

ANIMAL GENETIC RESOURCES IN POLAND

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ABSTRACT

The evaluation of the breed structure in the most common livestock species kept in Poland suggests that in the case of the majority of species, the current structure is relevant and addresses the needs of specific sectors (dairy and beef cattle, horses, sheep and goats, fur animals, fish and honey bees). The domestic breeding stock available for pig fattening units does not fully reflect the needs of the sector. Therefore, the domestic breeding material is complemented by a growing import of replacement stock from international breeding companies. Moreover, in 2011, already 2.8 millions of piglets were imported to commercial fattening farms managed in open systems, and in 2012 this number increased up to 3.5 millions. As was already indicated here, the fast growing poultry production sector, both for meat and for eggs, is based, either solely or in the majority, on imported genetics of high productive potential.

Key words: animal genetic resources; livestock

INTRODUCTION

Conservation of genetic resources for food and agriculture requires maintaining the biological wealth of agricultural lands, including diversity of breeds and varieties of farm animals and of cultivated crops, but also their utilisation in such a way that it will be sustainable, and will provide a solid basis for the future needs of plant and animal breeding.

Therefore, conservation of animal genetic resources (AnGR) cannot be restricted or focused on rare breeds only, it has to address all populations of farm animals, and be based on improved understanding of their biology and status of their populations to prevent potential threats, especially genetic erosion. It is necessary to fully utilise in AnGR conservation approaches both *in-situ* and *ex-situ* methods, supported by the theory of small populations' management (Filistowicz and Zwolińska-Bartczak, 1995; Filistowicz, 2011; Zwolińska-Bartczak *et al.*, 1995; Żuk *et al.*, 1995).

National legislative framework relevant to AnGR conservation and sustainable will include: the law on organization of animal breeding and reproduction (animal breeding acts of 1997 and 2007 with further amendments) and the law on measures to support rural development (2004, 2007), as well as the law on organic agriculture (2001).

In 1996, the Minister of Agriculture and Food Economy formally established the National Focal Point for Animal Genetic Resources, and appointed the Central Animal Breeding Office as the host institution. At that time, the Central Animal Breeding Office was responsible for performance recording, breeding value evaluation and artificial insemination in most of farm animal species. The key achievement during this initial period was development of conservation programmes for populations that were covered by the state support measures. In May 2000, the Minister accepted 32 conservation programmes to be implemented for 75 breeds, varieties and lines of farm animals. These

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programmes covered all major livestock species that were kept in Poland, included all native breeds; and also a small number of imported populations (mainly poultry) that were bred in Poland for more than 30-40 generations.

Due to the ongoing transformation in organization of animal breeding, the National Focal Point was transferred in 2010 to the National Animal Breeding Centre and since January 2002 to the National Research Institute of Animal Production. The current structure to support AnGR conservation is provided in Figure 1.

Global contribution

Poland actively participated in the preparation of the first Global State of the World's AnGR Report (SoW-AnGR) initiated by the Food and Agriculture

Organization of the United Nations (FAO), including by preparing a national report on AnGR. The Country report (2002) contained: a) an analysis of the state of biodiversity in the livestock sector as well as a review of production systems and evaluation of the utilization of animal genetic resources; b) analysis of the changing demands and trends in livestock production; c) a review of the state of national capacities to manage AnGR; d) ten overall national priorities for the conservation and sustainable utilization of AnGR and e) recommendations for enhanced international co-operation in the field of farm animal biodiversity. The agreed national priorities for action were gradually implemented over the last ten years, which resulted, among other things, in increased farmers' participation in *in-situ* programmes, introduction of new breeds into conservation programmes and

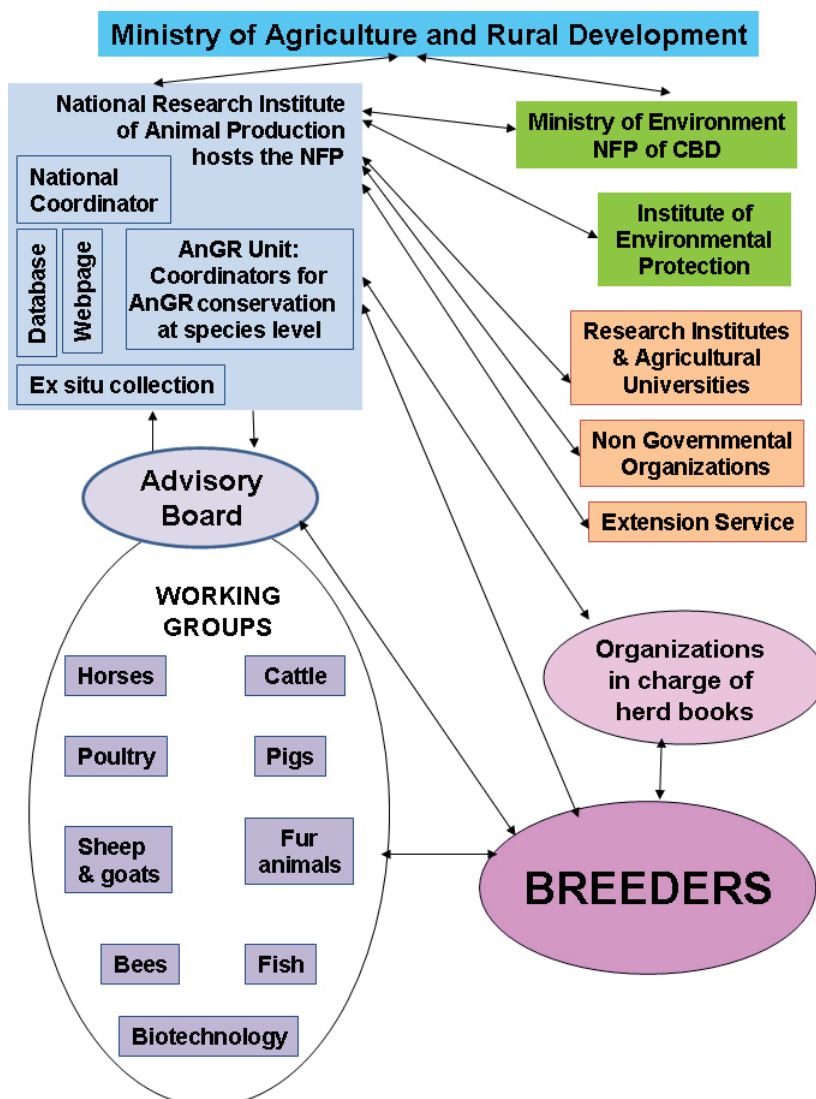


Fig. 1: The national network on animal genetic resources in Poland

enhancing *ex-situ* conservation measures.

The report on the State of the World's Animal Genetic Resources (FAO, 2007a) resulted in compilation of existing knowledge and information, and provided the first ever evaluation of the state of the resources themselves, the state of efforts and actions to enhance their sustainable management, and the state of art in development of both *ex-situ* and *in-situ* methods aimed at improved conservation and sustainable use of AnGR.

The Global Plan of Action for animal genetic resources (GPA) was adopted in Interlaken, Switzerland, in 2007, and later endorsed both by the FAO Council and the FAO Conference, demonstrating commitment by all FAO member countries to its implementation.

Poland made substantial efforts to implement the GPA and has provided its first Country progress report on AnGR, which was due in 2011. We have already initiated preparation of our country contribution to the second Global Report SoW-AnGR, which is scheduled to be presented to the Commission on Genetic Resources for Food and Agriculture in 2015. Preparation of the second Country progress report on the implementation of the GPA (FAO, 2013a) is also underway.

Implementation of the GPA is conducted through the national plans and programmes; development of National Strategies and Action Plans for AnGR (NSAP-AnGR) as recommended by the FAO (2009). Till 2013, a number of countries have already developed NSAP-AnGR (in Europe: Armenia, Austria, Croatia, Czech Republic, Denmark, Finland, Germany, Italy, Montenegro, Norway, Slovenia, Spain, Sweden and UK) (FAO, 2013b). Other countries are conducting preparatory work.

The National Research Institute of Animal Production was entrusted by the Ministry of Agriculture and Rural Development with the preparation of the NSAP-AnGR, with the process based on the broad participation of breeding and research communities and NGOs, and extensive consultations during three national level conferences organized in Balice. The NSAP-AnGR has to fulfill an overall goal: "Effective utilisation and conservation of genetic resources of farm animals to contribute towards development of sustainable agriculture"; there are also six specific objectives to address various aspects of the overall goal. The structure of NSAP-AnGR follows the GPA structure with four strategic priority areas (characterisation, utilisation, conservation and capacity building). The Polish NSAP-AnGR contains in total 15 national strategic priorities (4+4+3+4) and 52 actions. In September 2013 the NSAP-AnGR was at the final stage of editing (Martyniuk and Krupinski, 2013).

AnGR conservation

The *in-situ* conservation programmes cover at present 88 genotypes (breeds, varieties and lines) kept at 3010 herds. The total number of females is over 90 thousands, as presented in Table 1.

The *ex-situ in vitro* conservation measures are important components of the overall AnGR conservation efforts. Cryopreservation activities were included in the NSAP-AnGR, with the aim to collect sufficient biological material that will allow the recovery of lost diversity within livestock breeds, if needed. To support *ex-situ* conservation activities, the National Research Institute of Animal Production has established the National Bank for Biological Material (*Krajowy Bank Materiałów Biologicznych, KBMB*). The National Bank for Biological Material is located in a separate building in the headquarters of the Institute, in Balice. Due to the veterinary requirements it consists of a complex of four independent divisions (gene banks for: cattle, horses, pigs, and sheep and goats - jointly). The National Bank will store biological material of breeds belonging to all five major livestock species.

In the National Bank for Biological Material, with financial support from a number of research projects, a large quantity of biological material is already deposited: 4400 semen samples of Swiniarka, Wrzosowka and Olkuska sheep (Krupiński and Martyniuk, 2009), 51 500 samples of semen from bulls belonging to four Polish native breeds: Polish Red, Polish Red and White, Polish Black and White and Polish Whitebacked cattle, as well as 1900 embryos of Polish Red cattle (Szczęśniak-Fabiańczyk, 2012).

The state of the livestock production in Poland

Livestock production in Poland is based on utilisation of a few key species: cattle, pigs, chicken and turkeys, that provide the majority of animal products for the domestic market as well as for export. In the last ten years, livestock production output and intensity have systematically increased, e.g. from 230.9 kg of warm carcass weight per 1 ha of agricultural land in 2000 to 342.2 kg in 2011; and from 648 l of milk /ha in 2000 to 780 l of milk /ha in 2011 (GUS, 2012).

Cow milk production in 2011 was 12052.2 million litres (GUS, 2012). Slaughter animal production, on the basis of warm carcass weight from six major species, reached in 2011, in total, 3757 thousands ton, with pigs contributing 1876 thousands ton, poultry 1427 thousands ton, and cattle, calves, horses and sheep respectively: 384; 28.0; 17.8 and 1.7 thousands ton (GUS, 2012).

The highest share in meat production belongs to pork (49.9 % of total production) followed by poultry meat (38.0 %) and beef and veal (10.2 % and 0.7 %).

Table 1: Number of herds/flocks and number of animals included in the *in-situ* conservation programme (data for 30th June, 2013 - National Research Institute of Animal Production)

Species	Number of breeds/ varieties/ lines	Number of herds/flocks	Number of females
Horses	7	1271	5295
Cattle	4	893	7498
Sheep	13	674	46014
Goats	1	2	29
Pigs	3	84	1764
Laying hens	19	19	19 570
Geese	14	14	4 820
Ducks	10	10	3 961
Rabbits	1	8	-
Fur animals (foxes, chinchilla, polecats, nutria)	12	24	1219
Total	84	3 010	90460
Local bee linies	4	-	699 (1282*) colonies
TOTAL	88	-	-

* jointly with the Kampinowska bee breeding region and Augustowska bee breeding zone

The remaining meats share (horsemeat and mutton/lamb) is only 1.2 %. In the structure of poultry meat, the dominant position is held by chicken meat (72.1 %) and turkey (18.4 %). The contribution of waterfowl meat accounts for 9.5 % only. In the last period, egg production increased from 7621 million in 2000 to 10373 million in 2011 (GUS 2012).

In general, small ruminant production is at a very low level. In 2011, sheep wool production was 775 tons only. Goat meat production was marginal, around 497 tons. Also, goat and sheep milk production was scarce, 35 thousand tons and 500 tons respectively (GUS, 2012).

Poland still maintains a very high level of mink skin production (5.5 million) while other carnivore species (fox, raccoon and polecat) skin production is at a much lower level: 180, 3 and 1.2 thousands respectively. Rapid decreases in demand for the herbivore species skin products resulted in drastic decrease in the use of rabbits and nutria with a rapid decrease of meat provided by these two species (5764 and 30 ton respectively in 2011) (GUS, 2012).

In Poland, utilisation of honey bee solely for pollination is rare. The main product is honey, and three breeds are used mostly: Carniolan bee (*Apis mellifera carnica*), Caucasian (*Apis mellifera caucasica*) and Central European (*Apis mellifera mellifera*). The sector is covering 1 246 633 bee colonies, which are kept in about 50,000 apiaries, that produced in 2011, in total,

23 thousands kg of honey, with average of 18.4 kg per colony.

Both aquaculture tradition in Poland and the market share indicate that the key commercial fish species in Poland are carp and trout. At present, annual carp production is at the level of 17.000 tons and trout of 18.000 tons, providing about 20 % of total fish and 90 % of freshwater fish for the domestic market.

Livestock number

Dairy cattle numbers dropped during the period 2000-2011, from 6082.6 thousands to 5760.6 thousands. In December 2012, the total population size was even smaller: 5520.3 thousands (GUS, 2013a). The dairy cow population in 2010 counted 2 528.8 individuals but in the next two years decreased further to 2 468.7 (GUS 2013a). The active population consists mainly of the Polish Holstein-Friesian Black and White (88.64 %) and Red and White varieties (3.09 %), Simmental (1.49 %) and in 4.84 % of dairy crosses.

The remaining breeds' share in the active population is only 1.95 %, and this includes mainly four breeds under the conservation programme Polish Red (around 4000), Polish Red and White (3500), Polish Black and White (2500) and Polish White-backed cattle (350 cows) as well as imported dairy breeds, such as Jersey, Montbeliarde or Ayrshire. All cattle breeds included in the conservation programme are

dual purpose, milk and meat type. There is a growing interest among smallholders to keep native breeds and participate in the conservation programme.

The development of beef cattle breeding in Poland, initiated through the national programme in 1994, was solely based on imported genetics from countries with long traditions in the utilisation and development of beef cattle breeds. In 2011, the population of purebred and crossbred beef cattle was about 25 000 animals, with 16 216 purebred and 7 459 crossbred cows. These relatively small populations however provide a valuable basis for further development of the sector with the expected abolition of milk quotas. In beef cattle population, Limousine has the highest share (69.7 %), followed by Charolaise (14.4 %); Hereford (4.7 %) and Simmental (3.7 %). In backcrossed population, the position of Limousine is even higher (89.2 %), indicating strong interest of beef farmers in this genotype.

In the years 2000-2007, the pig population was about 17-18 millions animals. By the end of 2012, pig number were only 11.1 million, lower by 14.8 % from the year before (GUS, 2013b). In 2011, only about 15 000 sows were under performance recording including 6317 Polish Landrace, 5149 Polish Yorkshire, 736 Duroc, 513 Pietrain and 67 Hampshire. Among native breeds included in the conservation programmes, performance recording was carried out for 804 Pulawy sows, 826 Zlotniki Spotted and for 661 Zlotniki White sows.

In the period of 2000-2010, the horse population decreased, with only 254 000 horses in 2011. In 2012, the number of mares registered in the stud books was 22 000 and the number of stallions was 4.5 thousands. Thus, the active population accounts for about 8.8 % of the total horse population. The majority of commercial population belongs to the Polish Coldblooded horse. In this species, the diversity of breeds kept in the country is tremendous, among them, seven native breeds are included in horse genetic resource conservation programmes (Hutcul, Polish Konik (since 80thies), Maloposki, Slaski (since 2004) Wielkopolski Sokolski and Sztumski (since 2007).

During the period of 1995-2010, sheep number dropped from 713 000 to 268 000. In December 2012, the sheep population was only 218.5 thousands, including 134.7 thousands of breeding ewes (GUS, 2013a). In 2010, 57.3 % of active population consisted of Polish Merino, Polish Lowland and Polish Longwool sheep. In this species, the number of native breeds included in the conservation programme is high (13) and includes: Polish Heath sheep; Swiniarka sheep; Olkuska sheep; Polish Cakiel in the old type; Polish Mountain sheep colored variety; Polish Merino in the old type; Polish Merino colored variety; Wielkopolska; Uhruska; Żelazna; Korideil; Pomorska and Kamieniecka sheep.

In 2002, there were 193 000 goats in Poland, including 111 000 females. In 2010, there were only 117 268 goats, and in 2011 the number further dropped to 111 800 (GUS, 2012). The majority of the goat population is represented by Polish White Upgraded goat (39.9 %) and Polish Coloured Upgraded goat (21.1 %). Other breeds under performance recording include: Saanen, Alpine, Anglonubian, Toggenburg and Boer goats.

The breeding stock of meat chicken and turkeys is imported in the form of grandparental stock and parental sets. In the case of laying hens, 95 % of breeding material comes from international breeding companies, while 5 % are from three Polish pedigree farms that specialise in dual purpose breeding stock. The genotypes under the domestic breeding programme include: Rhode Island Red (4 lines), Rhode Island White - New Hampshire, Barred Rock (3 lines each), Barred Plymouth Rock and Sussex (2 each) and one line of Leghorn and of Green-legged Partridge chicken. Chicken genetic resources conservation programmes are carried out for 10 lines of the following breeds: Green-legged Partridge, Yellow-legged Partridge, Polbar, Rhode Island Red, Rhode Island White, Leghorn and Sussex.

The goose genetic improvement programme is implemented on the basis of two lines: male (W-33) and female (W-11) of the White Italian goose. Beyond these two lines, and their crosses, there are 14 breeds and varieties of geese under the *in-situ* conservation programme. In case of ducks, only two Pekin lines (A-55 i F-11) and Dworcka synthetic breed (line D-11), developed through crossing of cayuga males with females of A-44 i A-55 Pekin lines, are under genetic improvement programme. Duck genetic resource conservation programme covers 10 lines, with 8 of them belonging to Pekin breed.

In 2010, the performance recording and breeding value estimation was conducted in 375 flocks of fur animals managing a total population of 44 766 breeding females. The genetic resource conservation programme under *in-situ* conditions is only for the following native breeds: Popielno rabbit, Beige Polish chinchilla, common fox of Pastel and White neck varieties, Lemon polecat and six varieties of nutria representing different coat colour mutations.

CONCLUSION

The evaluation of the breed structure in the most common livestock species kept in Poland suggests that in case of the majority of species, the current structure is relevant and addresses the needs of the specific sectors (dairy and beef cattle, horses, sheep and goats, fur animals, fish and honey bees).

Further intensification of livestock production underlines the need for effective implementation of genetic resource conservation programmes, both for local breeds and commercial breeds and using as appropriate *in-situ* and *ex-situ* measures.

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