

Saving traditional pig breeds

Friedrich Weißmann

About

The establishment of commercial pig breeding programs drastically decreased pig breed diversity. As a result, today, many traditional pig breeds are endangered and risk being irreversibly lost, although there is significant social interest and intention to maintain these old breeds. There are a range of encouraging approaches to maintaining these breeds.

This technical note provides a brief look back on pig breeding and presents successful examples of conservation of genetic resources.



- Saddleback & pied
- Landrace type

The change from traditional to high breeds

Pigs are one of the oldest domestic animals with a significant role in evolution of human culture. The domestic pig originates from the wild boar and domestication was widely scattered over the world starting roughly at the same time about 8,500 BC. Till the end of the 18th century pigs were more or less of the wild boar type with solid bristles, long legs, and – most notably – of late sexual maturity.

During the 19th century pigs experienced a dramatic change induced by industrial revolution, population growth, and agricultural intensification. Increasing demand for human food energy caused systematic breeding mainly focussing on higher fat yield of the carcass. The UK was the most important starting point in Europe for creating a range of pig breeds with various phenotypes.

Breeding brought about the following pig groups in the 19th century:

- Small white & small black
- Middle white & middle black
- Large white & large black



Picture 1. Today, pig production mainly relies on hybrid animals based on only very few genotypes. (Photo: Thomas Alföldi)

More recently, the latest significant change in pig breeding began in the 1950s, starting mainly in USA. The demand for fat was replaced dramatically increasing demand for meat protein. The obvious consequences were a rapidly increasing number of pigs, but simultaneously a drastic decrease in pig breed diversity. The latter is the consequence of the very efficient commercial pig breeding programs, which were also established in this times, promoting so-called hybrids which are based on only very few lines of genotypes.

This development is a consequence of redefined breeding objectives towards considerably improved performance (daily weight gain, feed conversion ratio) and carcass quality (body protein synthesis capacity). Table 1 exemplifies the realised impressive breeding progress. Intensification of pork production also resulted in a significant increase in sow fertility in terms of increasing litter size (piglets born alive), piglets' birth weights and daily weight gain.

Table 1: Performance development of the German Landrace

	1962	1970	1999
Daily weight gain [g]	720	746	955
Feed conversion [kg feed per kg live weight gain]	3.16	2.85	2.63
Muscle area (13th rib, <i>Musculus longissimus dorsi</i>) [cm²]	29.7	36.0	46.4
Fat area (13th rib, <i>Musculus longissimus dorsi</i>) [cm²]	32.1	20.9	17.2
Lean-fat-ratio [fat area per muscle area]	1.08	0.58	0.37

These advances are primarily the result of specialisation; increasing demand for pork caused economic pressure and specialised production systems. In former times closed on-farm production included sows and fattening pigs at the same farm. Pure-bred sows were restocked via selection within the own breeding stock or by buying gilts from other (herd book) farmers.

Recently, this more or less closed pure-breed system has been replaced by a strictly work-sharing system based on cross-breeding. Piglet production and pig fattening became separate systems although largely still in the hand of farmers: The piglet producers' sows are now hybrids, which are crossed with a terminal sire line to produce growing-finishing hybrids for the fattening farm. Farmers producing the parents of the piglet producers' sows are in close contractual, organisational, and economic dependence on commercial breeding societies. This overall system limits itself to only very few pig genotypes.

With regard to traditional breeds' survival chances it is obvious that, beginning with the second half of the 20th century, the structural change in agriculture, in pig breeding and in pig production led to a dramatic decrease in the number of old breeds and populations of appropriate individual pigs.

Strengths and weaknesses of traditional breeds

High diversity ...

Discussing traditional breeds these days means old pig breeds whose phenotypes originate in the 19th century. As mentioned, their appearance is still of huge variety concerning size or stature and, most obviously, colour. Some examples:

- White: Middle White, Yorkshire
- Black: Berkshire, Cornwall
- Saddle back: Angeln, British and German Saddle back, Swabian-Hall Swine
- Pied: Bentheim Black Pied, Gloucestershire Old Spots, Turopolje
- Landrace: Chester White, German Landrace (white); Tamworth (red)



Picture 2. Middle White (a), Cornwall Large Black (b), Angeln Saddleback (c), Tamworth (d). (Photos: Antje Feldmann, www.g-e-h.de (a, b, d), Christina Well (c))

... high meat quality ...

Furthermore, traditional breeds have advantages in meat quality characteristics like tenderness, juiciness and odour; properties closely associated with a certain intramuscular fat synthesis, which in turn, is closely related to overall body fat synthesis.

... but low competitiveness

All these old breeds are mainly characterised by a high capacity for body fat synthesis. Breeding for higher fat yield in the 19th century was associated with a selection for earlier sexual maturity resulting in a shorter period of juvenile growth and lower protein synthesis. Hence, the poorer protein synthesis resulted in a lower yield, and body fat synthesis started earlier with a higher yield. Those fat pigs are also characterised by

inferior feed conversion, because energy-rich fat synthesis costs much more feed energy than synthesis of protein.

Because productivity in pork production today focuses on improved weight gain, feed conversion, lean meat content, and the proportion of valuable cuts, it is obvious that traditional pig breeds are no longer competitive and therefore have become more or less rare populations in the meantime.

Two basic strategies to save traditional breeds

First of all, the survival of those rare or endangered breeds is closely linked to unselfish enthusiasm of people interested in maintaining cultural heritage. Two different strategies for their survival exist; hobby use versus economic-professional use although creation of a certain economic value is necessary to sustain and motivate those concerned.

Improvement in breeding in hobby use

Hobby use occurs in zoos or within closed circles of interested breeders. In both cases, the driving force is to maintain typical phenotypes as pure bred. Special breeding programs are not involved due to small population sizes, a lack of organizational structures or personal and monetary resources.

To avoid inbreeding regional exchange of genotypes is necessary but such exchanges are often challenging due to the distinctive localisation of these old breeds, leading to a narrow range in distribution (e.g. Angeln saddle back in the North of Germany). In those cases it is common to exchange animals of the same phenotype but of distinct regionalism; e.g. German Saddleback (middle and East of Germany) and/or Swabian-Hall Swine (South of Germany). Such exchanges are not limited by national borders, except by means of politically or veterinary trade restrictions. It was common in the 1960s and 1970s to cross Piétrain with old breeds of related phenotypes (like Bentheim Black Pied, Angeln Saddleback, Swabian-Hall Swine) as an attempt to improve competitiveness in terms of lean meat content and proportion of valuable cuts, although this approach could not prevent the almost-extinction of the breeds involved.

Creation of a sustainable value via economic-professional use

Attempts to generate a sustainable value by economic-professional use seems a more auspicious approach, well characterised by the catchy formula "protecting through consumption". The idea behind this is illustrated by three exemplary initiatives concerning the traditional pig breeds (i) Swabian-Hall Swine, (ii) Bentheim Black Pied and (iii) Iberian Pig.

Exemplary initiatives to save traditional pig breeds by improving their economic use

Swabian-Hall Swine



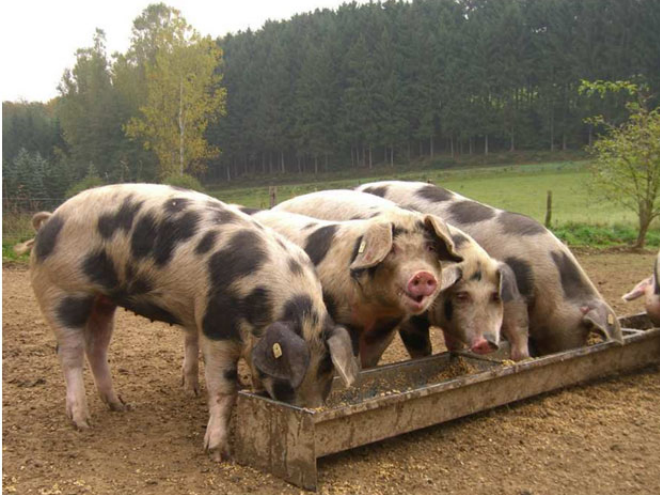
Picture 3. Swabian-Hall swine. (Photo: Antje Feldmann, www.g-e-h.de)

The region of Swabian-Hall (Schwäbisch Hall) is located in southern Germany and the marketing concept for Swabian-Hall pork focuses on regionalism; the label portrays the Swabian-Hall Swine as local but with supra-regional recognition. Pure-breed Swabian-Hall sows are mated with Piétrain terminal sire lines to generate growing-finishing pigs for pork production.

This stepwise approach tries to kill two birds with one stone: On the one hand the survival of the pure-breed genotype is ensured by producing pure-breed sows, whereas the use of Piétrain as terminal sire guarantees sufficient lean meat and valuable cuts from finishing pigs, to be competitive within a market dominated by carcass quality. In fact, sensory properties of meat quality (tenderness, juiciness, flavour or marbling) are not importance for the economic value of the carcass.

The marketing concept focuses on regional production of a local breed. "Swabian-Hall pork" is of Protected Geographical Status (PGS) in the European Union since 1998. Only pork originating from Swabian-Hall, Hohenlohe and defined adjacent regions, can be sold under that name. The heart of the construct is the Farmer Producer Association of Swabia-Hall (Bäuerliche Erzeugergemeinschaft Schwäbisch-Hall, www.besh.de). Swabian-Hall pork is mainly distributed via food retailing and – to a lesser extent – via farm gate sale. However, despite all its successes it has not yet been possible to achieve "not endangered" for Swabian-Hall Swine.

Bentheim Black Pied



Picture 4. Bentheim Black Pied.
(Photo: Antje Feldmann, www.g-e-h.de)

The marketing concept focused on the local breed name “Bentheim Black Pied” in form of a registered and protected picture/word trademark, guarantees appropriate pork is of Bentheim Black Pied origin. The region of Bentheim is in the West of Germany, but farms with this pig breed are scattered all over Germany. Consequently, farmers involved are not associated in a Farmer Producer Association (Erzeugergemeinschaft), but form a membership corporation (www.bunte-bentheimer-schweine.de) with the aim to centralize breeding and to decentralize merchandising.

In recent years, their two main breeding goals were to reduce inbreeding and Porcine Stress Syndrome (PSS), the latter became necessary due to historic crossbreeding with Piétrain. Nowadays, Bentheim Black Pied labelled pork is of pure-breed origin since crossbreeding with Piétrain or other lean terminal sire lines is forbidden.

Appropriate pork is multilaterally sold via butcher’s shops, farm shops, weekly markets, online shops and gastronomy without special consideration of meat quality and carcass quality.

Iberian pig



Picture 5. Iberian pig.
(Photo: Antje Feldmann, www.g-e-h.de)

Iberian pigs and ham is a real success story (www.jamon.com). The Iberian pig is one of the rare non-improved swine breeds that survived modern systems of pig production. This is attributed both to its perfect adaptation to natural Mediterranean ecosystem and the high quality of its products, highlighted by the concept of Jamón Ibérico – Iberian ham.

The population of the Iberian breed was drastically reduced since 1960, due to African swine fever, lower fat acceptance, and dominance of modern hybrid lines. But more recently, production from pigs of the Iberian type has increased, to satisfy a new demand for top quality meat and cured products.

The Iberian pig has a high capacity for fat synthesis and intramuscular fat content. Pigs are slaughtered as heavy pigs with live weights of 140 to 160 kg, since an extremely high carcass fat content is required to produce good quality products like Jamón Ibérico – an air-dried ham in a high price section, only produced from Iberian pigs or their Duroc cross-breeds. Hams are labelled according to the pigs’ diet; the finest is called Jamón Ibérico de Bellota from free-ranged acorn-fed Iberian pigs, although there is also Jamón Ibérico production with cereal based diets.

Conservation – an international and national task

The conservation of animal genetic resources is a global task requiring extensive international cooperation and coordination. FAO is the international and politically relevant organisation in this context and the Convention on Biological Diversity (CBD) dating from 1992 was inspired by the growing commitment to sustainable development and to emphasise the global dimension of the topic.

The FAO Commission on Genetic Resources for Food and Agriculture (CGRFA) provides an intergovernmental forum to reach global consensus on policies relevant to biodiversity for food and agriculture. In September 2007 the FAO published the first Report of the State of the World Animal Genetic Resources leading to the Global Plan of Action for animal genetic resources. Many national activities result from those international obligations.

Strategic action priorities are:

- Characterisation, inventory and monitoring of trend and associated risks
- Sustainable use and development
- Conservation (*in situ* and *ex situ*)
- Policies, institutions and capacity-building

A main basis for the Report of the State of the World Animal Genetic Resources is the Animal Diversity Information System of the FAO, in which the data on farm animal breeds of the states are collected. All European National Coordinators for animal resources work together in the European Regional Focal Point (ERFP).

On a national basis, herdbook breeders can be granted subsidies for using threatened farm animal breeds within the framework of support programmes (*in situ* conservation). *Ex situ* conservation of animal genetic resources through cryo-conservation (frozen storage) particularly sperm and embryos in gene banks, is currently carried out primarily as complement to *in situ* conservation ("back-up copy").

Further reading

Weblinks

Bentheim Black Pied:

www.bunte-bentheimer-schweine.de

BLE, Informationssystem Genetische Ressourcen:

www.genres.de

British pig breeds:

www.britishtpigs.org.uk; www.thepigsite.com

FAO: www.fao.org/ag/againfo/themes/en/animal_production.html

Iberian pig: www.jamon.com

Rare Breeds Survival Trust:

www.rbst.org.uk/pigs-information

Swabian-Hall Swine: www.besh.de

Print publications

Comberg G. (1978). Schweinezucht. Ulmer Verlag, Stuttgart

Daza, A. (1996). El sector del porcino Iberico-I. Mundo Ganadero 83, 30-34. (in Lopez-Bote, 1998)

Fabuel et al. (2004). Analysis of genetic diversity and conservation priorities in Iberian pigs based on microsatellite markers. *Heredity* 93, 104-113

Lopez-Bote (1998). Sustained utilization of the Iberian pig breed. *Meat Science* 49, 17-27

Samraus H.H. (1986). Atlas der Nutztierassen. Ulmer Verlag, Stuttgart

Imprint

Author

Friedrich Weißmann

Thuenen Institute of Organic Farming (Federal Research Institute)

Trenthorst 32, D 23847 Westerau, Germany

Tel. +49 (0) 45 39 / 88 80 - 317 (-140 Fax)

E-mail: friedrich.weissmann@ti.bund.de

www.ti.bund.de

Title photo

German Saddleback, ©BLE, Bonn/Thomas Stephan

LowInputBreeds

LowInputBreeds is the acronym of the project 'Development of integrated livestock breeding and management strategies to improve animal health, product quality and performance in European organic and 'low input' milk, meat and egg production'. It is funded under the Seventh Framework Programme of the European Community for Research, Technological Development and Demonstration Activities (Contract No. 222623).

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Editorial support

Gillian Butler, Newcastle University, UK

Layout

Helga Willer, Research Institute of Organic Agriculture (FiBL), Frick, Switzerland

Publishers

Consortium of the LowInputBreeds project, c/ Newcastle University, UK, and Research Institute of Organic Agriculture (FiBL), Frick, Switzerland

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