CONSERVATION OF GENE RESOURCES OF FARM ANIMALS IN THE NORDIC COUNTRIES

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1. INTRODUCTION

The Nordic Council of ministers decided in 1979 to finance a working party for coordinating the Nordic Animal- Gene Banks (NAGBs). This party has five members, one from each Nordic country and a part-time secretary. The working party has been in contact with several other researchers and institutions and is represented in the corresponding European working party. These links have provided possibilities for fruitful commication. on the initiative of the working party, the agricultural ministries reported on the national situation in their respective countries (maiiala et al., 1986). overall responsibility is considered as an official task. EacF- Kirnistry of Agriculture, in cooperation with other ministries, is responsible for animal conservation. That includes providing necessary investment funds and covering the operating expenses of gene banks.

This report summarizes the activities undertaken and progress achieved.

2. NORDIC GENE BANKS FOR ANIMAL GENETIC RESOURCES

For several reasons responsibilities and activities are- divided into national and joint Nordic-country tasks.

The national part covers the registration and maintenance of all valuable biological material stored in gene banks, in the form of live animals and/or frozen cells. Local storage is preferable as it is simpler, cheaper and safer than centralized storage. In the case of live animals, care is taken to avoid their unnecessary transport and to minimize the risk of loss, while valuable material is stored in at least two places.

In support of their activities, the governments cooperate with breeding organizations and research institutes possessing the know-how and equipment required to freeze and store semen and embryos correctly, even originating from animals which are not included in their particular area of interest. The conservation of living populations of small or less productive breeds is, for economic reasons, important and thus can be combined with the keeping of animals for other purposes. To promote economic improvement, live populations of less productive breeds can be used to a limited extent as producers, for therapeutic investigations in prison farms, as educational tools in agricultural schools, participants in the management of pasture and landscape development, to remove coppices from forests, to utilizer harsh environments or marginal areas, and as experimental animals, producers of furs, riding horses, and company and tourist attractions in national parks and zoos. These populations are also important members of living museums'.

In the past, it has been demonstrated that concerned private individuals make valuable contributions to this work when they succeed in obtaining the necessary support.

3. NORDIC DATA BANK FOR ANIMAL GENETIC RESOURCES

The central part of Nordic animal gene banks concentrates on tasks which can be carried out most efficiently by all the Nordic countries together, i.e., firstly,:through the establishment of an information centre, including a data bank. All information registered in the individual countries is submitted to the main data bank for tabulation and maintenance. Thus, the bank is able to supply users with needed information. The joint Nordic data register is also beneficial as many Nordic breeds are closely related and as such their conservation can be considered from the same genetic point of view. Some breeding organizations interchange males and semen for breeding purposes across borders. The collection of all data in one central bank simplifies the calculation of genetic relationships and populations differences among breeds. The Nordic data bank was developed in,. collaboration with the European working group for animal genetic resources (maijala and Simon, 1987@,, and this working group has helped to establish gene banks at the national level and map endangered breeds.

The future work plan will proceed according to the original plan Which is summarized as follows: 1) to operate a data bank with standardized information about breeds, single animals and cells to facilitate long-time storing; 2) to follow up the continuation of related work,in the Nordic countries; 3) to keep informed of research results, and to work toward the adaptation of modern techniques for storing genes; 4) to maintain an information centre on the inter-Nordic level and seek up-to-date data on the scientific and practical levels; and 5) to seek to establish cooperation with other agencies conducting similar operations on animal and plant production, on both national and international levels.

4. MOTIVATION FOR CONSERVATION OF GENE RESOURCES

Advanced methods and techniques of breeding have made rapid changes possible in farm animal populations and breeds suited to the modern economic uses of today's market have been developed. This potential has increased with the use of artificial insemination and electronic data processing capabilities.

The undesirable aspect resulting from the disappearance of breeds and animal varieties is reflected in the loss of genetic variation. It is difficult, at any particular time, to say which qualities may be considered useful in the future. The founding of gene banks is, therefore, an important step to ensure the conservation of these resources.

The NAGB has three different motives for practising conservation methods: 1) biological-economic; 2) scientific; and 3) cultural-historical (maijala et al., 1986).

The biological-economic motives concern preparation for unpredictable future needs. An economic goal is to breed animals which, in an effective and economical way, turn feed into products which satisfy market demands. Consequently, breeding goals must be adapted to reflect trends in the production and market situation. Biotechnical research has made better use of valuable genes possible in traditional populations, and genetic engineering developments allow the transfer of wanted traits without the inclusion of other unwanted gene material. A gene bank also assures the possibility of being able correct errors, one of the fundamental goals of breeding.

The scientific basis for protection of gene resources concerns the need for genetic variation for research purposes, the evaluation- of genetic and environmental changes in terms of development and behaviour (control populations), and the teaching of biology and animal husbandry. .

The cultural-historical motives for the protection of the gene resources of domestic animals are the same as those for the protection of other examples of cultural heritage and nature.

Earlier, this cultural protection included mainly material values, such as handicrafts, tools, buildings, and later entire cultural landscapes. Farm animal breeds constitute literally living parts of our cultural heritage. This is quite clear, considering the important role farm animals have played in the life and foundation of the Nordic countries. Variations in national and regional breeds reflect geographical and cultural ‘differences in basic lifestyle, agricultural environment and production methods. In a suitable traditional environment, farm animal breeds reflect the interaction between people, production and nature. This contributes to the making of museum and the protection of culturally important parts of modern existence.

The cultural-historical motives are those most easily understood by people, yet they may not always understand the other motives. The NAM encourages cooperation among people with different points of view.

5. METHODS FOR PRESERVATICN

There are, in principle, three methods of preserving animal gene resources: preservation in haploid form as frozen semen and embryos; preservation in diploid form as living animals and frozen embryos; and - single genes preservation.

The NAGB has concentrated mainly on preserving live animals, and frozen semen and embryos. The former is the only method available for all species, but the number of species for which semen and embryo freezing is possible has been increasing. The-practices of embryo freezing and conserving DNA in simply frozen semen may be well-founded for genetic analyses and the later isolation and transfer of genes of particular interest. (Brem et al., 1989).

Live populations are able to satisfy the requirements of cultural-historical conservation. Frozen embryos and semen are cheap to store and pose the least risk of infections and inbreeding depression. Conservation through live animals is very common, and ‘old, semen doses have been stored for some breeds of cattle,, horses, pigs, sheep and hens. The freezing of embryos has been carried out for some cattle and sheep breeds.

6. THE NEED FOR PROTECTION OF GENE RESOURCES OF NORDIC FARM ANIMALS

Horses

A good criterion for considering endangered breeds is the actual number of males and females selected and used annually for breeding purposes. The trend for Nordic horse breeds is shown in Table 1.

TABLE 1
NUMBER OF MARES SERVED BY NUMBER OF STALLIONS IN 1978 AND 1983

		1978		1983	
Country	**Breed**	**Mares**	**Stallions**	**Mares**	**Stallions**
DK	Jutland	190	18	237	42
DK	Belgian	274	23	345	40
S	Ardemes	1621	80	1077	89
DK	oldenburger	416	21	716	39
DK	Frederiksborg	300	32	251	34
S	Swedish half-blood	4751	137	4025	392
S	North Swedish	2294	127	1200	131
N	Dole	2015	108	2979	112
DK	Fjord	1592	66	1683	90
N	Fjord	739	53	945	62
S	Fjord	1263	75	800	76
N	Nordland Pony	64	19	101	25
S	Gotland Pony	1078	126	654	121
DK	Iceland Pony	500	30	820	56
F	Iceland Pony	20	2	18	2
N	Iceland Pony	60	9	100	19
S	Iceland Pony	56	12	280	18
IS	Iceland Pony total	50000		52000	

1/ The countries are indicated by their car registration symbols.

From the national reports, only the Jutland horse is directly threatened. of the Finnish, North Swedish and Dble horses, the heavier type is significantly reduced as a result of fewer draught horses being used in agriculture and forestry. The lighter type, a work and trotting horse combined, is the most popular.

For the Jutland horse it is necessary to make allowances for breeding that ensures a sufficient stock of semen. This race should also be the first choice when storing frozen embryos. For the rest of the Nordic races, and especially for the threatened varieties, the freezing and storing of semen should start as soon as possible. At least 100 doses frm each of 25 stallions should be stored if as many suitable stallions can be found.

Cattle

Since production of highly productive breeds is usually more economics the success of animal breeding causes a displacement of less productive breeds. Some breeds might continue to exist under the same name as the original but with changed genotypes. This development, therefore, has led to substantial changes in gene frequences and loss of genes. The original Danish Black Pied - SDM is an example of a landrace which now consists entirely of 6 500 semen doses from 13 SDM bulls.

The cattle breeding organizations in all five countries deep-freeze every year semen from a number of bulls for longtime storing. Sweden still has some nearly 30-year-old stored doses. Some landraces not supported by an active conservation organization are in a precarious situation, such as two of Finland’s landraces. To avoid total losses, a herd of each breed is kept in separate prison farms, where they fom a part of mental health and work programes for the prisoners.

The trend in Nordic cattle breeds is shown in Table 2.

TABLE 2
IN CATTLE BREED DEVELOPMENT IN THE NORDIC COUNTRIES

Country	Cows and heifers inseminated with semen from these breeds	1978	1983	1988
DK	Danish Black Pied - SDM	728890	715876	592970
DK	Danish Red - RDM	239410	108730	137230
DK	Danish Red Pied	54220	33765	25000
DK	Jersey	140405	164345	127020
S	Jersey	7643	10053	6950
N	Jersey	2515	3702	3357
S	Finnish Ayrshire	511634	506157	419312
SF	East Finnish	1823	220	352
SF	North Finnish	0	25	99
SF	West Finnish	45893	23671	11589
S	Swedish polled - SKB	9985	9598	5666
S	Friesian - SLB	208562	246796	219210
SF	Finnish Friesian	156415	167872	130711
N	Norwegian Red - NRF	433718	468151	422898
S	Swedish Red and White - SRB	363147	375148	315518
N	Blacksidet Tr6nder and Nordland - STN	620	611	832
N	Telemarkcattle	270	255	591
IS	Iceland cattle, total	36325	32941	32023
IS	Galloway, total	100	100	350

Norwegian Red cattle - NRF - is a population based m extensive crossing of landraces, initially with SRB, and some Finnish Ayrshire. During recent years considerable elements from both Swedish and some overseas Friesian have also been introduced.

Apart from differences in colour, the population is still quite homogeneous. There is a NRF control population on a 1970 level in connection with a research programe being conducted at seven agricultural colleges and one officially run farm.

One hundred doses of semen from every progeny-tested bull have been stored since 1983. The costs have been borne by the continuous breeding work. Some old Norwegian landraces exist as frozen semen only, while small populations of some others remain.

The cattle population of Iceland can be considered as a natural gene bank, with a history dating back to the beginnings of Icelandic agriculture. TO protect valuable genes, which can be lost through modern selection procedures, semen from all bulls used in artificial insemination programes is stored.

Goats

Dermark has about 9 500 goats of German and Swiss breeds. Finland has about 2 500 - 3 000 landrace goats.

Iceland has a goat population of about 250. This population is probably of Norwegian heritage from old times. Financial incentives are paid to all farmers who keep goats, to maintain populations, but the breed is still endangered, and further steps are planned. Research done in 1985 shows that the Icelandic goat has more bottomwool (,Kashrftirwooll) than other goat breeds in Western Europe.

Norway has about 100 000 landrace goats. The breeds were divided into local breeds, named after the district in which they were found. There are, however, no sharp distinctions in racial traits. Semen from some he-goats is being frozen each year.

Sweden has a population of about 8 000 goats. They are not distinctly different from the Norwegian landrace, and can be included in the same population. Some breeding animals are also imported from Norway.

Sheep

The Nordic landraces belong to the North European group of short-tailed sheep. In addition, there are some breeds of British and Dutch origin.

In Derunark the following five breeds are considered worthy of protection: oxford Down, Leicester, Texel, Shropshire and whiteheaded marsk. The two breeds mentioned initially have been in Dermark for 100 years. None of the breeds are now endangered, but the stock sizes of some breeds should be kept under surveillance so action can be taken if the number decreas" considerably.

In Finland the sheep population has decreased to 10 percent of the number in 1950. There are still 55 000 landrace ewes left, known especially for their high fecundity, and for that trait, exported to many countries. There is a breeding centre with 150 animals on a prison farm. The stock will be increased to about 500 animals. moreover, the State Agricultural Centre has a stock of 150 females.

The Iceland landrace (about 712 000) is, according to investigations, more closely related to the Norwegian landrace than to the sheep on Shetland and the Orkneys. The colour, which varies considerably, has lately become of great practical importance, especially grey, for the production of furs, and the chocolate brown colour (moorit) for wool production to supply the specialized knitwear industry. The breed is rather fertile. Recently, a particular single gene has been found in the breed, the Thoka gene. Females which carry this give birth to an average of 0.7 lambs more per lambing than those without this gene. ‘Variations in colour and fertility are not threatened. In the breed there are some individuals with a special gene for leadership. This peculiarity has been known and highly valued from old times. In recent decades the number of ‘Leadersheep, has decreased significantly. Pure breeding of sheep with leader ability is provided for by law, but the grants have so far been inadequate. This quality is still valuable and the provision of the law should be followed up.

Norway has four national breeds: the pure landrace Spel; Dala; and Rygja, both crossbred from Spel, Leicester, Cheviot, and possibly oxford Down; and 4) Steigar which is Spel crossed with Cheviot. The last three are heavier breeds, while the mothering abilities and flock instincts are best developed in the Spel. None of the breeds are threatened.

Norway also has some small groups of wild sheep. They are of the same kind as the Spel sheep, but are smaller and more varied. Further investigations of their qualities are needed.

Sweden, according to official records, has divided its sheep breeds into four groups:

1. Fur sheep comprising Gute sheep and Fur sheep breeds
2. White Landrace with breeds Rya, Landrace Finewool and Spel sheep the
3. Heavier breeds for meat production that include 10 breeds; Texel, Leicester, and oxford Down are the most important
4. Crossbreeds.

The Gute sheep is a wild sheep from Gotland. This breed is very old. During the 18th century some Merino, Cheviot and Leicester sheep were imported to Gotland, and the breed has probably got some of these genes. The breed still has some primitive qualities like horns, mane hair on the males, and strictly seasonal reproduction. It is very frugal, and is kept mainly on poor pasture areas for grazing, but demonstrates a low level of reproduction.

The Fur sheep descends from the Gute sheep, with some qualities of the Leicester and Rya sheep breeds. This is a popular breed, which is also exported, among others, to Norway. Its fur is sold under the name ‘Viking Lamb,.

The Rya sheep is a breed with an especially glossy wool. It nearly became extinct around the turn of the century. During the 1960s and 1970s it was crossed with meat breeds to improve its slaughterweight. The breed is no longer endangered. moreover, none of the Swedish breeds are threatened species.

Official aid to support the conservation of endangered breeds can be provided by designating reserved areas as pastures for sheep.

Pigs

Landrace and Yorkshire are the dominant breeds in the Nordic countries. They are indigenous populations sharing common origins. Swedish landswine are mainly based on imports from Deranark effected in the periods 1914-15 and 1935-39. Norwegian landswine have developed from imports from Sweden following 1945. Later, there were exchanges of -breeding material between Sweden and ‘Norway. The Yorkshire breed is found to a larger extent in Finland, where both breeds are almost equal in size. Finland has exported breeding animals both to Norway and Sweden. In Dermark, where the Yorkshire pig has been poorly represented in comparison to the landswine, the breed is being re-established. These breeds resemble similar breeds outside the Nordic countries, and are therefore not endangered.

Danish Blacks’potted pigs are bred from traditional Danish Landrace. The breed merits protection, especially because of its immunogenetical potential. With about 30 boars and about 340 saws spread over 20 breeding centres, the breed is thus protected.

Denmark and Sweden have some Hampshire and Duroc pigs for crossbreeding purposes. Norway procures the semen of these breeds from Sweden for similar purposes.

The pigstock on Iceland dates from the beginning of the 20th century, and is not defined as a national breed.

Even though none of the pig breeds in the Nordic countries are threatened, a limited effort to protect them is needed. Rapid changes may occur, which could lead to total crossbreeding, especially if crossing with imported breeds is found.to be more successful economically.

Poultry

Nordic landraces are small and some are endangered species. These breeds represent a wide spectrum of genes. The short generation interval of poultry makes it possible to make rapid use of gene resources from both the productive and scientific points of view. The breed is protected mainly through living populations.

Hens

White Leghorn is the dominate breed in all Nordic countries, followed by the Rhode Island Red and New Hampshire hens. The breeds are imported from the USA, but further developed and specialized in Nordic country lines.

Denmark, Finland, Norway and Sweden have established a joint Nordic control line, the ‘Ultuna population”, based on international white Leghorn hybrids.

The production of chicken for slaughter is based mainly on imported breeds but further developed in the different Nordic countries.

Denmark has two traditional national breeds: the Danish Land hen and Lute hen. The populations are small, 1 000 and 100, respectively.

The Finnish landrace hen w ‘ as saved in the 1970s by private individuals and is kept in zoos, on some farms, and by the Oulu University, which uses the breed for research purposes.

Iceland has a traditional flock of coloured hens, which was threatened considerably, but the

Agricultural Research Institute took action to save it in 1974 and its eggs were gathered from varied locations around the country. Economic problems have made follow-up action difficult, but new steps have been taken to solve them.

Norway has had a gene bank for poultry since 1973. Breeding material, about 16 000 hens, is divided into about 30 lines. The Jaer hen, a traditional Norwegian small landrace, is included in the gene bank, both as a pure breed and in a few crossbreeds. The Jaer breed is influenced somewhat by inbreeding, but shows good ability in crossing, especially in improvement to the shell quality. The Jaer hen has the sex-tied genetic factor for cross-striped feathers, making it autosexing.

The Swedish University of Agricultural Sciences has for some years tried to breed a ‘Swedish hen, ‘with the ability to make satisfactory use of Swedish-produced feeds, which contain less protein than ordinary hen feed. Research has so far proved very promising. At the same time, the most important stocks are conserved in a gene bank. Sweden also has some animals of a traditional dwarf breed which form a handsome hobby breed.

Ducks

Steps have been taken to save a traditonal Danish duck and two Swedish landraces. These include the Black and White-chested Danish duck, the Swedish Blue duck, which originally came from Poland, and the Swedish Yellow duck, which is supposed to have risen spontaneously from the Blue duck. Both are good layers, especially the Yellow duck, but this breed is less fleshy than the Blue duck.

Geese

The breeds selected for gene bank conservation in the Nordic couontries are listed below. -

Dermark: Greyspotted Danish goose and Grey Danish goose;
Iceland: Grey-spotted Tame goose;
Norway: Smaalens goose and White Norwegian goose;
Sweden: Skaane goose and Oland goose.

The breeds represent great variations in size, growth rate, and laying ability. These variations provide good potential for improved crossing results.

Rabbits

The following breeds are considered worthy of conservation: the White Land and French Wddder,in Demark; White Land and Trbnder in Norway; and the Kohare rabbit in Sweden.

Four of the breeds are landraces. The French WIdder has been a popular rabbit breed in Dermark for many generations. The Trbnder rabbit has decreased significantly and is now endangered. The Kohare changes colour somewhat, owing to seasonal change. There are few left, but some breeding is done by the Swedish Small Animal Corporation.

Fur Animals

The breeding of fur animals has traditions going back to the turn of the century. Norway obtained Blue fox and Polar fox from Iceland in 1903, and later from Alaska and Greenland. Red fox and Silver fox arrived from the USA, in the late 1920s, and the Polecat some years later. Dermark and Finland have, during recent years, obtained Raccoon Dogs from the USSR. Demark also produces Chinchilla on a limited scale. The extent of the mutation and combination types for the different species varied considerably, owing mainly to variations in market conditions.

The genetic constitution of fur colour has been worked out, and given symbols. The same phenotype can be produced through different combinations of genotypes. No genes, which at this time are considered favourable, are endangered. The situation is different for small populations manifesting uneconomic or negative mutations, however, they may still be of genetic interest.

Conservation of gene resources which exist, or will evolve in the coming years, will make it quicker and easier to meet future demands for new colour combinations. White Polar fox is an example: the race was coumn earlier, but later went out of production. Now it is of interest again, for crossbreeding with the Silver fox, to produce the popular Golden Iceland and Northern Light species. Finland may start conservation programes for fur animals on a research farm.

Bees

The Brown bee is indigenous to all of the Nordic countries, except Iceland. It is still the largest breed in Norway, while the Yellow Italian bee is now the most'comon in Sweden and Dermark. other breeds, like Krainer and Buckfast, are also found, but to a lesser extent. moreover, there is a large group of uncontrolled crossbreeds.

In Norway, a breeding plan for bees was drawn up in 1976 to ensure the conservation of their gene.resources.

In Northern Sweden, conservation of the Brown bee is currently considered to be of most interest. This is thought to be the purest'of the breeds, and has the most resistance to cold. The Swedish Organization of Beebreeders (SBR) has a mating station in Umeaa. In imtland, beekeepers have agreed, on a voluntary basis, to keep Brown bees exclusively in the area around 6stersund.

Reindeer

Reindeer are spread all over the Northern Hemisphere in forest and tundra areas. There are variations in size and colour, and in the skull and horn shapes. The reindeer can be divided into wild reindeer and (tundra reindeer) and tame reindeer (forest reindeer), but there is no clear distinction between the two. In the Nordic countries, only Norway has wild reindeer. The approximate distribution of reindeer is: Dermark (Greenland) 18 000, Finland 364 000, Iceland 2 000, Norway 200 000, and Sweden 260 000. Reindeer genetics are influenced by different management techniques as well as natural selection. Research has shown that wild reindeer have better ability,to dig up lichen from under the snow than tame reindeer.

Reindeer are kept separately in groups, but there is a high degree of mixing between groups during mating seasons. The size of the groups varies from a few hundred to 15 000-20 000. From a breeding point of view, the transfer of animals from one group to another, and the mixing of close groups allow the group sizes to increase considerably.

Thus, there is no danger of inbreeding. Gene pools of characteristic groups of both wild and domesticated reindeer should include both sexes, as the problem of freezing semen and embryos has not yet been satisfactorily solved.

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RESEARCH ON GENETIC MARKERS IN THE SURQO ZEBU OF SOMALIA

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SUMMARY

The zebu population of Somalia includes four main types (Boran, Dawara,, Gasara and Surqo), which cannot be considered as breeds in the same sense as cattle in Europe. Boran, Dawara and Gasara are included in the type known as East African Shorthorned zebu, while the Surqo is regarded as an ancient stable mixture of zebu and Sanga (see Figure 1).

The task of identifying the genetic relationships existing among these types, within a rather heterogeneous population, could best be approached through the study of marker loci like thoseicontrolling the immmogenetic and biochemical polymorphic systems, rather than through the comparison of morphological traits.

Research was continued along these lines to facilitate the genetic characterization of Boran and Dawara types (Di Stasio et al., 1978.and 1980), and the study was extended to include the Surqo type ird-a comparison of the results.

1. MATERIALS AND METHODS

Blood samples were obtained from 124 Surqo adult animals at the Mogadishu slaughterhouse.

The erythrocytes were typed for blood groups using the following reagents: A, ZI, B-)#, Gl, K, I 0 P, Q, Tl, YI, Al, BI, II, Jt, 01, PI, 01 I cil 3' E1, M, *S, S,)*-, U, Ull, U” and Z. These reagent ‘I@ ‘ ‘ 1! so2-!@izati Pr ed by 1 1 on from Europeafl cat@le f5reeds at the osservatorio di Genetica Animale, Turin, were tested in the 1979 and 1982 comparison tests arranged b y the International Society for Animal Blood-Groups Research (ISABR).

Plasma and haemolysate samples were subjected to horizontal starch gel electrophoresis according to the techniques suggested by Braend and Stormont (1963) for haemoglobins (Hb), by Sartore@(1970) for carbonic anhydrases (CA), by Kristjansson (1963) for transferring (Tf), by Ashton and Lampkin (1965) for albumins (Al) and by Rondolini et al. (1973) for amylases (AmI). For the nucleoside phosphorylases (NP) th4-fe-chnique suggested by Harris and Hopkinson (1978) has been used with minor changes in the staining technique (0.05 phosphate buffer pH 7.2 ml 10, inosine mg 10, xantine oxidase 0.2 U, MTT mg 10 and PMS mg 1 in ml 10 of 2 percent agar ai 52 0 C).

To detect haemoglobin and carbonic anhydrase types, polyacrylamide horizontal electrophoresis in 0.032 M Tris-0.1 m glycine buffer, pH 8.4, has also been used.

2. RESULTS AND DISCUSSION

In Table 1 the phenotypic frequencies found in the Surqo population for the blood antigen factors,of,, the A, B, C, F, J, L, M, S and Z systems are reported and compared with the f . requencies found in Boran and Dawara populations (Di Stasio et al., 1980). From the results, it appears that the frequencies are similar among @e three populations except for S,, which resulted rarely in Surqo, and for K, P, S 1 and Ul,, which are much more frequent in Surqo than in Boran and Dawara.

Considering the F system, with the F, and V, reagents in this investigation, the presence of the

F (T- allele rtported @ osterhoff (1967) in South African cattle could not be ascertained.

In Tables 2 and 3 the phenotype and allele frequencies for Hb, CAF *IV,*, ;at AmI and Ti systems are given for Surqo, together with the allele frequencies for Boran and Dawara. All systems, except Hb and Tf, harmonized according to the Hard@Weinberg law.

From these results, it appears that data from Surqo are rather similar to those obtained from Boran and Dawara, although some aspects seem worthy of note with respect to Hb, CA and NP systems.

With regard to the Hb system, in addition to the well-known A and B variants, a third variant with intermediate electrophoretic mobility (see Figure 2) has been found. In the absence of a reference sample, this variant could not be identified with certainty, either with Hb C or Hb I. However, on the basis of electrophoretic mobility and the data reported in the literature (8chwellnus and Guerin, 1977) it would appear to be most likqly Hb I, considering also that according,to Schwellnus and Guerin (1977) the Hb' allele is of African origin, while @ originated in Asia. Because the presence of rare alleles is of significant importance in the study of genetic relationship among populations, it would be helpful to establish whether this variant corresponds to the one found in Boran and Dawara. In this respect, it must be noted that electrophoretically identical variants may be controlled by different alleles; hence, conclusions based on the presence of rare variants must be confirmed by thorough biochemical studies.

This also applies to the CA system, where two variants have been found, one corresponding to type S of the European cattle reference sample, while the second has much slower electrophoretic mobility (see Figure 3). In the qenus Bos three variants with slower electrophoretic mobility than S have been reported so far, that is, S (Sartore, 1970), z (Penedo et al., 1982) and stchanker et al., lg@l@ntof these, the z variant could correspond to trgh;alf"' ound in @urqo-. Furthermore, it must be noted that this variant can be detected only when alcohol-chloroform extracts of haemolysates are used in the electrophoretic analysis, therefore this method must be used always when dealing with samples from Bos indicus.

With regard to the NP system, to our knowledge the present data are the first reported in zebu cattle. It is felt that future studies would require further investigation of other populations both from Africa and Asia, in order to establish whether the frequency of the @'rallele, much higher in Surqo than in European cattle (Ansay and Hanset, 1972), could be used as a marker to distinguish Bos taurus from BOS indicus.

3. CONCLUSIONS

From the results reported here, it would appear that, from a genetic point of view, the Surqo population is very similar to Boran and Dawara populations. In this respect, it must be noted that the investigation dealt with nomadic populations, among which crossing occurs frequently, and for which no kind of registration and/or pedigree documentation exists.

Nevertheless, a thorough investigation of the-rare variants identified should be conducted, in-view of their possible contribution to the study of the phylogenesis of the genus Bos, by generating data concerning the ancient origins of the different popu ations.

Table 1

Phenotypic frequencies of blood antigen factors in the Surqo population compared with those found in the Boran and Dawara populations.

System	Blood factor	Frequency			System	Blood factor	Frequency		
		Surqo	Boran	Dawara			Surqo	Boran	Dawara
A	A	0.72	0.66	0.50	C	C_2	0.81	0.56	0.68
	Z'	0.20	0.16	0.15		E	0.98	0.82	0.82
B	B_2	0.59	0.65	0.62		R_1	0.05	0.01	0.00
	G_1	0.69	0.59	0.41		W	0.67	0.78	0.56
	K	0.28	0.03	0.00		X_1	0.82	0.51	0.76
	I_1	0.23	0.10	0.09		X_2	0.14	0.27	0.12
	I_2	0.06	0.09	0.09	F	F_1	1.00	0.95	0.94
	O_1	0.49	0.42	0.38		V_2	0.41	0.29	0.18
	O_3	0.14	0.06	0.21	J	J	0.63	0.60	0.56
	P	0.51	0.03	0.00	L	L	0.85	0.71	0.79
	Q	0.40	0.35	0.44	M	M	0.00	0.01	0.00
	T_1	0.24	0.24	0.23	S	S	0.59	0.41	0.32
	Y_2	0.63	0.54	0.76		S_1	0.92	0.47	0.47
	A'	0.39	0.14	0.26		S_2	0.08	0.53	0.50
	B'	0.37	0.13	0.47		U_1	0.60	0.22	0.32
	I'	0.43	0.39	0.35		U_1'	0.11	0.25	0.18
	J'	0.17	0.12	0.21		U"	0.46	0.53	0.41
	O'	0.52	0.64	0.35	Z	Z	0.98	0.94	0.91
	P'	0.15	0.34	0.35					
	Q'	0.75	0.68	0.50					

Table 2

Distribution of phenotypes of Hb, CA, NP, Al and AmI systems in the Surqo population and respective estimated allele frequencies compared with those found in the Boran and Dawara populations.

System		Phenotypes							Allele frequency				
Hb		AA	A(I)	AB	(II)	B(I)	BB			Hb^A	Hb^B	$Hb^{(I)}$	
	obs.	36	11	61	2	3	11		Surqo	0.58	0.35	0.07	
	exp.	41.71	10.07	50.34	0.61	6.08	15.19	9.01**	Boran	0.54	0.42	0.04	
									Dawara	0.63	0.36	0.01	
CA		SS	SZ	ZZ						CA^S	$CA^{(Z)}$		
	obs.	77	24	2					Surqo	0.86	0.14		
	exp.	76.18	24.80	2.02				0.03	Boran	1.00	0.00		
									Dawara	1.00	0.00		
NP		H	L							NP^H	NP^L		
		105	13						Surqo	0.67	0.33		
Al		AA	AB	AC	BB	BC	CC			Al^G	Al^A	Al^B	Al^C
	obs.	5	31	1	74	2	0		Surqo	0.00	0.19	0.80	0.01
	exp.	4.08	34.35	0.43	72.32	1.81	0.01	1.37	Boran	<0.01	0.30	0.69	0.01
									Dawara	0.02	0.28	0.69	0.01
AmI		BB	BC	CC						AmI^B	AmI^C		
	obs.	94	21	1					Surqo	0.90	0.10		
	exp.	93.96	20.88	1.16				0.19	Boran	0.92	0.08		
									Dawara	0.92	0.08		

Table 3

Distribution of transferrin phenotypes in the Surqo population and respective estimated allele frequencies compared with those found in the Boran and Dawara populations.

Phenotypes	Phenotype distribution (*) obs.	exp.
AA	6	6.40
AB	1	3.90
AD_2	8	9.46
AF	17	16.14
AE	17	13.36
BB	3	0.59
BD_2	1	2.88
BF	5	4.91
BE	4	4.07
D_2D_2	3	3.50
D_2F	12	11.93
D_2E	14	9.87
FF	13	10.18
FE	11	16.84
EE	6	6.97

Allele frequency	Surqo	Boran	Dawara
Tf^G	0.00	0.01	0.00
Tf^A	0.23	0.20	0.33
Tf^B	0.07	0.05	0.05
Tf^{D_2}	0.17	0.15	0.17
Tf^F	0.24	0.41	0.33
Tf^E	0.29	0.18	0.12

(*) = 19.27***

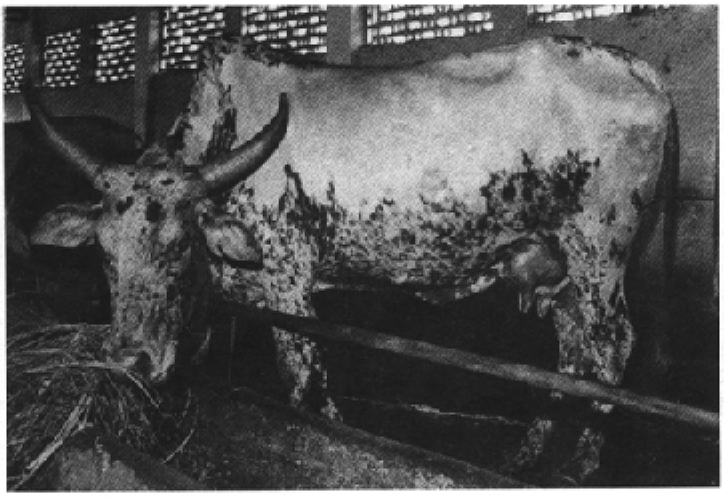

Figure 1. A typical Surqo cow.

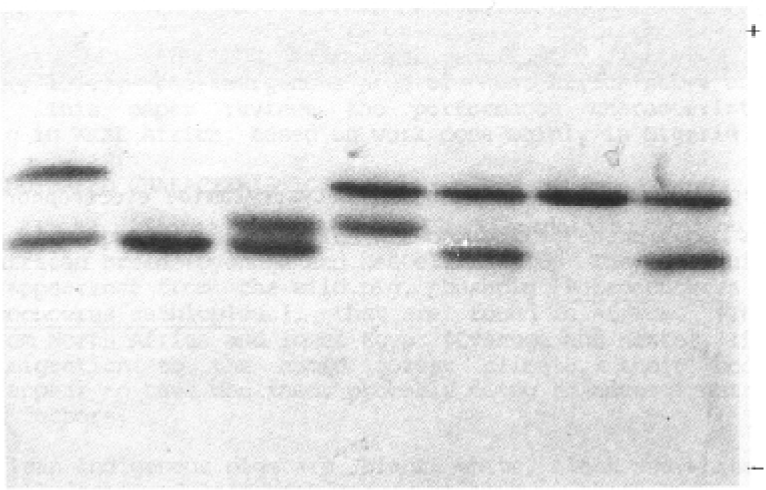

Figure 2. Haemoglobin phenotypes (starch gel electrophoresis); from left to right: AB, AA, A(I), (I)B, AB, BB, AB.

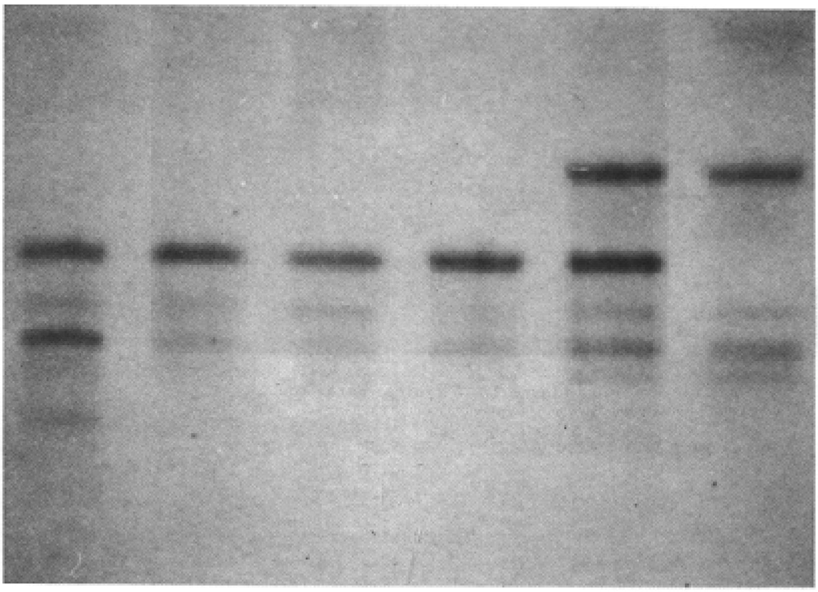

Figure 5. Carbonic anhydrase phenotypes (polyacrylamide electrophoresis); from left to right: ZZ, SZ, SS, SS (ref. sample), SS, FS (ref. sample).

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INDIGENOUS PIG OF NIGERIA

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SUMMARY

Indigenous pigs of West Africa form the majority of the pig population in Nigeria. They are very precocious but have low prolificacy, a low growth rate and poor carcass characteristics. However, the ability to thrive on low-quality diets in stressful environments is quite remarkable. In recent years, there has been a steady decline in the indigenous pig population. Therefore, conservation of the germplasm of this valuable genetic resource is highly desirable.

1. INTRODUCTION

Tropical Africa has an estimated population of 7.3 million head of pigs (FAO, 1981). of these, more than 50 percent are in the coastal regions of West Africa, extending from Senegal to Cameroun. The greatest proportion of the pig population in the region is made up of slow-growing indigenous pigs (Fetuga, 1983). Presently, Nigeria has the largest pig population in West,Africa (Temple and Reh, 1984), estimated at one million animals, of which approximately 60 percent are of the indigenous type (ogunfawora et al., 1980). Although the production potential of the indigenous pig is l@, @t is well adapted to the harsh unfavourable environmental conditions of the tsetse fly”infested humid and sub-humid areas and provides a valuable source of meat and income to small-scale farmers in the region. Therefore, in situations where small-scale farmers cannot provide the nutrition and mmgement required by exotic improved breeds (Fetuqa et al., 1976), the indigenous pigs of West Africa serve as a valuable alternafl’vi.- This paper reviews the performance characteristics of the indigenous pig in West Africa, based on work done mainly in Nigeria.

2. ORIGIN AND BREED CHAPACTERISTICS

The indigenous pigs of West Africa are of Mediterranean type and are known as the West African breed (Oyenuga and Nestel, 1984). They are quite different in size and appearance from the wild pig, bushpig (Potamochoerus porcus) and

warthog (Phacochoerus aethiovieus), that are found in Africa. Probably originated from Nor@ A rica and lower Egypt (Oyenuga and Nestel, 1984). In the process of migration to the humid forest climate, their body size and productivity appear to have declined, probably owing to adverse nutritional and environmental factors.

West African indigenous pigs are black, white, black and white or pied in colour with well developed hair coat and erect ears. Their body is small, long and shallow with a level back. A characteristic feature is their long, straight, pointed snout and strong jaws and feet which facilitate searching for feed below ground level. Saws have 5-6 pairs of teats.

Under traditional management systems, adult animals weigh 70-100 kg and measure about 59-63 am at the withers, but there can be considerable variation in this range depending on the management.

In comparison with exotic breeds, indigenous pigs may possess greater heat tolerance and disease resistance (Igboeli and Orgi, 1980) and some kind of trypanotolerance also. However, there is no experimental evidence to support such claims. The authors, observations on these pigs in the sub-humid zone showed that they can tolerate more internal and external parasites than exotic breeds.

3. POPULATION, DISTRIBUTION AND PRODUCTION SYSTEMS

Presently, Nigeria has an estimated population of 0.6 million head. of indigenous pigs (ogunfawora et al., 1980). During the last decade, there has been a steady decline i@t@eir numbers while the exotic and crossbred populations have steadily increased (see Table 1). For example, in some major pig-producing areas of the sub-humid zone, indigenous pigs are virtually non-existent in their pure form, owing to indiscriminate breeding with exotic breeds (Pathiraja et al., 1986).

As in the case of other West African countries, most of the indigenous pigs in Nigeria are also concentrated in the southern humid forest areas (Oyenuga and Nestel, 1984). However, pig production based on indigenous genotypes features quite prominently in some areas in the sub-humid zone as well (Pathiraja et al., 1986). Small numbers of indigenous pigs are also found in the sem@l@arid northern parts, in isolated pockets. To a large extent, distribution of the pig population is governed by socio-religious factors.

Indigenous pigs are kept mainly under extensive production systems, described as small-scale subsistence production (Dafwang et al., 1986). In this system, animals receive only household scraps but are alto-we@ to roam and find food by scavenging. However, in urban and intensively cultivated areas, indigenous pigs are also kept under semi-intensive systems, confined in low-cost houses and fed agricultural by-products and a variety of plant materials.

4. REPRODUCTIVE CHARACTERISTICS

The breed is very precocious. Females mature at 5 tci,5-and-a-half months at a live weight of about 10.6 kg, and the first farrowing occurs at 8-10 months of age (Chiboka, 1981). Its average ovulation rate is 10.6 (Akpokodje et al., 1985), while the mean litter size is 7.4 (with a range of 2 - 14, @e@, 1986; and Fetuga et al., 1976). The litter size increases steadily from the first to the four@ -parity and then declines (Adebambo, 1982). Excessively early precocity, as when farrowing occurs at 8 months, results not only in small litters but also in high perinatal mortality (osuagwuh and Akpokodje, 1981). The latter is associated with a high incidence of dystocia and low birth weight. Although they mature early, gilts are not sufficiently mature physically to farrow at 8 months.

Sows come into heat within 3-9 days of weaning (Somade and makinde, 1984; and Adebambo, 1986). However, the first heat after weaning is short, particularly the standing heat (Somade and makinde, 1984). Under improved management, it is possible to get 2.3 farrowings a year and as the preweaning mortality rate is 15.8 percent, about 14 weanlings per saw can be obtained annually. Some parameters of reproductive traits are shown in Table 2.

Sows have good mothering ability and produce richer milk than exotic breeds but have lower total milk yield during a 56-day lactation period (see Table 3). Despite this, indigenous pigs consume more milk per kg of litter gain than the exotic breeds (Adebambo and Dettmers, 1982). During lactation, indigenous saws often lose up to 35 percent of their body weight.

Males can be used for mating as early as 6-9 months of age and their semen characteristics appear to be normal at this age (Ekpe, 1981).

A. GROWTH AND CARCASS CHARACTERISTICS

Piglets of the West African breed are smaller at birth than exotic breeds and the females are lighter than males (Makinde and olowookorun, 1985 and 1986). The mean birth weight is 1.05 kg while the mean weaning weight is 5.87 kg (Adebambo, 1986). Daily gain, feed intake and feed efficiency of indigenous pigs are lower than those of exotic breeds (see Table 4). The maximum growth rate occurs in the phase between 45-56 kg live weight. The growth rate of the indigenous pig increases from weaning up to 56 kg live weight and beyond this weight average daily weight gain and feed efficiency decrease. observations on sex effects on the growth performance of indigenous pigs reared to different terminal weights show that the barrows grow at a faster rate, consume more feed, but utilize feed less efficiently than boars and gilts (Fetuga.et al., 1976).

Tissue growth rates a-re poorer in the indigenous pigs than in the exotic breeds (see Table 4). Lean tissue deposition declines rapidly after 34 kg live weight. The rate and efficiency of tissue growth as well as efficiency of feed utilization indicate that these animals should not be reared beyond a live weight of 45-56 kg (Fetuga et al., 1976).

Indigenous pigs have relatively poor conformation and carcass quality compared to improved exotic breeds (Fetuga et al., 1976). They have a lower proportion of lean cuts and a greater pr@por@ion of fat cuts than European breeds (see Table 5). At all slaughter weights, the indigenous pigs are shorter but have thicker back-fat, higher dressing percentage and smaller loin-eye muscle area compared to European breeds (Fetuga et al., 1976). Sex differences in carcass quality are similar to those observe@ 1'n other breeds. Boars are leaner and have superior carcass conformation than gilts which are leaner than barrows (Fetuga et al., 1976).

B. CROSSBREEDING

F crosses of the indigenous pig with the Large White and Hampshire have been e@aluated under intensive management. Data on reproductive, growth and carcass traits (see Tables 5 and 6) show that the crosses exhibit some degree of heterosis for these traits.

5. PERFORMANCE UNDER TRADITIONAL MANAGEMENT

Under traditional management systems, the production potential of the indigenous pig appears to be much lower than its genetic potential (see Table 7). Although the reasons for its low productivity under such management systems are manifold, inbreeding owing to the small population size of individual herds appears to be a significant contributory factor.

6. CONCLUSIONS

West African indigenous pigs have low production potential, but their ability to thrive on low-Wality diets under small-scale farmer extensive production systems in the humid forest zone is quite remarkable. With increasing demand for grains by the growing human population, pig production in the region will have to rely increasingly on agricultural by-products which are low in quality and bulky in nature. Therefore, there is every justification toconserve the valuable germplasm of the West African indigenous pig, not only for use in its pure form but also to introduce its adaptational qualities to exotic, high-producing but susceptible populations. An effective way of doing this is to improve its genetic potential for production while conserving its valuable adaptation characteristics.

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Table 4

GROWTH RATE AND EFFICIENCY OF TISSUE DEPOSITION IN INDIGENOUS (I) AND EXOTIC (E) PIGS FROM WEANING TO DIFFERENT TERMINAL WEIGHTS

	Terminal Weight (kg)											
	34.1		45.5		56.8		68.2		79.6		91.0	
	I	E	I	E	I	E	I	E	I	E	I	E
Mean daily live weight gain (kg)	0.29	0.48	0.30	0.55	0.32	0.61	0.34	0.66	0.31	0.74	0.30	0.78
Feed efficiency (kg feed/kg gain)	3.06	2.11	3.38	2.26	3.60	2.49	3.85	2.74	4.21	3.36	4.68	3.52
Lean deposition (g/day)	160.5	284.6	174.2	342.0	180.7	381.0	183.0	413.0	164.4	470.8	155.5	491.8
Fat deposition (g/day)	66.8	85.8	103.1	123.0	122.3	155.0	145.7	196.5	146.4	241.3	150.5	269.7
Bone deposition (g/day)	27.8	47.4	30.9	53.6	27.9	57.9	28.4	60.2	26.3	61.7	26.1	61.0
Ratio of lean to fat deposition	2.4	3.3	1.96	2.78	1.48	2.46	1.26	2.10	1.12	1.95	1.03	1.82

Adapted from Fetuga *et al.*, 1976

TABLE 1

ESTIMATED POPULATION OF LOCAL AND EXOTIC BREEDS OF PIGS IN NIGERIA, 1975-1985 (1000)

Year	Local	Exotic	Total
1975	771.3	95.3	866.6
1976	761.7	103.9	865.6
1977	752.4	112.4	864.8
1978	743.1	121.0	864.1
1979	734.0	129.6	863.6
1980	718.5	146.7	865.2
1981	718.2	179.8	898.0
1982	709.6	224.0	933.6
1983	679.7	291.3	971.0
1984	656.4	353.4	1009.8
1985	609.1	441.1	1050.2

Source: Ogunfowora etal., 1980.

TABLE 2

SOME REPRODUCTIVE TRAITS OF INDIGENOUS SOWS UNDER INTENSIVE MANAGEMENT

Mean litter size at birth	7.15
Mean litter size at weaning	6.30
Gestation length (days)	113.10
Litters/saw/year	2.36
Pigs/saw/year	14.50
Interval in days	
Weaning to oestrus	9.86
Farrowing to mating	51.79
Between farrowings	164.80

Adapted from: Adebambo, 1986.

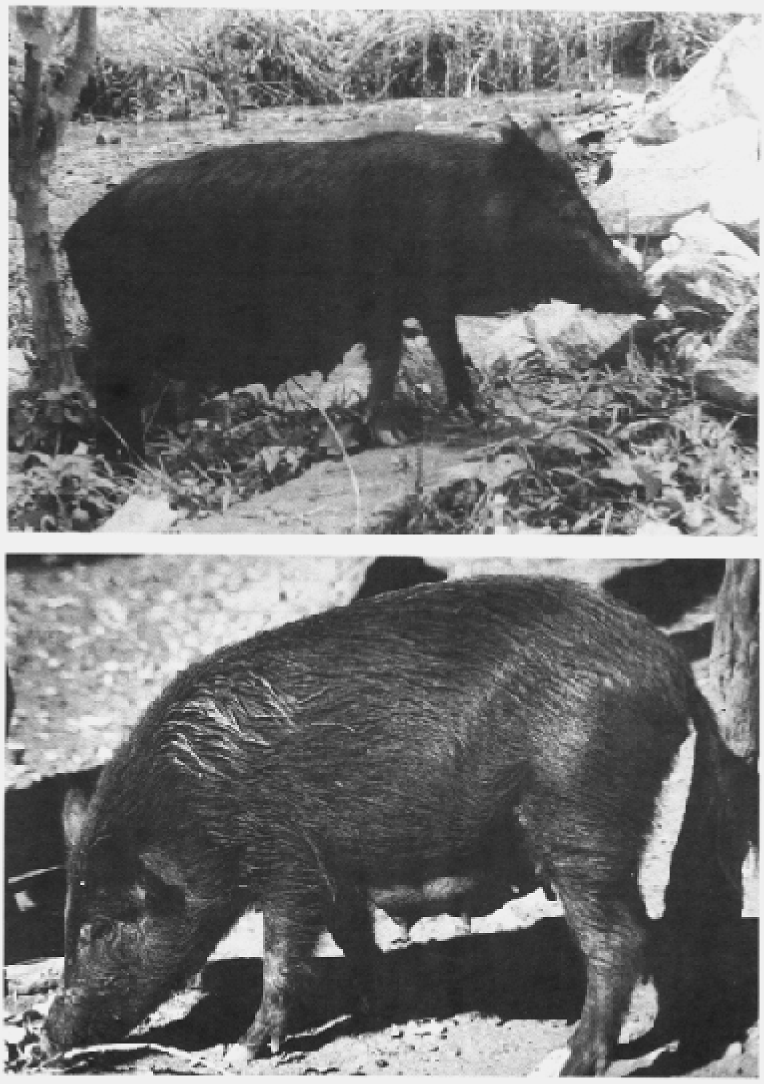
TABLE 3

AVERAGE MILK YIELD AND COMPOSITION OF INDIGENOUS AND EXOTIC SOWS UNDER INTENSIVE MANAGEMENT

		BREED	
	IND 1/	LW 2/	LR 3/
milk production/sow (kg) (lactation of 8 weeks)	54.3	112.2	95.7
Milk composition (%)			
Total solids	22.4	19.4	19.7
Protein	6.9	6.3	6.4
Fat	9.3	6.9	6.9
Lactose	5.4	5.4	5.7
Ash	0.83	0.71	0.73
Calcium	0.47	0.28	0.27
Phosphorus	0.19	0.14	0.14

1/ IND - Indigenous.
2/ LW = Large White.
3/ LR = Landrace.

Source: Adebambo and Dettmers,.1982.



West African indigenous sows.

TABLE 5

PERFORMANCE OF INDIGENOUS AND EXOTIC PIGS AND THEIR F 1 CROSSES LINDER INTENSIVE MANAGEMENT

Trait	Pure Breeds			Crosses	
	LW 1/	HA 2/	IND 3/	LWXIND	HAXIND
Litter size at birth	8.75	8.25	7.15	8.36	7.89
Birth weight (kg)	1.58	1.95	1.05	1.40	1.35
Weaning weight (kg)	9.95	12.45	5.87	8.82	10.80
154-day-weight (kg)	57.85	62.51	30.53	55.44	56.45
Mortality up to slaughter (%)	38.15	17.82	6.49	12.32	11.22

1/LW=Large White.
2/HA=Hampshire.
3/IND=Indigenous.
Source: Adebambo (1986).

TABLE 6

CARCASS CHARACTERISTICS OF INDIGENOUS AND EXOTIC PIGS AND THEIR F CROSSES

Trait	Pure Breeds			Crosses	
	LW 1/	HA 2/	IND 3/	LWXIND	AXIND
Age at slaughter (days)	149.2	146.8	174.0	156.0	154.6
Weight at slaughter (kg)	51.6	52.6	49.8	52.3	51.2
Carcass yield (%)	65.4	66.8	65.7	60.4	64.7
Carcass length (cm)	65.0	68.1	60.5	64.1	66.6
Back-fat thickness (mm)	19.6	16.1	22.0	20.4	18.2
Carcass lean (%)	54.7	58.7	52.7	52.5	55.4
Carcass fat	26.5	29.3	28.5	27.9	31.2
Ham	29.0	30.8	26.8	28.2	31.8
Shoulder	20.9	16.8	21.10	21.4	16.5

1/LW=Large White.
2/HA=Hampshire.
3/IND=indigenous.
Source: Adebambo (1986).

TABLE 7

PRODUCTION CHARACTERISTICS OF INDIGENOUS PIGS UNDER SMALL-SCALE FARMER PRODUCTION SYSTEMS IN THE SUB-HUMID ZONE 1/

Trait	Mean	Range
Age At first litter (months)	16	13-22
Litter size at birth	5.1	1-16
Litter size at weaning	4.0	0-8
Mortality to weaning	22.5	15-35
Weaning age (weeks)	9	7-13
Number of litters/saws/year	1.3	1-2.2
Mortality from weaning to slaughter	12	4-18
Age of boars at first mating (months)	15	10-21

1/ Data is based on 35 small farms.
Source: Pathiraja et al. (1986).

POLISH RED CATTLE: A SCHEME FOR THEIR CONSERVATION

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SUMMARY

Polish Red is the only indigenous cattle breed in Poland. Breeding was first started at the end of the 19th century. At the end of the 1960s the breed constituted more than 20 percent of the total cattle population in Poland. During the 1970s Polish Red cattle were superseded by Friesian,- and now there are about 200 000 cows left (i.e., 3 percent of the total population).

These dual-purpose (dairy-beef) animals are hardy and well adapted to rather poor feeding conditions. An improvement programme, through crossbreeding, would likely diminish their original characteristics. Therefore, together with breed improvement, a gene reserve in the form of a conservation herd of 300 cows and a gene bank of frozen semen and embryos have been implemented. A systematic breeding programme has been implemented also to maintain the old genotype and ensure wider genetic variation within the herd.

1. HISTORY

Polish Red is an indigenous cattle breed originating from uniformly red cattle of different shades - from red to brown. They used to be the native cattle of western and southern Slavonic peoples and of all Baltic countries. The first time that particular attention was paid to Polish Red cattle in terms of breeding was at the end of the 19th century, when the Red Cattle Breeders' Association was founded by the Agricultural Society in Cracow in 1894. The first monograph describing the breed was published by Adametz in 1901; he classified it, according to its craniological type, as originating from Bos brachyceros (europeus). The introduction of milk-data recording in 1906 mar@e the beginning ot selection work. In 1913, volumes I and II of the herd book were published. Between the two world wars, these cattle were bred successfully and played a significant role in the rural economy of Poland.

At the end of the 1960s, there were about 2 million head of this breed in the southern and eastern parts of Poland, i.e., about 20 percent of the total cattle population. From the year 1960 Danish Red and, to some extent, Jersey bulls were used in this breed, since high-production herds no longer had high-quality sires. In southern regions, however, there remained areas where this crossbreeding was not practised.

2. CHARACTERISTICS OF THE BREED

The environment and especially feeding conditions in thehabitat of Polish Red cattle were never favourable to high production. Cattle were fed exclusively on pasture and, during the winter, mainly or exclusively on hay. This breed evolved under circumstances where natural selection gave rise to the development of traits which rendered the animals very hardy and well adapted to the harsh environmental conditions, although yields were rather low. Selection has been minimal, so the breed is poorly specialized and characterized by several inconsistent genetic features, and performance reflects highly varied levels of production.

The breed is dual-purpose (dairy and beef). The mature weight of cows is 380-550 kg and their height at the withers is 115-130 cm. milk yield averages about 2 500 kg. In 1982, milk-production data revealed that 1 600 cows averaged 3 096 kg milk, 127 kg fat and 4.10 percent fat; in 270 days of first lactation, the figures were: 2 705 kg, 118 kg and 4.35 percent, respectively.

The yield of the best-perfoming cow in 1982 in 305 days was: 5 704 kg, 274 kg and 4.80 percent, respectively and of dams of young sires in 305 days it was: 5 088 kg, 228 kg and 4.50 percent, respectively. The protein content in milk averaged 3.5 percent and total solids averaged 12.7 percent. Poor and unequally developed udders constitute a frequent body conformation defect.
.

This breed possesses a number of significant advantages, such as longevity, high fertility, disease resistance and a high survival rate for calves. For instance, during breeding trials it was easy to find several 17-to-20-year old cows as embryo donors which. were fertile and calving regularly. Good reproductive ability was demonstrated also by the fact that only 4 percent of young.breeding bulls having met performance test requirements were unsuitable for reproduction purposes, compared to 12 percent of Friesian bulls. There were no problems with mastitis, and the whole population was free of tuberculosis and, to date, of leukaemia.

Milk from Polish Red cows is distinguished by its very good technological properties and is used as raw material in the manufacture of Emmental cheese. Meat from young fattened bulls is of the highest quality, but the breed does not meet contemporary modern farming requirements as fattening to higher weights is unprofitable. Cattle of this-breed are not big. Adult bulls reach 700-900 kg, and daily weight gain becomes too low when their weight exceeds 400 kg. Therefore, commercial crossbreeding has been fairly extensive, and about 20 percent of cows are inseminated with semen from Charolais or Simmental bulls. The crossbreds obtain very good slaughter evaluation.

3. THE PRESENT SITUATION

When agriculture was intensified during the 1970s, Polish Red cattle were replaced by Friesian and Red-and-White cattle in almost aii regions. In spite of pressure to introduce Friesians, this native breed survived owing to the efforts and persistence of some farmers. They appreciated its advantage over other breeds in harsh agricultural/enviromental conditions. There are now about 200 000 head left. The breed is found in southern Poland in the foothills of the Carpathians (about 100 000 in an area where there are exclusively Polish Red cattle) and in some pockets in south-central and north-east Poland. About 99 percent are on smallholdings, with an average size of 5 ha. In the submontane region, the cattle are kept at a high stocking rate (98 head,with 55 cows on 100 ha).

Animal husbandry practices have changed during recent years, however, including those practised in areas where Polish Red cattle are bred. This process is influenced by the intensification of feedstuff production, an increasing number of specialized dairy farms, and especially by the fact that milk production has become profitable.

About 60 percent of Polish Red cows are inseminated artificially. At present about half of these cows have been, and soon most of them will have been, mated with proven sires. Plans for genetically improving this population aim at obtaining quickly genetic improvement for higher and more effective milk production. Great variation in milk performance in this breed makes it possible to obtain a high selection differential. Thus, the fat yield of dams of young sires is now almost twice the average performance of all Polish Red cows according to milk-production data. Crossbreeding with foreign breeds is also included in the programme. Good results were obtained by crossbreeding with proven Angler sires. Crossbred heifers averaged 3 416 kg of milk, 4.29 percent fat, and 3.32 percent protein. Their advantage over purebred Polish Red contemporaries reached 700 kg of milk and 0.15 percent fat content. Their lactation lasted an average of 301,days compared to 249 days for Polish Red heifers. Since these results are encouraging, Angler bulls will be used again this year.

4. MEASURES TO CONSERVE GENETIC QUALITY

The breeding progr being carried out now may result in some of the original characteristics. of these cattle becoming weaker. Therefore, the Ministry of Agriculture and Food decided. to establish a gene reserve for conserving the old genotype of this breed. Two main methods of conservation were employed: the creation of gene banks for frozen semen and embryos and a breeding herd.

A matter of high priority was the collection of semen. Two hundred doses or more of semen were collected from 40 bulls. These were intended for current use in the conservation herd, as well as for long-tem storage.

To enlarge the reserve of purebred animals, the practice of embryo freezing has been started. To date, 82 eggs from 11 cows, 17 to 20 years old, have been collected non-surgically. of those, 39 embryos were morphologically normal and were frozen.. However, long periods of hormonal imbalance after treatment made the use of older animals inefficient and as such was stopped (Wierzbowski, et al., 1984). A new group of purebred cows is now ready for this purpose. Kc-cording to the results of the previous experiments, a calving rate of 35 to 55 percent, after transfer of frozen embryos, and of 50 to 65 percent, after transfer of fresh embryos, may be expected.

Within the small closed population of a conservation herd, changes in genotype occur with time. Inbreeding is the cause of this genetic drift. An increased rate of inbreeding decreases genetic variation. In order to limit this occurrence, carefully planned breeding is required when keeping a small group of breeding females. Breeding ought to ensure the maintenance of original and valuable breed characteristics, as well as wide genetic variation within the herd.

The following factors were taken into consideration in creating and managing the conservation herd: a) herd size, and selection of initial material; b) division of the herd into groups; c) mating system; and d) choice of offspring to be kept in the herd.

a) The relatively high cost of maintaining unimproved stock means that its size must be limited. A herd size of 300 head was calculated to be the minim= required (Reklewsk et al., 1982). Also, Klautschek (1984) demonstrated that a minimum of 300 cows is needed in a closed herd for breeding activities. Increasing the. inbreeding coefficient in subsequent generations, by random mating, depends on the sex which occurs in the smaller number (Falconer, 1960), in this case male. Increasing the number of cattle of the other sex will not have a noticeable effect on decreasing the inbreeding rate.

A conservation herd of 300 cows was formed in 1983. It is kept on three separate farms. The cows were selected from all regions native to the breed. The semen of 20 bulls representing 6 genealogical lines was selected from the gene bank. The bulls were interrelated to a very limited degree.

b) Since there is a ratio of males to females of 1:15, the herd of cows was divided into groups of 15 cows each. Animals of the initial generation should not be related to each other, not even to a limited degree, i.e., sires to each other and dams of one group to dams of the remaining groups. Within a group of females, however, close relationships are permissible. Animals resembling each other were put in the same group. Purebred cows were grouped together according to their pedigrees and the non-pedigree cows were grouped according to their body conformation type and size, their birth place and blood group. Bod6 et al. (1982) and Bod6, (1982) believe that blood groups, especially according o@ - tRe number of ‘BI alleles, as well as other polymorphic alleles, may be helpful in dividing into groups animals of which the pedigree is unknown. Heifers bred through embryo transfer are added to the family groups.

c) Each group of cows was inseminated with thee semen of one bull. To avoid excessive inbreeding, controlled mating practices should be followed. To do this, a bull with the least relationship to a given group of cows should be chosen systematically every generation.

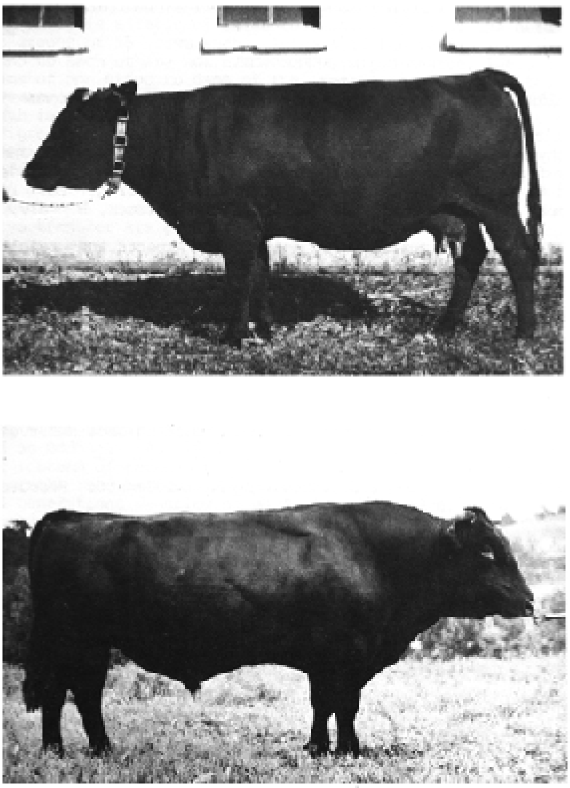
After cow grouping, a mating plan for many future generations should be prepared. The second generation would be inseminated again with the semen of bulls selected from the gene bank. Subsequently, bull production would then be based exclusively on the conservation herd. From the third generation, female progeny of a given group would be mated to a bull selected from the progeny of a different group of cows, thus creating a rotational mating system. However, this method is still being investigated as Bodó et al. (1982), on the basis of Yamada's research (1980), suggest that instead of Rotational mating, a more correct procedure would be to divide the stock into a 'few subpopulations and to breed cattle separately through 8-10 generations - allowing them to. inbreed - and then to mate those subpopulations with each other.

d) The size of the conservation herd will be constant; therefore, only a part of the offspring would be used for further breeding. Selection runs counter to maintaining genetic variation within a population. During the routine improvement of commercial performance, genes and their unique combinations disappear unintentionally owing to selection. Genes which determine specific and rare traits for an indigenous breed can never be replaced with new genes introduced from outside,.

To avoid decreasing the original variation, heifers should be brought into the herd at random. On the other hand, it is also desirable to maintain such traits as high milk-fat content and longevity in this conservation herd, if we hope to use the conserved genetic material in the future for improving the population continually. Therefore, these traits should be taken into consideration in the selection of young sires. Selected sires must come from dams with at least 6 recorded lactations and they should possess milk-production capabilities of above average milk-fat content and fat yield. In every group of cows, 2 or 3 should be selected as dams of young sires. In this way, every group would generate a young sire every 2-2.5 years. To minimize the rate of inbreeding, a general rule has been formulated: one male descendant per sire, and one female descendant per dam, as recommended by Smith (1983). Every cow should likely bear the herd a heifer.

This undertaking is expensive and requires constant government subsidies. Part of the purpose of preserving Polish Red cattle is the possibility that in the future their traits in milk and meat quality may be valuable economically.

Such traits, as well as their hardiness, mean that these cattle may be a genetic resource for future breeding. moreover, Poland's only indigenous cattle breed should be preserved as a living example of Polish agricultural history.



Polish Red - Cow and Bull. (photo credit Maria Pazdan).

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ISTRIAN CATTLE

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SUMMARY

The Istrian breed of cattle, of the Yugoslavian peninsula of that name, is an endangered species. The Istrian breed is related to other Podolic breeds and research into its genetic relationships with other breeds, as well as its conservation through the establishment of open nucleus units, frozen embryo stocks and a semen bank is being undertaken.

1. INTRODUCTION

The peninsula of Istria is the biggest peninsula of Yugoslavia and is situated off the north-eastern coast of the Adriatic, opposite Italy (see Figure 1). The first data on cattle in Istria were registered by Povse (1894). In the 1890s, there were about 50 000 cattle in Istria and according to Povse (1894), there were four breeds: Buje, Labin, Istrian Karst and self-coloured light cattle. According to Ogrizek (1957), the Buje breed is identical to Istrian.

The Istrian Karst breed is small and approximately 110 cm in height at the withers. It was mainly bred in Cicaria and thus crossbred with Kranjska, Gorica and Croatia cattle.

Cattle from the basin of Labinare similar to the Istrian Karst breed. As this breed walked at a quick pace, it was given the name I - bue cavallol.

Late in the 19th century, only a few of the self-coloured light cattle, described as autochthonous by Povse (“bue indigeno bianco”), remained. This breed resembled Mariadvori cattle.

Buje or Roman cattle were, according to Povse, imported from the Italian regions of Romagna and Puglia at the end of the 18th century. They were of average size and the cows weighed 350-450 kg, and measured roughly 134 cm at the withers. The cows were not milked and fattened oxen attained a weight of 700-950 kg, with carcass percentage of approximately 52 percent.

According to the ‘Appunti zootecni6i’ (from the Inspector’s Office of Pula, 1954) Istrian draught cattle are said to have been brought to the peninsula by Roman legions from the plains along the Danube estuary and also by Attila’s hordes (in 452 AD), from the steppes of south Russia and Bessarabia. Data from the same source show that Istrian draught cattle were crossbred, around the year 1800, with bulls of Podolic breed imported from Romagna and Puglia and later from marcha and Polesina. Under Istrian conditions and over a long period of time, with only little crossbreeding with Italian-type Podolic cattle, a special breed of cattle was created and named after the centre of its breeding, Buje. Frm 1886 to 1931 Buje cattle were improved through the introduction of selected bulls in the region of Buje, initially Romagnola bulls and later on maremm bulls.

Following a Zootechnics Conference held in Padova in 1931, the practice of home improvement was established by means of maintaining bull stations, where selected bulls were kept.

According to Smalcelj et al. (1958), Istrian cattle made up 70 percent of the total cattle populati6n-ln- Istria after World War II. Then Brown Swiss cattle numbers tended to increase until, in 1972, out of a total of 18 000 cows and pregnant heifers, 7 500 head were Brown Swiss and Istrian cattle crossbreds, and approximately 10 500 head were Istrian cattle (Sic, Rakos and Putinja, 1973). In the same year, 5 950 Istrian cows and heifers and 2 802 head of F 1 generation, resulting from crossbreeding with Brown Swiss, were inseminated. Istrian Podolic cattle are still threatened by other cattle populations.

2. DESCRIPTION OF THE BREED

The Istrian breed is of light grey to white colour with some darker shades. It has long horns and hard hooves. It is a late-m,aturing breed and reaches adult size when it is 6 to 7 years old.

The height at the withers of an adult cow is 136-138 cm, body length is 152-153 cm and chest-depth is approximately 69 am. The bull can weigh up to 700 kg and its height at the withers is about 148 cm. Fattened oxen can weigh more than 1 000 kg. Istrian cattle reach a height similar to Hungarian Podolic cattle (Bodó and Reti, 1985) but they are somewhat shorter and thinner.

Compared to other Yugoslavian Podolic types (from Posavina or Kolubara), whose numbers are diminishing, Istrian cattle have a larger frame and body size (ogrizek, 1957 and 1963).

3. PHYSIOLOGICAL CHARACTERISTICS

The draught power of the Istrian breed is excellent. Its step, although unhurried, is steady and strong. It has a lively temperament and obeys readily. moderate in intake, it feeds on pasture, browse vegetation, dry leaves, straw and corn stalk. It is resistant to heat. These factors contribute to the fact that oxen are **used** for ploughing for 12-15 years.

The fattening-capacity of the Istrian breed is moderate. The meat of young animals is succulent, while that of the older animal is tough and dark-red in colour with rough fibres. Fat deposits form around the abdominal organs and muscle tissue is lean. Normal carcass percentage is 50-52 percent while for a well-fattened ox it can exceed 56 percent.

The milk yield of the Istrian cow is poor - about 1 000 1 milk during lactation - with 4-4.5 percent milk fat. The udder is small and fleshy and the teats are short. Cows are not milked and the calves suck for 5-6 months. The Istrian cow is highly fertile and calves every year for a period of 12-15 years.

4. CONSERVATION PROGRAMME

In 1987 Maijala elucidated reasons for the preservation of the small number of rare cattle breeds associated with the characteristic climate and economic development of Istria. The conservation of Istrian cattle is of significant importance in view of these considerations:

- their excellent draught power under difficult conditions;
- their use in the production of biological' food and the exploitation of marginal pasture land;
- their successful use in landscape management;
- their role in the production of female animals for crossbreeding purposes in meat production;
- the need for production of animals for experimental purposes and research (in genetics, physiology, biochemistry, immunology and morphology, etc.);
- their importance in the fields of ethnography, history and genetics;
- their role in ensuring preservation of local culture and tradition (as examples of living cultural heritage,);
- their use in zoological gardens as tourist attractions, and for ceremonial purposes;
- their use in teaching animal science; and
- in demonstration of man's ethical respect for all living creatures.

The principal motive for preservation of Istrian cattle, however, is the importance the breed could have for cattle development in the future and, hence, one is inclined to accept the statement of Bowman (1981), cited by Maijala in 1987; that is, for animal production in the future and for quicker and cheaper reproduction of desirable types of animals, it is mote important to conserve a wide range of genetic variation rather than to develop 'over sophisticated forms of within-population selection'.

Conservation of the breed is based on two aspects:

a) Establishment of four open nucleus units

The programme foresees laying the foundation for the establishment of open nucleus units at four localities, where cattle are kept freely in fenced areas similar to wildlife conditions. The establishment of four herds with 50 female animals in each is planned, including the number of bulls required for natural insemination.

one such herd is to be located in Buzet and in addition to Istrian it will also include the Pannonian type of Podolic cattle. The initial stock (19 head) will be used for research on external characteristics, reproductive criteria and genetic relationships to other types of Podolic cattle (through transferrin and haemoglobin analyses). Previous research carried out in this field will help in formulating methods and analyses (Gaspert, 1977).

The origin of Istrian cattle is linked to the dev ‘ elopment and migration of other Podolic types of cattle from their Middle Eastern origins through Pannonia, to central and southern Italy. Research carried out on the genetic relationships among the Istrian cattle population will contribute to an understanding of its historical development and also to the origins of Podolic cattle in this part of Europe. This idea was recommended to the authors by Astolfi et al. (1983), who were of the opinion that migration paths could be traced by-@nalysis of the frequency of cattle genes in the areas situated along these hypothetical paths (see Figure 1).

b) Semen and embryo conservation

The constraints of breed preservation through living animal gene collections (for example, maintenance costs, accident and disease risks, inbreeding depression, possible contamination from other breeds and genetic drift) would be overcome by practising simultaneous conservation of frozen semen and embryos.

The additional advantage of freezing embryos would mean that ‘the breed can be regenerated and used for crossbreeding within a generation, even if the number of live animals is zero or minimized to show only its type and colours to our descendants, (maijala, 1987).

In order to avoid accidental risks, Istrian cattle semen banks will in future be located in three places rather than one as at present. The technique of embryo transfer is being improved, and it will soon be possible to produce and freeze adequate numbers of Istrian cattle embryos. The calculations of Smith (1984), cited by maijala (1987), on the possibility of a conserved gene-inventory being exploited in the future would be especially useful.

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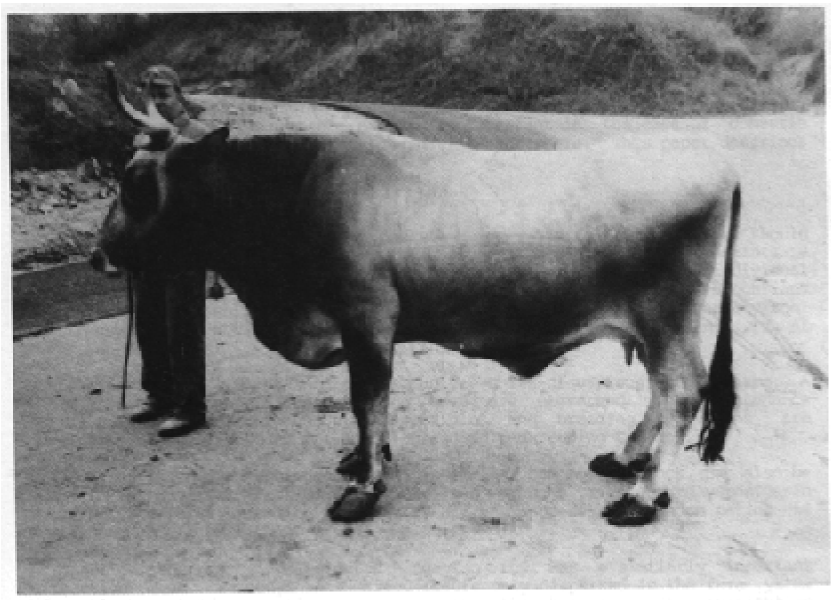

Istrian Podolic cow, 12 years, 650 kg.
Owner: Blažković Franjo, Grdoselo near Pazin
Foto: Mimanić M. (1988.)

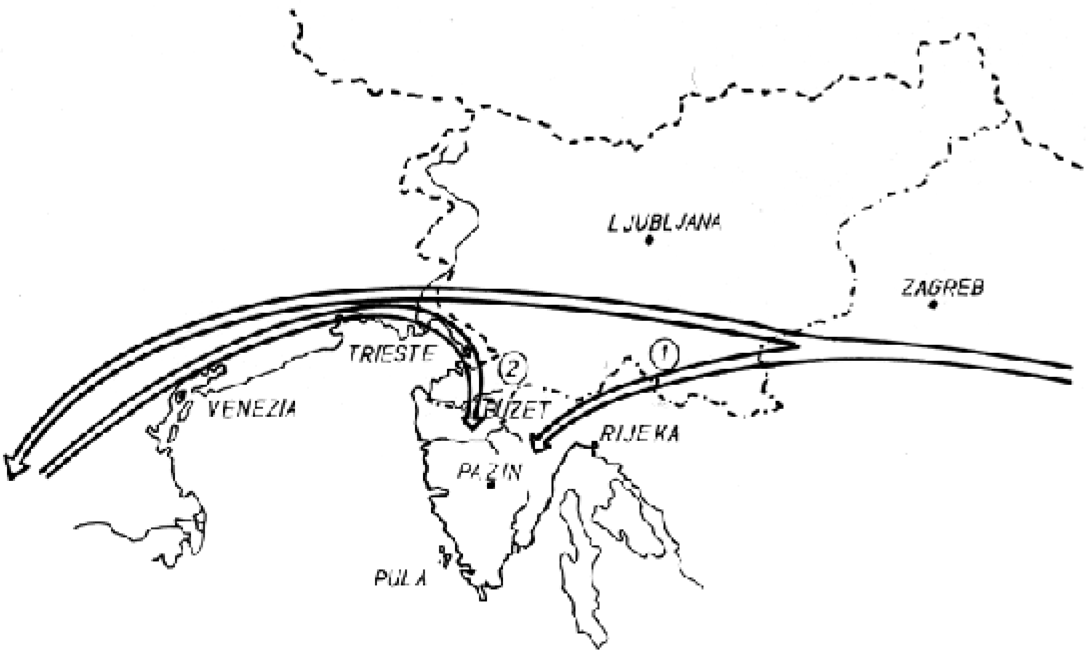

Fig.1. The Lines drawn may indicate migration pathways of Podolic cattle to peninsula Istra.
Route (1) is the accepted path of migration of the Podolic stock.
Route (2) indicates the diffusion of the italian podolic breeds to Istra.

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THE NAKED NECK FOWL

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SUMMARY

The genetic value of ancient breeds of livestock is recognized increasingly all over the world. This seems especially important in the case of domestic fowl where hybrids are increasingly dominating everywhere. This paper describes some old Hungarian breeds.

Within the species of domestic fowl in Hungary the following breeds should be taken into consideration for preservation: the three colour variants white, yellow and speckled - of improved fowl, already classified as individual breeds called White Hungarian, Yellow Ijungarian and Speckled Hungarian, respectively. The white and speckled breeds both have a naked neck variety too The Transylvanian Naked Neck, although similar to the above variants, is oi different origin.

These breeds are maintained in the poultry units of various state farms. A minimum of 200 or more layers of each breed are preserved. The maintenance costs ‘are financed through state subsidies and breeding activities are supervised by the Institute for Animal Breeding and Feeding Control.

Some of the above-mentioned breeds, in smaller numbers of stock, can also be found in the National Park of Kis-Kunscig, and in some private farm yards. In these private farms, breeding activities are not supervised, random roating is practised, and no particular breeding plan is followed.

Earlier, the partridge-coloured Hungarian fowl was a similarly important attractive breed. Nowadays this breed occurs only dispersed in the farm yards of small households, mostly crossbred with other breeds. The institution responsible for the maintenance of genetic resources is planning also the reconstruction and preservation of this breed. All these breeds developed from the Hungarian native fowl in the course of centuries.

The Transylvanian Naked Neck Fowl, perhaps the most interesting of the above-mentioned breeds, according to Csukás (1955), was brought from Asia Minor to Transylvania, Serbia and Bosnia during the Turkish occupation of Hungary more than 400 years ago. In the opinion of Hreblay (1900), this breed originates from elsewhere and not from Asia minor. The breed is mentioned sometimes as ,Szeremley fowl, after the name of Szeremley, who first took it to the Viema International Exhibition in 1875. The use of this name as the breed designation has been disputed as Szeremley was not its breeder, he simply brought it to the exhibition where it caused a great sensation among the breeders. The exhibition jury classified it as a previously unknown breed and it was registered as Transylvanian Naked Neck, after its geographical origin. Later, it spread over Europe, especially Germany, where even a breeders, organization called ‘NackthalszUchter-Verein filr Deutschland, was established. owing to rigorous selection criteria for production, the breed spread widely in Germany (Biszkup, 1983).

The naked neck trait is transmitted as a dominant character, if requi red it can be introduced easily into other breeds. Practical hobby breeders made use of this character to produce heavily crossbred species with fancy feathers and then advertised them as Transylvanian Naked Neck. Thus, today there are many naked neck varieties of fowl with considerably different phenotypes.

The conformation of the Transylvanian Naked Neck fowl is similar to that of the Hungarian fowl with the difference that its neck, and occasionally its mid-breast, are naked. There are varying degrees of nakedness, and the breed is characterized by its blood-red colour and feather collar. Its rump is medium-long, and egg-shaped. The wings are high, relatively large and well developed and close to the body. The thigh and shank are longer than average. The feet and beak are white or slate-grey. of the many coloured varieties, black is the most common at present but white, speckled and pied varieties are known also. The adult hen and cock weigh about 2.0 to 2.5 kg, and 2.5 to 3.0 kg, respectively.

At the end of the last century, this breed was popular, owing mainly to its tolerance of extreme climatic conditions, its prolificacy and rapid development, and its tender meat. Also, it had moderate feeding requirements. Kept on an appropriate area, it collected a considerable proportion of its feed. It was an excellent brooder and took care of its baby chicks reliably (B6heim, 1896). These characteristics were important 80-90 years ago. However, in 1903, Kiss and Verner reported that in spite of all its good characters Transylvanian Naked Neck fowl propagation was limited as its naked neck caused breeders to feel an aversion toward this particular breed. Therefore, at the end of the 19th century and. the beginning of this century, this breed became an endangered species.

With the beginning of intensive management, the danger of extinction increased as the formerly advantageous characters no longer had the same importance. In closed management systems, brooding proved to be decidedly harmful. Thus, this breed and other indigenous breeds, were neglected as modern breeds and specialized hybrids produced more profitably. As a result, it became clear that the conservation of this breed required more attention. However, it was found that some of the apparently undesirable characteristics of this breed, resulting in its lack of commrcial popularity, could be utilized successfully in modern hybrids. Research has been increasingly centred on the heat tolerance of the Naked Neck fowl in varying climatic conditions (Bordas et al., 1978; Merat, 1979; Momet et al., 1979 and 1980, Hanzl-Somes, 1983;-te'ln-El-Dein et al., 1984, Horst-Rauen,-1986, and Ludrovszky et al., 1986).

These experiments have shown generally that the Naked Neck fowl tolerates and adapts more easily to extreme high temperatures and that its genetically determined characters are manifested more completely than in fowls with normal feathering. This advantage is increased by the fact that owing to its naked area, this breed requires less energy for feather formation. Naked Neck and feathered neck stocks of chickens were also compared under varying climatic conditions in our experiments. Unfortunately, there were no Naked Neck and feathered neck birds available from the same line, therefore the experiment had to be carried out with two different breeds. The two breeds used were: Transylvanian Naked Neck, Na/Na; and Hybro broiler feathered neck, na/na.

The chickens were raised from one day old up to seven weeks in different controlled environments. Climatic chamber No. 1 simulated the normal conditions usp in Hungarian broiler raising, and chamber No. 2 simulated desert conditions (359C at 30 - 40 percent relative humidity), while in chamber No. 3 tropical conditions (35 OC at 90 percent relative humidity) were produced. In all three climatic chambers genotype A and la individuals were kept separately. The body weights reached in chamber No. 1 -by each genotype **(A** and **B)** and each sex (male and female) were regarded as 100 percent and the others were compared on this basis. These data, together with percentage death losses, are shown in Table 1. Feed conversion was also investigated (see Table 2). As expected, the broilers produced more favourable results than the Naked Neck ones, but the latter proved to be better feed converters in desert and tropical conditions than in normal conditions.

On the basis of the results it would seem that Transylvanian Naked Neck chicks, owing possibly to their betterheat tolerance, produced closer to their geneticall determined production capacity than the broiler chickens. However, other influencing factors may have existed as well. In the case of genotype B, mortality was also lower.

On the basis of this experiment and the observations of other investigators conducting similar research the Naked Neck character may be useful to layer or broiler lines which must produce under tropical or desert conditions.

This study represents a good example of demonstrating how the preservation of native breeds of poultry and/or livestock in order to conserve their useful characters can be utilized successfully in improving overall food production, even under the intense production constraints and market requirements of today. production constraints and market requirements.

TABLE 1

EFFECTS OF GENOTYPE AND ENVIRONMENT ON THE BODY WEIGHT AND MORTALITY OF 7-WEEK-OLD CHICKS

Climatic chamber conditions	Parameters	Broiler		Naked Neck	
		male	female	male	female
normal	body weight/g	2021	1.688	713	596
	body weight/% 1/	100	100	100	100
	mortality/%	8.8	2.9	2.9	2.9
desert	body weight/% 1/	74.1	76.8	93.5	89.9
	mortality/%	8.8	0	2.9	2.9.
tropical	body weight/% 1/	73.6	79.1	88.9	89.4
	mortality/%	44.1	61.7	2.9	2.9

1/ Body weight of chicks kept under normal conditions = 100 percent.

TABLE 2

EFFECTS OF GENOTYPE AND ENVIRONMENT ON FEED CONVERSION UP TO 7 WEEKS OF AGE

Genotype	unit	Envirorment		
		normal	desert	tropical
Broiler	kg feed/kg	2.16	2.15	2.12
	body weight %	100	99.5	98.1
Naked Neck	kg feed/kg	2.68	2.30	2.30
	body weight %	100	85.8	85.8

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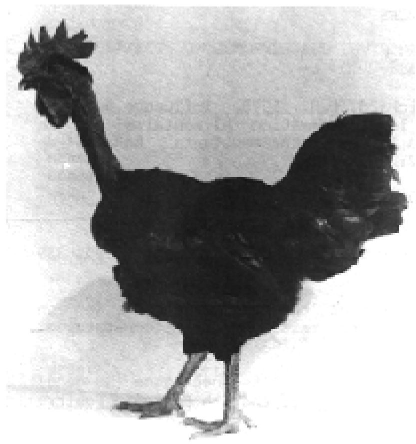
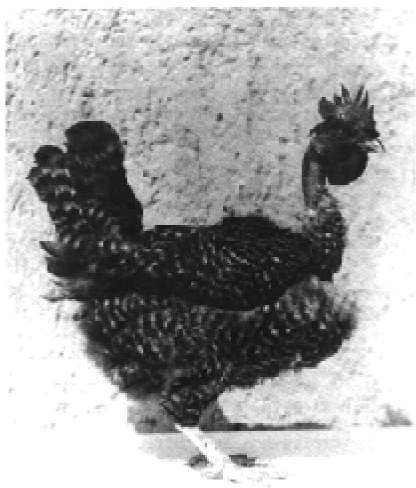
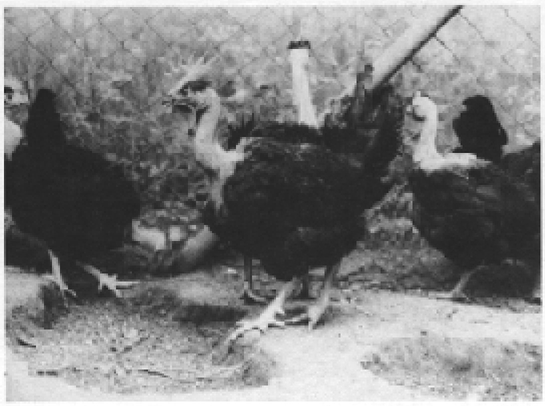


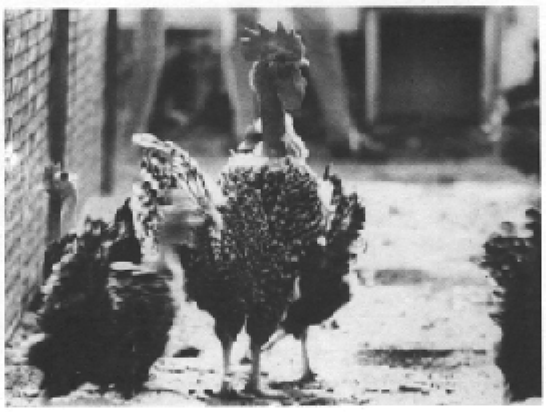
Transylvanian Naked Neck cock.
(photo Monostori)



Specked Hungarian Naked Nec hen.
(photo Monostori)



A group of Transylvanian Naked Neck birds. (photo Eszes)



Specked Hungarian Naked Neck birds. (photo Eszes)