and 800 semen straws. Samples originated from : -sheep (1959 DNA samples from 5 breeds, 397 blood samples from Barbarine breed) -horse (301 DNA samples and 372 blood samples from 2 breeds), -cattle (28 blood samples from local breed), 800 semen straws, 500 of them from the endangered local breed -goat (72 DNA samples), -camel (271 DNA samples), -Oryx dammah (52 DNA samples and 5 blood samples) -a crustacean (Proasellus) with 19 DNA samples from 5 individuals.

The national coordinator for AnGR of Tunisia is Mr Hatem Abdeljawed Ben Ameur, from the ministry of Agriculture, water resources and fisheries. Pr M'Naouer Djemali (INAT) is also an active participant to the FAO committee for animal genetic resources.

b. Algeria

The national gene bank is located at INRAA-BARAKI and was launched in 2022, to become operational in 2026. Its objective is to preserve local breeds from genetic erosion. The National Coordinator for AnGR of Algeria at FAO is Mr LABIED Mohamed, head of the division « Conservation and animal breeding » at ITELV, for ruminants. In SCALA-MEDI, ITELV is represented by Ghania Zitouni, head of the division for non ruminant species and small-scale farming, in charge of chicken breeding, among others. Expertise on artificial insemination can be found at the « National Center for Artificial Insemination and Animal Breeding » (CNIAAG), which is the main actor for the production and storage of frozen semen for cattle, horse, and some local breeds. It is responsible for the distribution of cattle semen from superior bulls across the country.

c. Morocco

There is not yet a national Animal Gene Bank. The decision has been taken to create a multi- domain National Gene Bank (Centre National des Ressources Génétiques CNRG) to preserve all genetic

resources of the country, plants, animals, micro-organisms. At present, the plant genetic resources component is being finalized to host the first collections. The other two components will be achieved in about 18 months. The structure is localid at El Koudia INRA's experimental farm in Sidi Yahia des Zaërs - Sidi Bettache. The National Coordinator for AnGR of Morocco is Mr Agdim Hassan, from the Ministry in charge of agriculture, fisheries, rural development, water resources and forestry. INRA-Maroc has a research team devoted to reproductive physiology in sheep, which aims at improving methods to preserve frozen semen from rams. Experiments are currently focusing on testing different biochemical components to improve the cryopreservation of ram semen (El Harouni et al., 2025). This work is conducted on rams from the Sardi breed. At present

there is no long-term storage of frozen semen at INRA-Maroc. Frozen semen for the Beni Guil sheep breed is kept in the Regional Center for Artificial Insemination at Fouarate -Kenitra. Eight rams from 6 farms were selected by ANOC in 2015 and 1000 straws are stored.

2) Training

A training program on gamete cryopreservation was held in France at the INRAE research centre 'Val de Loire' in Nouzilly, near Tours, from May 22nd to May 27th, 2023. This training involved eight participants, including 3 from Tunisia, 3 from Algeria, and 2 from Morocco. It was reported in the mid-term report. The program can be found in annex 1. Participants were sent by INRA Maroc (2), USTO (1), ITELV (2), ESAM (1), INAT (1) and NGBT (1). At the end of the training session, protocols were provided to the trainees in order for them to apply in their lab what they had seen. The procedure for collecting semen from cocks was demonstrated but not each participant had the possibility to practise, so that they were not able to repeat the sampling procedure with chickens from experimental farms.

Consequently, it was decided to undertake the collection enrichment for sheep, with procedures already available et practised in partner countries, namely Tunisia and Morocco.

3) Collection enrichment

a. Sheep in Tunisia

Since reproductive resources were limited to cattle, it was decided to enrich the collections with frozen semen from sheep thanks to SCALA-MEDI. Three rams were chosen from the Noire de Thibar breed, a local breed of Tunisia with a small population size. A total of 550 straws were obtained (Table 1) over 3 collection periods with quality check (motility, concentration). Straws are printed with the sire ID for traceability.

Table 1. Sheep reproductive material collected in Tunisia

Animal ID	Collection date	Ejaculate rank	Ejaculate volume (ml)	Mass motility (37°C)	Individual motility (37°C)	Concentration (millions/ml)	Diluent volume (ml)	Number of straws	Straw colour	Total
5346	18/03/2025	1	1.5	3.5	55	4783	2.5	40	bleu	
5346	18/03/2025	2	2	4	65	6777	2.5	50	bleu	
5346	27/03/2025	1	1.5	3.5	60	7739	6	50	bleu	
5346	27/03/2025	2	2	3.5	55	5711	4	45	bleu	
5346	17/04/2025	1	1.8	3.5	60	7096	5	20	bleu	
5346	17/04/2025	2	1.8	3.5	60	5762	3	22	bleu	227
9733	18/03/2025	1	1	4	65	8448	6.5	40	bleu	
9733	18/03/2025	2	1.5	4	70	9519	5	40	bleu	
9733	27/03/2025	1	1	3.5	55	6091	5	22	bleu	
9733	17/04/2025	1	1.7	5	70	8383	5	20	bleu	
9733	17/04/2025	2	1	4	65	6629	4	19	bleu	141
9736	18/03/2025	2	1	4	70	9999	5.5	45	bleu	
9736	27/03/2025	1	1	4.5	65	7974	6	55	bleu	
9736	27/03/2025	2	1	4.5	65	9276	8	55	bleu	
9736	17/04/2025	1	1.5	4.5	65	8244	4.5	27	bleu	182

										550

Exchange of information between gene banks of partners

a) French National Gene Bank

The French National Gene bank was presented during the training program organized in 2023. Furthermore, a visit was organized at the central facility of the French National Gene Bank (FNGB) located in Maisons-Alfort on July 3, 2025, as a follow-up session of the Annual meeting held in Paris, June 30-July 1, 2023. Members from USTO, INRA Maroc, INAT and NGBT attended the meeting. This visit was described in the report of the 4th Annual meeting. The French National Gene bank was created in 1999 and is holding collections of semen, embryos and cells for 8954 animals from 280 breeds of 22 species (mammals, birds, fish, shellfish) with a total of about 450 000 doses at the end of 2024. The regulatory framework was described, the FNGB has a mission to preserve farm animal genetic resources which includes experimental lines from research. The ministry of Agriculture is funding the cost of conservation (person-month and consumables) but not the collection. The cost of liquid nitrogen has greatly increased since 5 years. Breed associations have a veto right on the distribution of the biological material they provided, and a written agreement is signed between the chair of the FNGB and each provider. The FNGB does not accept individual providers, only institutes, associations, companies…A scientific committee is shared with all animal gene banks in France, under the frame of the CRB-Anim infrastructure (https://crb-anim.fr). The ratio of endangered breeds with material in the FNGB varies from 50% to 90% depending on species, small ruminants and rabbits have the highest rate. These breeds make 'type I' of the collections whereas type II corresponds to animals with rare origins or extreme breeding values or specific phenotypes (scrapie susceptibility for example) and type III corresponds to regular monitoring of selected populations. However, the onset of genomic selection has stopped the collection of type II and strongly decreased the collection of type III for cattle. The FNGB is managed by a multi-actor board to address issues of collection enrichment and characterization, to validate requests and to approve the budget. The presentation was followed by a visit to a storage room, under the guidance of the manager of the collections, David Briganti from LNCR, a laboratory in charge of sanitary controls for breeding animals (mammal species) that was briefly introduced by its director, Laurence Guilbert-Julien. LNCR is hosting the central site of the FNBG.

Being a member of the French Gene Bank Network CRB-Anim, the FNGB aims at coupling collections of reproductive samples with collections of tissues (blood, ear biopsies) used for DNA

extraction. This is done with a genomic gene bank named @BRIDGe, maintained by INRAE in the GABI research unit. This gene bank was also visited after the 4th annual meeting in the afternoon of July 3, 2025, which was described in the report of the 4th Annual meeting as such : Members from USTO, NGBT and INRA-Maroc visited the biobank of the genomics facility (@BRIDGe) of UMR GABI. They were welcomed by Déborah Jardet who had been working on Scala-Medi samples and organized a visit for them, including the biobank and the facilities for DNA extraction, sequencing, qPCR, digital PCR, open-array, histology, slide scanning and cell sorting. A detailed overview of the biological samples process, from receipt to genetic data collection, was presented. Deborah Jardet highlighted the technologies used, quality protocols, and the platform's capacity for managing collaborative projects, including those related to local breed selection or conservation programmes. The exchange provided an

opportunity to discuss the potential for integrating data from indigenous breeds and opportunities for collaboration in the field of genomics applied to animal biodiversity.

b) Italian National Gene Bank

A visit was organized at the central facility of the Italian National Gene Bank located in Lodi, on February 11, 2026, as a follow-up session of the Final meeting held in Milano, February 9- 10, 2026. Members from USTO, INRA Maroc, INAT and NGBT attended the meeting. In 2002, as part of a reorganisation process involving CNR's Research sections, the Institute for Defence and Valorisation of the Animal Germplasm (IDVGA) merged along with other entities into IBBA. The Animal Germplasm unit has recently moved to Lodi, at the Parco Tecnologico Padano site, where about 350 square meters of labs and offices are devoted to it. Personnel at the Lodi unit comprises 6 researchers on permanent position, one on a temporary position, 2 associated professors and a number of trainees. The main themes of research conducted by the researchers are related to the following: 1) economically significant relationships between genome and phenotypes; 2) reproduction and genetic conservation; 3) bioinformatics. Collections of the gene bank consist exclusively of semen samples from local breeds of 4 species, with 28546 semen straws from 291 donor animals. The preferred collection method is based upon epididymal sperm extraction from testis sampled at the slaughterhouse. Several technical publications about this collection method were shared by the team to support future implementation of these methods by SCALA-MEDI partners.

4) Meeting with ERFP secretariat

ERFP is a network at the scale of geographical Europe (not only European Union), where each country is represented by its national coordinator (NC), also a member of FAO committee for animal genetic resources. The NC is nominated by a ministry and may be an academic. ERFP has set up three working groups : in situ conservation, ex situ conservation (gene banks) and doc-inf for documentation-information (databases on animal genetic resources). ERFP secretariat is currently located in France and managed by IDELE in collaboration with INRAE (both partners of SCALA-MEDI). Coralie Danchin-Burge (IDELE), ERFP secretariat manager is also a member of the advisory committee of SCALA-MEDI. She described activities of ERFP to a delegation of partners (USTO, INAT, INRA Maroc, NGBT) just after visit of the FNGB on July 3, 2025.

ERFP handles all issues related to in situ (on farm) and ex situ (in gene banks or conservatory flocks) conservation. It participated to the EU project GenResBridge and published a European Strategy for Animal Genetic Resources in 2022 that can be downloaded from https://www.animalgeneticresources.net/index.php/publications/ ERFP facilitates the update of DAD-IS FAO database by its members. The ex situ conservation working group has set up a European Network of Animal Gene banks, named EUGENA (https://www.eugena-erfp.net/en/). In order to fulfil objectives of Task 8.2, it was agreed that North-African partners should inform their National Coordinators for animal genetic resources about this meeting and contact the chair of the ex situ WG, Fernando Tejerina (Spain), and the chair of EUGENA, Ewa Sosin (Poland) for further exchanges. Michèle Tixier-Boichard provided contacts. The meeting

concluded with an open discussion on opportunities for collaboration, particularly in terms of sharing expertise, strengthening technical capacities and joint projects on genetic conservation.

At the final conference of SCALA-MEDI, on Feb 10, 2026, in Milano, Coralie Danchin-Burge (IDELE) gave an invited talk on animal genetic resources in Mediterranean region, and provided information on the next meeting of ERFP working groups which will take place just before the 4th EAAP Regional Meeting - Mediterranean Region - May 20-22, 2026, in Sassari (Italy). The doc-inf working group is organizing on May 19 a workshop devoted to documentation of animal genetic resources from the Mediterranean area, the experience of SCALA-MEDI, using ODK, could be reported here. The ex-situ working group is also organizing a workshop that would benefit to the

gene banks representatives of SCALA-MEDI partners from North Africa. Coralie Danchin-Burge has informed the chairs of the ERFP working groups in order to facilitate the participation of SCALA-MEDI partners to these meetings.

5) Conclusions

National gene banks (NGB) are in operation or soon to be in operation in each country of Northern Africa involved in SCALA-MEDI, Algeria, Morocco, Tunisia.

This shows that training and networking provided in SCALA-MEDI can have an impact on the preservation of animal genetic resources in these countries. Already, new germplasm has been added for sheep in the NGB of Tunisia. Yet, there is a major gap for chicken, with no cryopreservation of reproductive material.

In the future, contacts should be strengthened with the ex-situ working group of ERFP, and expertise should be developed for the cryopreservation of chicken genetic resources, which may include semen as well as primodial germ cells, as shown in the training event.

References

Imad El Harouni, Lamaizi Khaoula, El Amrani Ahmed, Bouchra El Amiri, Allai Larbi. Hemp Seed Oil (Cannabis Sativa L.) improves ram sperm quality after cryopreservation. La 7ème édition des Journées Pratiques de Formation en Sciences Analytiques; 23-24 Avril 2025, Casablanca.

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Annex 1. Cryopreservation training programme (INRAE, May 2023)

	Monday		Tuesday		Wednesday	
MORNING			9-10h: theory on semen quality AVC/IG 10-11h: oviduct sphroïds KR 11-12h: challenges for bee FG			
9h-12h30	traveling to INRAE Tours				G1 Lab visit and proteomics platform	G2 Practicals: semen quality
speakers			AVC, IG, KR , FG		AVC,IG	
AFTERNOON	presentation of the French National Gene Bank		G1 Practicals: semen quality	G2 Lab visit and proteomics platform	14-15h: Presentations by participants	
14-16h					15-16h: theory on freezing	
speakers	MTB		AVC/IG		AVC/IG	

	Thursday		Friday		MTB: Michèle Tixier-Boichard
MORNING	theory on PGC		9H-10H45 G1 cell culture	G2 egg quality	AVC : Anais Vitorino-Carvalho
9h-12h30			11H-12H30 G2 cell culture	G1 egg quality	IG: Isabelle Grasseau
speakers	MG		MG	SRG	KR : Karine Reynaud
AFTERNOON					FG: Florence Guignot
14h-17h	G1 Practicals: sampling and transfer of PGC	G2 Practicals semen freezing	G2 Practicals: sampling and transfer of PGC	G1 Practicals semen freezing	MG: Marina Govorun SRG Sophie Rehaut-Godbert
speakers	MG	AVC/IG	MG	AVC/IG	