CONSERVATION AND DEVELOPMENT OF
DUAL-PURPOSE CATTLE BREEDS IN EASTERN EUROPE

March 2020

SDGs:

Countries:
Armenia, Georgia and Ukraine

Project Codes:
TCP/RER/3604

FAO Contribution
USD 486 000

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Contact Info:
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Implementing Partners
The Ministry of Agriculture of the Republic of Armenia, the Ministry of Agriculture of Georgia and the Ministry of Agrarian Policy and Food of Ukraine.

Beneficiaries
Cattle owners and producers of livestock products, staff from the ministries of agriculture and associated institutions, producer and breeding associations, research personnel, input services providers and product marketing service providers.

Country Programming Framework (CPF) Outputs
Armenia: Output 1.1.5; Georgia: Output 3.2; Ukraine: Output 1.11.

BACKGROUND
Following the independence of Armenia, Georgia and Ukraine in the 1990s there were major structural changes in cattle production, both in the composition of genetic resources and the management of animals and farms. In general, cattle that had been kept at communal farms were distributed to individual owners, many of which did not have sufficient resources or knowledge to perform animal husbandry. In the subsequent years, large commercial dairy farms were established in all three countries, which have supported the growth of the dairy industry. However, most cattle are still kept by small producers: in Armenia, there are only about 500 farms that have more than 50 cattle; in Georgia, family holdings account for 98.8 percent of the national cattle stock; and in Ukraine, 64 percent of cattle are owned by small households, accounting for 80 percent of milk production. Databases on indigenous livestock numbers were either incomplete or unavailable in the target countries; however, it is important to mention that Ukraine had an animal registration and identification system prior to the project, Georgia’s system was in its preparation phase and Armenia’s system was in its planning phase.
Locally adapted, dual-purpose cattle breeds, as well as their production systems, will remain crucial to the livelihoods of household producers, particularly in mountainous areas. This applies to large areas of Armenia and Georgia and to the Carpathian region of Ukraine.

More specifically, the Caucasian Brown and the Carpathian Brown cattle breeds have been specifically bred for these locations and their respective contexts:

- The Armenian landscape largely consists of high mountains and wide valleys, with 70 percent of the land at an altitude of 1 500-3 000 metres. Only 0.3 percent of the territory is found at an altitude lower than 500 metres. The vegetation period in lower areas lasts about 250 days, while in alpine areas, it only lasts about 95 days. This allows for grazing periods of around 230 days and between 150 to 180 days in lower areas and mountainous areas, respectively. More than 65 percent of agricultural land and about 50 percent of forests are used as pastures. Cattle feeding during the summer relies on grazing, while in the winter it depends on the hay collected during the summer and certain fodder crops. The natural pastures have not been improved and have largely been subjected to intensive soil erosion and flora degradation.

- In Georgia, approximately 26 percent of agricultural land is arable, while 65 percent is permanent grassland that is used exclusively by ruminants. The three major types of pastures include summer pastures, winter pastures and permanent village pastures. Most village pastures are privately owned, and the predominant farming system consists of small family operations. On average, these farms cultivate a total area of 0.75 ha each and are subdivided into two to four plots. These small and fragmented plots are typically used for subsistence agriculture.

- In Ukraine, about 69 percent of the surface area is used as arable land, while 13 percent is used as pastures or for making hay. Although over 90 percent of Ukrainian territory is defined as plains, the Carpathians in the west of the country reach an altitude of 2 000 metres. In the Carpathians, natural hayfields and pastures thrive as preserved alpine meadows. Village pastures are often overstocked with animals, which causes serious pasture degradation. While dairy cattle are managed using advanced technologies at larger agricultural enterprises, privately-owned dairy cattle are mainly found on small farms with poor fodder supply (consisting of silage supplemented with hay, straw, fodder beets and grain forage). In summer, cattle grazing occurs either in community herds or on individual lands. In winter, however, fodder roughage is often comprised of poor-quality straw and hay made from overmatured grass.
The FAO livestock breeding programme supports countries in conserving and developing locally adapted breeds by following a broad approach that addresses technical, policy and institutional concerns. It also aims to take into consideration relevant interactions with natural resource management, production system dynamics and general economic development. In the target countries, government institutions have recognized the importance of maintaining and developing locally adapted cattle breeds, both for supporting livelihoods and ensuring the genetic diversity of adapted breeds so that they can fulfill their roles in local ecosystems. Specifically, in Ukraine, cattle breeding is becoming more commercialized, with indigenous breeds receiving less attention and the deterioration of genetic resources posing a serious threat to their conservation. In Armenia, dairy cattle breeding is smallholder-based and in order to maintain high quality animals, farmers usually resort to importing non-indigenous breeds and/or their semen. In Georgia, indigenous cattle are among the most commonly used breeds, and their conservation is central to rural livelihoods.

IMPACT

The goal of the project was to improve the livelihoods of small-scale animal breeders through the conservation and development of local dual-purpose cattle breeds in Armenia, Georgia and Ukraine. It was envisioned that this goal would be supported by the creation of a conservation and development programme for selected breeds based on phenotypic evaluation and molecular genetic analysis.

ACHIEVEMENT OF RESULTS

Output 1: The population size and locations of selected dual-purpose breeds are identified and documented in the three countries

The national consultants on animal genetic resources carried out literature research and compiled relevant information on the phenotypic characteristics of the Armenian Caucasian Brown, Georgian Caucasian Brown and Carpathian Brown cattle breeds. In Ukraine, the national consultants were also responsible for reviewing the available information on the Carpathian Brown cattle population in the national registry. On the other hand, in Armenia and Georgia, national consultants were required to carry out mapping expeditions of the Armenian Caucasian Brown cattle and the Georgian Caucasian Brown cattle populations, respectively. Together with national service providers, the project consultants evaluated the population size, herd structures and locations of the selected cattle breeds in each country. Finally, guidelines on animal identification and registration were developed and were included in the Development Plan and Breeding Strategy formulated under the project.

Output 2: Phenotypic and molecular genetic characterization of the selected breeds and description of their production environment

The international consultant on livestock breeding, along with the lead technical officer and national/international gender consultants, developed a survey for selected cattle owners in order to gather data for the phenotypic and molecular genetic characterization of cattle. The survey covered 100 farms, 300 cows and 20 bulls in each country. In addition, the FAO/International Atomic Energy Agency (IAEA) joint laboratory performed genotyping on 543 Caucasian Brown and Carpathian Brown cattle samples, as well as 48 Fleckvieh-Simmental and 18 Ayrshire cattle samples. The analysis covered 64,000 single nucleotide polymorphism (SNPs), accounting for a substantial degree of genomic variation in Bos Taurus and Bos indicus.

The data collection component of the project also focused on the cattle production environment, its supporting institutions, specific products and their demand, and the economics of selected breed production at over 100 farms. Specific attention was paid to gender roles and socio-cultural aspects of farming activities.
Output 3: Development options and needs for the selected breeds and their production environment are identified and discussed with the animal breeders and relevant institutions

The project team drafted the Breeding Strategy and Development Programme, which specifies operational needs for both the Carpathian Brown and Caucasian Brown cattle breeds. Moreover, it proposes that state support programmes be established for the conservation and development of the target breeds in each country. A multistakeholder approach was adopted in the development of the Breeding Strategy and Development Programme. This was achieved through interviews with smallholder farmers during data collection and the involvement of various stakeholders at the regional workshop held in Kiev, Ukraine in 2019. The results and conclusions of the project were shared with governments, non-governmental organizations (NGOs), breeding organizations and scientific institutions, with the expectation that the Breeding Strategy and Development Programme becomes an integral component of cattle advancement beyond the project. The results of the project were also used as promotional materials, which were introduced to funding institutions by FAO country offices and presented to relevant organizations by the project team at official meetings.

The project also identified concerns related to feeding cattle. As a result, a national consultant on cattle feeding developed training materials covering the use of agricultural by-products and crop residues in cattle feed, which provides an economically viable and sustainable solution. The training reached 51 farmers from five marzers (administrative divisions/provinces) in Armenia.

IMPLEMENTATION OF WORK PLAN

All project activities were carried out within the approved budget, with a no-cost extension being approved to allow for the delays experienced during implementation. Specifically, there were delays in the payments to be made under the Letters of Agreement because of the time required to release payments and the information flow being unclear in some cases. Additionally, due to the seasonal nature of cattle breeding in Eastern Europe, data collection was postponed in Ukraine until the first available housing period. The project team adequately reviewed risks and their potential for creating problems on an ongoing basis throughout project.

No capacity building activities on molecular genetic characterization techniques were carried out as these techniques were not being used in the livestock sectors of Armenia, Georgia and Ukraine at the time of project implementation. Similarly, no study tours were organized to develop capacity in genotypic and phenotypic analysis. It was determined that the impact of these activities would have been limited and unsustainable. Finally, although no country-specific workshops were carried out to discuss breeding development opportunities, stakeholders were involved in the regional workshop, strengthening the regional approach to cattle breeding interventions in Eastern Europe.

FOLLOW-UP FOR GOVERNMENT ATTENTION

The key area for follow-up action is the implementation of the Breeding Strategy and Development Plan designed under the project in target countries. In Armenia, the development of a national animal identification and traceability system was recommended, while in Georgia and Ukraine, it was recommended that the existing systems incorporate breed data. Since genetic analysis of the Armenian Caucasian Brown and the Georgian Caucasian Brown cattle breeds revealed a high level of similarity, regional cooperation is encouraged in future efforts that support advancement of the breeds.

SUSTAINABILITY

1. Capacity development

The relevant policies and legal frameworks for the advancement of cattle breeds are either in place or being developed in target countries. The Breeding Strategy and Development Plan provides governments with the necessary information to implement effective interventions, however, the sustainability of such interventions will be dependent upon the availability of financial resources. The data collected and analyses performed under the project have provided a basis for the future direction of the livestock sector, and this information has been made available to all relevant stakeholders.

2. Gender equality

Particular attention was paid to the development of gender-sensitive activities during project design. Gender-disaggregated data was collected in project surveys. Ultimately, the resulting Breeding Strategy and Development Plan met the needs of both men and women involved in cattle breeding and related farming activities.
3. Environmental sustainability
The conservation and advancement of indigenous cattle breeds formed the basis of the project, presenting a great example of natural resource utilization and environmental sustainability.

4. Human Rights-based Approach (HRBA) – in particular Right to Food and Decent Work
During data collection, attention was paid to assessing the division of labour and the working conditions in households that keep Carpathian Brown and Caucasian Brown cattle. Through the examination of socio-economic aspects of the livestock sector and their impact on the lives of stakeholders, the project upheld key principles of human rights.

5. Technological sustainability
The concepts introduced in the Breeding Strategy and Development Plan are suitable for local contexts and are based on a strong collaboration with relevant stakeholders. Under the project, good practices were introduced to governments and the capacity of stakeholders and service providers to improve dual-purpose cattle breeds was greatly developed. Stakeholders and beneficiaries are now equipped with the technical skills required to benefit from the efforts made under the project.

6. Economic sustainability
The sustainability of the project is largely dependent on the financial commitment of beneficiary governments. In Armenia, interest has been shown in allocating additional financial resources to Caucasian Brown cattle breeding. In Georgia, the possibility of introducing artificial insemination into cattle breeding has been postulated. In Ukraine, local breeder organizations have requested for the Government to carry out follow-up activities with the help of FAO. Efforts have also been made to use the project as a means to securing finance for follow-up projects. The activities carried out and the project results were presented to funding institutions by country offices. Additionally, the project team has discussed the results with relevant organizations at official meetings. The development of a breeding organization to support the financial sustainability of the project has also been considered. This would not create any extra financial burden for beneficiaries or stakeholders. Importantly, some of the tools that are not currently affordable to beneficiary governments (e.g. a national animal identification and traceability system in Armenia) are considered essential to the continuation of project activities. These remain key areas to be addressed.

DOCUMENTS AND OUTREACH PRODUCTS
- Survey on the Armenian Caucasian Brown cattle in Armenia. T Szobolevszki. Budapest, Hungary. 2018. 43 pp.
- Data Collection Protocol. T Szobolevszki. Budapest, Hungary. 2018. 16 pp.
- Survey on the Armenian Caucasian Brown Cattle Breed in Armenia. The Strategic Development Agency. Yerevan, Armenia 59 pp.
- Final Report on the Implementation of a National Survey on the Conservation of Dual-purpose Cattle and the Collection of Genetic Samples. M.V. Zubets (Institute of Animal Breeding and Genetics). Kiev, Ukraine. 26 pp.
- Report on the Implementation of the National Survey on the Conservation of Dual-purpose Cattle and the Collection of Genetic Samples. Georgian Veterinary Doctors United Association. Tbilisi, Georgia. 2019. 46 pp.
- Training materials on the use of agro-industry by-products in Armenia. Z Chictyan. Yerevan, Armenia. 2019. 21 pp.
- Breeding Strategy and Development Plan for Caucasian and Carpathian Brown Cattle Breeds. C Egger Danner. Vienna, Austria. 2019. 98 pp.
- Gender and Socio-Economic Characteristics of Cattle-Keeping Households in Armenia, Georgia and Ukraine. Z Bossányi. Budapest, Hungary. 2019. 39 pp.
- Final Technical Report on Genomic Analysis of Caucasian and Carpathian Brown Cattle to Support Strategic Decision Making for Breeding and Improvement of a Dual-purpose Breed. Animal Production and Health Laboratory, Joint FAO/IAEA Division. Vienna, Austria. 22 pp.
## ACHIEVEMENT OF RESULTS - LOGICAL FRAMEWORK

| Expected Impact | Improved livelihoods of small-scale animal breeders through conservation and development of dual-purpose cattle |
|------------------|------------------------------------------------------------------------------------------------------------|
| Indicator        | A conservation and development programme for the selected breeds and their production environment based on phenotypic and genotypic evaluation and molecular genetic analysis |
|                  | 1. Database for selected dual-purpose breeds in three countries established or updated. |
|                  | 2. Detailed phenotypic and genotypic characterization of the selected breeds. |
|                  | 3. Outline of breeding programmes for the selected breeds. |
|                  | 4. A development approach for the selected breeds. |
| Baseline         | 1. Databases on population size is incomplete or non-existent. |
|                  | Ukraine: exists, but needs improvement. |
|                  | Georgia: under development. |
|                  | Armenia: non-existent |
|                  | 2. The selected breeds are not appropriately characterized. |
|                  | 3. No breeding goals and breeding programmes exist. |
|                  | 4. The role of the selected breeds in livelihoods and regional development is not defined. |
| End Target       | 1. Databases are established or improved. |
|                  | 2. Characterization of one dual-purpose breed in each country. |
|                  | 3. Breeding goals and programmes are discussed and agreed upon among breeders and relevant institutions. |
|                  | 4. Development programmes for the selected breeds are formulated. |
| Comments and follow-up action to be taken | Based on the reports of the service providers, the data collected by national consultants and the genetic study developed by the FAO/IAEA joint laboratory, the Breeding Strategy and Development Plan was formulated for the Caucasian Brown and Carpathian Brown cattle breeds in Armenia, Georgia and Ukraine. All relevant stakeholders were involved in its development. As part of follow-up action, the Breeding Strategy and Development Plan should be implemented in the target countries. |
The population size and locations of selected dual-purpose breeds are identified and documented in the three countries.

| Output 1 | The population size and locations of selected dual-purpose breeds are identified and documented in the three countries |
| --- | --- |
| Indicators | Target | Achieved |
| Baseline | Caucasian Brown and Carpathian Brown cattle were mapped, and photographs, phenotypic data and genotypic data were collected. Recommendations were provided for the development of the national animal identification and traceability systems as part of the Breeding Strategy and Development Plan. The national service providers registered the selected animals in a separate database. The development of a national animal identification and traceability system was recommended in Armenia. In Georgia and Ukraine, on the other hand, national authorities were recommended to include breed data in their animal identification and traceability systems. |
| Comments | Describe typical appearance of breeds | Achieved |
| Activity 1.1 | The national consultants on animal genetic resources collected relevant literature and information related to the phenotypic characteristics of the Armenian Caucasian Brown, Georgian Caucasian Brown and Carpathian Brown cattle breeds in each country. The results were presented at the Regional Workshop on Conservation of Dual-purpose Breeds in Eastern Europe, held in Yerevan, Armenia in 2018. | Yes |
| Activity 1.2 | The national consultants on animal genetic resources reviewed and studied the available population information on the Carpathian Brown cattle. The findings were reported at the Regional Workshop on Conservation of Dual-purpose Breeds in Eastern Europe, held in Yerevan, Armenia in 2018. | Yes |
| Activity 1.3 | The national consultants executed mapping expeditions in Armenia and Georgia to identify locations and farms where Caucasian Brown (Armenian and Georgian, respectively) cattle were kept. They collected quantitative information on the population and established a sample selection base, which was required for the characterization of farms and individual animals. The service providers executed the field data collection based on the mapping results. | Yes |
| Activity 1.4 | The national consultants and the service providers evaluated the population size, herd structures and locations of Armenian Caucasian Brown, Georgian Caucasian Brown and Carpathian Brown cattle. The service providers described their findings in country reports. | Yes |
| Activity 1.5 | Guidelines based on field data collection were included in the Development Plan and Breeding Strategy. Relevant authorities dealing with the identification of livestock were also involved in the formulation of the Breeding Strategy and Development Plan. | Yes |
## Output 2

Phenotypic and molecular genetic characterization of the selected breeds and description of their production environment

| Indicators                                                                 | Target | Achieved |
|---------------------------------------------------------------------------|--------|----------|
| Achieved                                                                  |        | Yes      |

### Baseline

- Phenotypic and genotypic data was collected for the Armenian Caucasian Brown, Georgian Caucasian Brown and Carpathian Brown cattle breeds. The project interpreted and incorporated these results into the Development Plan and Breeding Strategy.

### Activity 2.1

**Breed surveys**

- Achieved: Yes
- Comments: The international consultant on livestock breeding developed a survey in collaboration with the lead technical officer and both the national and international gender consultants. The survey was carried out on selected cattle owners to collect data for the phenotypic and molecular genetic characterization of a sample of cows and bulls, as well as for longitudinal milk recording in Armenia. Overall, data was gathered for 100 farms, 300 cows and 20 bulls in target countries.

### Activity 2.2

**Molecular genetic characterization and analysis, documentation of surveys and collected information**

- Achieved: Yes
- Comments: The FAO/IAEA joint laboratory genotyped a total of 543 samples from Caucasian Brown and Carpathian Brown cattle using the third-generation bovine array on the Affymetrix-Axiom platform (Axiom Bovine Genotyping v3 array) in 384-well format. Additionally, samples from 48 Fleckvieh-Simmental and 18 Ayrshire cattle were also genotyped. The array included 64,000 SNPs, providing high coverage of genomic variations in *Bos taurus* and *Bos indicus* breeds.

### Activity 2.3

**Surveys on production systems**

- Achieved: Yes
- Comments: During data collection, the service providers collected information on the production environment and socio-cultural aspects of the selected farms. In each country, at least 100 farms were visited. Particular attention was paid to gender roles.

### Activity 2.4

**Assessment of production environments**

- Achieved: Yes
- Comments: Relevant information was collected on the production environment, its supporting institutions, specific products and their demand, as well as the economics of the production of selected breeds. The results were incorporated into the country reports and the Development Plan and Breeding Strategy.

### Activity 2.5

**Capacity building on molecular genetic characterization**

- Achieved: No
- Comments: No relevant capacity building was carried out in selected countries regarding molecular genetic characterization techniques. Molecular genetic characterization was not being performed in the livestock sectors of Armenia, Georgia or Ukraine. Since there was no existing capacity, equipment or institute to regularly perform molecular genetic characterization, capacity building efforts would not have been sustainable. However, the monitoring of animal genetic resources in Armenia, Georgia and Ukraine remained the mandate of national focal points and relevant recommendations were made regarding this in the Breeding Strategy and Development Plan.
| Output 3 | Development options and needs for the selected breeds and their production environment are identified and discussed with the animal breeders and relevant institutions |
|---|---|
| Indicators | Target | Achieved |
| | | Yes |

**Baseline**

**Comments**

A clear strategy was developed on how to improve breeds, which also included development options. In the future, the beneficiary governments should implement the Breeding Strategy and Development Plan drafted under the project.

| Activity 3.1 | Draft breeding goals and breeding plans | Achieved | Yes |
|---|---|---|---|
| Comments | The project team drafted a comprehensive plan, entitled the Breeding Strategy and Development Programme for Carpathian Brown and Caucasian Brown Cattle Breeds. It includes operational needs and proposes state support programmes for supporting the conservation and development of breeds. |

| Activity 3.2 | National consultations | Achieved | Partially |
|---|---|---|---|
| Comments | Country-specific workshops were not organized, as relevant stakeholders were invited to regional meetings. There was a strong focus on adopting a regional approach. Hence, it was better to discuss development opportunities in a joint manner. In addition, farmers were interviewed when data collection on the production environment was being performed, supporting the development of a smallholder-focused approach in the Breeding Strategy and Development Plan. Stakeholders were involved in the development of the breeding strategy at the regional workshop in Kiev, Ukraine 2019. |

| Activity 3.3 | Draft development programmes | Achieved | Yes |
|---|---|---|---|
| Comments | The Breeding Strategy and Development Plan is expected to play an integral role in developing the Caucasian and Carpathian breeds. The findings and conclusions of the project were ultimately shared with beneficiary governments, breeding organizations, scientific institutions and NGOs. |

| Activity 3.4 | Promoting the breed and development programmes | Achieved | Yes |
|---|---|---|---|
| Comments | The Development Plan and Breeding Strategy was developed based on strong justification from results of the genetic study. The project results and activities were introduced to funding institutions through the country offices, and the project team delivered information to relevant organizations during official meetings. In addition, the results of the project were suitable for aiding the identification of donors for future follow-up projects. Specifically, since the molecular genetic analysis revealed that the Armenian Caucasian Brown and Georgian Caucasian Brown cattle breeds are similar, regional cooperation is encouraged in follow-up actions. |

| Activity 3.5 | Capacity development in genotypic and phenotypic analysis and interpretation of results | Achieved | No |
|---|---|---|---|
| Comments | After much deliberation, it was decided that the impact of a study tour would have been too limited and would not have provided sustainable results. Hence, the tour was not organized. |

| Activity 3.6 | Farmer training on the use of agricultural by-products and crop residues as cattle feed | Achieved | Yes |
|---|---|---|---|
| Comments | One of the key outcomes from the data collection was the identification of a major problem in cattle feeding. Due to the lack of feed, the genetic capacity of the Caucasian Brown and Carpathian Brown cattle could not be properly assessed. Consequently, a national consultant on cattle feeding developed training materials on the use of agricultural by-products and crop residues as cattle feed. This provides a cheap and sustainable solution to the problem. The national consultant delivered the training to 51 farmers from five marzers in Armenia. |
Partnerships and Outreach
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