A new Tweed from “Forest Sheep“ Wool
Quality production and the use of a sheep genetic resource for extensive pasturing

Paper submitted by the
Federal Ministry of Agriculture, Forest, Environment and Water Management
Austria

The present paper on market creation for biodiversity is submitted to the OECD Working Group on the Economic Aspects of Biodiversity by the Austrian Ministry of Agriculture, Forest, Environment and Water Management.

The study describes an example of market creation for biodiversity, with reference to the development and creation of a special tweed as a new high quality products with socio-economic relevance. The author of the case study is Beate Berger, Department for Biodiversity and Genetics of the Institute for Organic Farming and Biodiversity, Federal Research Institute for Agriculture in Alpine Regions, Thalheim.

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1 General Description

1.1 Description of the ecosystem

1.1.1 Geology, climate and soil

In Upper Austria the Granite and Gneiss hills north of the Danube are called the Mühlviertel. This name meaning "mill quarter" stems from two rivers called the "Grosse" and the "Kleine Mühl" as well as from the many water-mills once working in this region. The parts of the Mühlviertel involved in the project are Ulrichsberg and the region of Haslach which are both located in the north-western part not far from the Czechian and Bavarian border (see Appendix I, Fig. 1.1). Altitude ranges from 350 to 1200m. Most of the farms lie between 500 and 800m. The climate is cool with harsh winds, 800 to 1000mm of rain per year and a mean temperature of only 6 to 7°C. The usually shallow soil consists mainly of lime-free loamy sands.

The main part is covered with woods and grasslands only 33% are arable land. Originally the plant societies in the grassland varied from dry meagre pastures on the hilltops to shallow moors in the dips. A large number of species of flora and fauna still live in these biotopes; for example up to 400 species of butterflies were counted in an area of 16,5 ha in Ulrichsberg. In another meadow nearby 6 different orchids are growing.

1.1.2 Agriculture

Farms are small mixed farms on average owning only 16 ha of arable ground and meadows and 14 ha woods.

Farm animals have always played an important role. The main farm animals are dual purpose cattle, usually of the Simmental breed. Milk and beef production provides most of the income.

Sheep were very common in the 19th century but had almost vanished in the 1970ies. There never was much pig farming in the region but usually a few fatteners are kept for supplying the household.

Until the second half of the last century the main arable crops were potatoes, turnips and flax with barley and rye playing a minor role. Traditionally the small fields were terraced to lessen the slope and minimise erosion. Wheat and corn were introduced during the latter half of the 20th century and are gaining importance.

1.1.3 The "Waldschaf" breed

The traditional sheep breed in the region was the Waldschaf (Forest Sheep) also called “Bergschaf” (Mountain Sheep), “Steinschaf” (Rock Sheep) or “zodertes Schaf” meaning “shaggy sheep” by old farmers although it is not related to other Austrian breeds of that name. The origin is probably the “Zaupelschaf” a landrace breed brought to Middle Europe by the Indogermanic settlers. Although crosses with other breeds are likely a genetic distancing project showed it to be distinctly separated from the other traditional Austrian breeds (SÖLKNER et al. 2002). The distance to Texel sheep and to Merino representing modern fine wool breeds was even wider.

The name Forest Sheep reminds of the customary use of forests for pasturing sheep and cattle in summer.

The Forest Sheep is a small to medium framed sheep with mostly white wool. Black, brown, grey and pied animals also occur. Characteristics are small well carried pointed ears, a narrow tufted head with a straight profile and big eyes, often pigmented eyelids and muzzle even in white animals, clean and fine boned legs, very hard claws and a long and woolly tail reaching well below the hocks. Both genders may wear horns. Adult rams weigh about 60 to 80 kg, ewes weigh 40 to 60 kg. The Forest Sheep is fertile all around the year with usually 3 lambings in 2 years. Fertility is 180 to 200% per lambing. As the ewes are very good well milking mothers the lambs grow rapidly. This breed is very well adapted to the harsh climate and poor feed in the region. Because of these proprieties it can be used in landscaping today.

Originally the Forest Sheep was kept as an addition to cattle mainly for supplying the farmer and his family with clothing and some surplus meat in autumn when most of the young animals were slaughtered. The flocks were small consisting of one ram and 5 to 10 ewes per farm.

1.1.3.1. The Wool

Like many other Landrace sheep breeds in Europe the Forest Sheep carries hairy medium wool. The fleece consists of wool fibres, long heterotypes or transitory fibres and some kemp and differs widely from other breeds. According to KUN (1995) the Waldschaf has an unusually high amount of wool fibres, which are significantly thinner and of very fine quality compared to other Landrace breeds like the Skudde or the Pommernschaf.

The transitory fibres are thicker and longer. They are responsible for the waterproof fleece coat of the Forest Sheep. The rain water runs along the transitory fibres.

Small bundles of these work like little gutters, the tips angling away from the fleece to allow dripping.

The kemp is much reduced compared to other breeds. The fibre types follow roughly a relation of 0,35 kemp : 1 transitory : 4,4 wool fibres.

Table 1 Fibre Diameter of Forest Sheep and Sumava

	N	Mean x in µ	Mode D in µ	Median µ	Range µ - µ	Std.Dev. s	CV %
Waldschaf							
Kemp	259	64,60	41*	60	27-147	22,14	34,3
Heterotype	900	49,00	49	49	21-85	10,40	21,2
Wool fibre	900	28,70	29*	29	10-49	7,71	26,9
Sumava							
Kemp	10	59,30	40*	61	40-85	14,60	24,6
Heterotype	150	59,30	55	59	36-83	9,27	15,6
Wool fibre	150	23,90	17	24	12-39	6,85	28,7

* smallest value
From G. KURT-KUN (1995)

As a whole the texture of the wool is very soft. Hairy medium wool is well suited for hand spinning and weaving and was used widely for homespun and knitting and the traditional Austrian Loden garments. If the animals are shorn twice a year fleece weight amounts to 3 to 4 kg of raw wool.

´1.1.3.2. The Meat

Lamb and mutton today provide the biggest part of the income of Forest Sheep breeders. The high fertility of the ewes together with good milk yield and strong mothering instinct makes it possible to raise 2,2 lambs per ewe per year. The market demand for home grown lamb of high quality has steadily increased during the last years in Austria. The market demands young lambs with tender meat, low fat and as little mutton flavour as possible. The Forest Lambs have the desired high quality meat. To achieve higher slaughter weights lambs from extensive grazing are commonly slaughtered with 5 to 7 months which is later than customary in Austria. At this age the Forest Sheep meat still has no mutton flavour but it is darker than lamb meat from intensive production and tastes a little like venison. This special meat is sold either directly to consumers or used in five local restaurants. It is declared as “Waldlamm” (Forest Lamb) and information about the project is available at the restaurants.

1.1.4 Industry and tourism

Until the end of the 19th century this part of the Mühlviertel had a thriving industry. The main products were wood and textiles. Flax and wool were the raw materials for the spinning and weaving manufactures. As long as the Bohemian region belonged to Austria trade played an important role. The historic architecture of Haslach still shows ample evidence of the wealth of the citizens.

Today the whole region is structurally less favoured. Approximately 70% of the working people have to travel up to 70km to Linz to find employment. The region was identified as less favoured region.

Tourism on a small scale basis has been steadily growing for more than 20 years with emphasis on soft tourism. The main activities are hiking, biking and trail-riding in summer and Nordic skiing in winter. Accommodation is mostly on farm on basis of bead and breakfast or apartments. The typical target groups are families with small children and elder people.

Haslach is very active in cultural events e.g. a yearly textile festival, art events and exhibitions of local crafts.

1.2 Description of the main impacts

1.2.1 Impacts on genetic and species diversity

Loss of genetic and species diversity started as early as the 19th century when "better" breeds of farm animals were introduced to the Mühlviertel together with modern farming methods and intensivation of spinning and weaving. Pasturing in the forests had to be discarded as the merino-type sheep imported to enhance wood production could not cope with the poor pastures. When home spun wool was no longer an important product the sheep were substituted by cattle. Simultaneously a growing demand for milk products and beef in the towns caused a change in the agricultural system from chiefly self-supporting farms to farms producing for the market.

1.2.2 Impacts on the ecosystem in general

1.2.2.1 Intensivation of agriculture

As draining and fertilising changed most of the grassland into intensive meadows the original multiple plant societies are highly endangered. The better grassland is mostly used as meadows yielding usually two crops per year and pastured in autumn. Now a

few diary farms are growing rapidly while many small farmers go out of business. High yielding diary cows need high quality roughage. To produce better silage farmers tend to cut the grass earlier heading for three crops per year. The land is heavily manured and plant societies change rapidly. An increasing amount of grassland is ploughed to grow corn, wheat and barley for high energy silage and concentrates. As most of this new fields are not level this may cause erosion and flush out problems.

1.2.2.2 Extensivation of agriculture

Many small farms go out of business or are farmed part time. Biodiversity does not always profit by the more extensive management of these areas. If farming is to be continued most farmers change from diary to suckler cows. Suckler cows are usually kept on pasture and are confined only in winter. Extensively pastured grassland may enhance biodiversity and even re-establish some of the original types of grassland. On the other hand pasturing heavy animals in wet weather on steep slopes may lead to erosion and degradation of pasture.

In small farms and in hobby farming sheep are increasingly popular to graze surplus grassland. Extensive sheep farming may be an excellent solution for maintenance of ecologically valuable dry meagre and half dry meagre meadows if suitable breeds are used. High performing meat breeds and their crosses are not adapted to this environment. Landrace or mountain breeds are able to cope with high fibre and low energy content in the ration. Rams of more intensive meat breeds can be used for cross-breeding to produce suitable slaughter lambs.

Often steep grassland is allowed to lie fallow or is afforested. Both methods seriously endanger biodiversity. Fallow grassland is invaded quickly by shrubs. Young trees change the whole plant society in only a few years especially the usual afforestation method with spruce only.

1.2.3 Damage to resource base

For Middle Europe the peak of biodiversity in plants is placed in the middle of the 19th century. Since then a steady loss has been recorded with a dramatic increase in the second half of the last century. The Bohemian Gentian decreased in the whole region from 1100 in 1969 to only 50 findings in 2002.

When in 1984 conservation of Forest Sheep started in Bavaria only about 80 animals of the old type were found. In the Chech Republic about 80.000 Sumava sheep – a breed related to the Forest Sheep – were kept chiefly for landscaping but as the flocks are heavily infested with MAEDI/VISNA almost no exchange of breeding

material was possible. After the political changes the privatised flocks decreased quickly to about 1500 animals in 2001. Together with some breeding material of old type found in Austria the conservation breeding scheme started in 1993. Since then the Forest Sheep has increased steadily in numbers now counting some 700 females.

1.3 Identification of main sources of these impacts

1.3.1 Conversion and land-use

A main reason for increased land use today is the enhanced mobility. As the region is situated only 50 to 70 km from the capital of Upper Austria (Linz, 270.000 inhabitants) for many years family homes and weekend cottages have multiplied almost unchecked.

Building of infrastructure needs land for new and better roads, shopping centres, car parks, etc.

Further promotion of tourism to provide additional income for farmers enhances land use for recreation facilities. Especially golf courses have multiplied in the last years each converting from 9 to 30 ha of arable land each into lawns and greens.

1.3.2 Non-sustainable use of biological diversity

The woods were discovered as a valuable income source and changed from mixed woods with beech, oak, fir and pine with rich underbrush to almost pure spruce plantations. Brooks were regulated to prevent flooding of lower meadows and moors were drained and ploughed. Beside the changes in agricultural structure the main reason for the loss of the Forest Sheep was displacement crossing with Merino breeds. Better feeding and housing made it possible to keep heavier and less hardy breeds for meat production.

1.4 Identification of key objectives of the market creation exercise

To protect and even to re-establish biodiversity in some regions several targets were identified:

1.4.1 Building a network of biotopes by protecting valuable areas. This was partly achieved by buying or renting the biotopes by the Österreichische Naturschutzjugend Haslach (ÖNJ), a very active group of the Österreichische Naturschutzbund an Austrian NGO

for nature protection trying to re-naturalise moderately intensified pastureland and brooks and to change some of the forest from pure spruce back to a mixed forest with beech, birch, pine and underbrush which is natural for the region. Beside the positive effects on plant biodiversity a marked positive effect on the game population was noted. The protected biotopes are mostly pasture land and have to be grazed. This was the start of the extensive pasture project of the Naturschutzjugend in 1993. A 16,5 ha dry meagre meadow with counted 400 species of butterflies was pastured by a small flock of 10 Forest Sheep ewes and the impacts on biodiversity were registered regularly. The attractive Forest Sheep developed into an attraction for locals and tourists especially as there are almost always young lambs in the flock.

1.4.2 Protecting biodiversity in farm animals is a main concern of the project. The traditional autochthonous breeds had almost become extinct. First conservation projects had been implemented in Austria since 1984 by the Austrian Society for Conservation of Genes in Farm Animals (Österreichische Gesellschaft für Generhaltung, ÖNGENE) but were mainly concerned with cattle. Sheep breeds were only considered part of the Alpine culture and neglected in the other Austrian regions. With the first ÖPUL program starting in 1995 (see 4.1) the interest in endangered breeds of all species grew towards sustainable conservation. Since the founding of the Institute for Organic Farming and Biodiversity in 1997 as a research institute monitoring, controlling and co-ordination of conservation activities are among the chief tasks.

1.4.3 In Situ or On Farm Conservation is the main method of gene conservation schemes in Austria. To keep the breed in its natural habitat and use it in the traditional way is regarded to be the best approach to a sustainable conservation. If on farm conservation of Animal Genetic Resources (AnGR) is to be successful a market for the products has to be found or created. Public awareness and understanding for the problem of biodiversity loss can be raised easier if there are products to sell which differ significantly from the main stream. Special quality labels help to transport the message of a rare and special product, regional origin and ecological production.

2. Identification of causes and sources of pressures

2.1 Identification of underlying causes of biodiversity loss

In case of the Mühlviertel the main causes for biodiversity loss are

- changes in agriculture
- urbanisation
- weak structures
- loss of traditional knowledge

A coherent marketing strategy for the whole region and its products was not in existence for years and only recently this region was discovered for tourism. As a consequence traditional local products found no market and received no promotion. With the migration of citizens from Linz to the surrounding regions and the weekend guests the understanding for traditional farming methods or traditional breeds decreased further. As long as there are animals in a green pasture and some spruce woods uphill the public tends to believe in an ecologically sound surroundings.

2.1.1 Information failure

The modern urbane population in Austria on the whole has a very hazy picture of farming. Two main opinions quite contrary to each other prevail and are fixed by advertising and scandal press respectively.

Firstly the romantic view of an idyllic agriculture basing on paintings from the 19th and early 20th century translated into TV spots advertising various agricultural and other products. Secondly the negative image of modern farming regularly evoked by media reporting various food and hormone scandals.

For the public information about high quality products from endangered breeds is very scarce. As a rule the amount of the product is not high like in case of the Forest Sheep tweed where one charge consists of 250 m of cloth. Also in many cases the product is available only seasonally like certain traditional cheeses. The big merchandising chains demand a steady supply of product to list and to promote it. So usually these products are promoted and sold only locally by on farm shops or at country fairs.

Information about biodiversity has improved much over the last years. Especially the homepages of institutions and organisations dealing with ecological problems provide a wealth of information about their projects. Some of them are listed in Appendix I.3.

2.1.2 Breeding strategy

2.1.2.1 Impacts on Austrian sheep breeding in general

Until recently sheep breeding was not a central interest of farmers. Beside the negative image of sheep compared to cattle – sheep were and are thought of as animals of the poor – there was no adequate promotion by breeders associations or agricultural organisations. Random cross breeding may enhance genetic diversity in theory but is generally not feasible for product quality. As a consequence the sheep common in the region varied greatly in type and productivity.

This has changed rapidly in commercial breeding during the last years: A few pedigree breeders now establish the basic animals by pure breeding. Animals not needed in pedigree breeding are used for commercial crossing. Imported non seasonal fine wool breeds with high fertility and good milking abilities (Merino) are used as mothers. The basic breeds are under intensive selection programs with no regard to inbreeding or genetic diversity. They are covered by rams of typical imported meat breeds (Suffolk or Texel) to establish slaughter lambs. When ewes of autochthonous breeds are in use replacement crossing with Merino is common. So within five to six generations the autochthonous genome is substituted completely.

2.1.2.2 Impacts on genetic diversity within the Forest Sheep

As to the Forest Sheep the low importance of sheep within the agricultural system affected them even more than other breeds.

For the breed the generally reduced number of sheep in the region led to a situation described in animal breeding as “genetic bottleneck”. Even if the head count of an old breed is re-established the loss of genetic diversity within the breed is irreversible.

The Forest Sheep population today stems from 154 individuals found in Bavaria, Austria and the Czech Republic at the end of the 1970ies. A few very original animals were found in the Mühl- and Waldviertel some years later and included in the breeding program.

Table 2.1.2.1 Forest Sheep registered in Herdbook

	male	female
until 1984	40	116
1986	0	4
1988	5	19
1990	9	57
1992	12	88
1994	21	185
1996	50	273
1998	52	397
2000	73	310

Genetic distancing (SÖLKNER et al. 2002) showed the Forest Sheep to be a distinctive breed with the next relations being another old Austrian breed the Alpine Rock Sheep (Alpines Steinschaf). Both breeds probably have their origin in the extinct Zaupelschaf which was described as a small fertile sheep with medium hairy wool. All colours were common, horns appearing occasionally in males and females. The breed was very hardy and the usual “land-race” in the whole region of Bavaria and Austria until the end of the 18th century when the first Merinos were imported. As the farms in the lowlands between the Alps and the Bohemian plateau could provide more and better feed and shelter they switched to the big framed Merinos. In the mountains the harsher climate with high rain fall in summer was unfavourable for fine wool sheep so the Zaupelschaf found a refuge there.

As an old saying goes the sheep “carries the pedigree on its back” meaning that crossbred animals especially crossings with fine wool sheep loose the typical medium hairy wool. Even after several generations of re-crossing with sheep carrying mixed wool the fine wool still can be seen in the fleece at the shoulder. Accordingly the first goal is to find animals with good wool quality which breed true for the trait. In large populations this is only a problem of selection but in an endangered breed it may easily lower population size to a critical extent. As a compromise animals showing slight crossing traits in the fleece at the shoulder were accepted into the herdbook until 31.12.2000.
A further negative impact was the Bavarian breeding program. As breeders in Bavaria get subsidies for buying first class rams only successful show animals were in demand. This led to very strict selection in ram lambs. Furthermore rams from big farms with many formally very correct offspring were preferred and others from small farms with only a few lambs per year were not represented at all.

As common in small populations inbreeding started to rise steadily after the first 3 generations of herdbook breeding reaching a maximum in the years 1995/1996 which mark the start of the first Österreiches Programm für eine umweltgerechte Landwirtschaft (ÖPUL, see chapter 7.1) in Austria.

Table 2.1.2.2 Inbreeding coefficient (WRIGHT 1931) in registered Forest Sheep in Bavaria and Austria

Year of birth	Inbreeding (%)		
	mean	min.	max.
1993	1,861	0	25
1994	2,394	0	31,25
1995	3,428	0	32,813

1996	3,425	0	31,25
1997	2,506	0	32,813
1998	2,709	0	25
1999	2,091	0	28,125
2000*	1,142	0	10,938
2001	0,753	0	9,375

* start of second ÖPUL Program

Thirdly a small isolated population of animals with close breeding is exceedingly sensitive to genetic drift meaning spontaneous changes in genetic diversity and loss of bloodlines even if random mating and a male to female ratio of 1:1 is supposed. Genetic drift probably is responsible for the genetic separation of the Alpine Rock sheep from the Forest sheep. Geographically speaking a wedge of Merinos separated the Zaupelschaf population in the region of Bavaria and Austria in a southern part in the Alps and a northern part in the Granite and Gneiss hills. The southern animals developed into the Alpine Rock sheep, the northern population became the Forest Sheep.

2.1.3 Missing markets

Meat: A market for lamb meat and mutton has only just arisen in Austria but now the demand is growing steadily. Consumption rose from 8.621 t in 1999 to 10.347 t in 2000 with inland production covering only some 83% (BUNDESMINISTERIUM FÜR LAND- UND FORSTWIRTSCHAFT, UMWELT- UND WASSERWIRTSCHAFT 2001/2002) of the demand. Part of it is the “welfare image” of lamb – low fat, easily digestible – and the animal welfare aspect consumers imagining nice lambs with their mothers in the meadow as a contrast to intensive pig farming with its negative image of mass production and pollution.

A market for mutton from grown animals is still almost non existent. As sausages of all kinds are a very traditional Austrian meat product this could be an outlet for surplus mutton if the negative image of mutton as a low quality meat could be overcome.

Wool: The current fashion trends in clothing favouring synthetics and cotton products are a severe impact on wool marketing. Additionally clothing is increasingly regarded as a short lived product and as a consequence has to be cheap. The traditional Austrian textile industry has almost vanished because of low price competition from foreign countries.

An alternative could be found in the popular Traditional Austrian Stile using high quality cloth made almost exclusively from wool, linen and very fine leather. Wool for knitting and skins for various purposes can enliven local markets and touristic

events. Spinning, felting and weaving as a hobby apply to many people and if these old techniques are taught a market for high quality natural wool is created.

2.2 Identification of adverse incentives with negative impacts on biological diversity

Until the last decade of the 20th century the local Agricultural boards were more concerned with propagating structural changes on farm than with preserving traditional knowledge, breeds, production methods and products.
Subsidies for arrondation of land were paid and resulted in cutting down of old fruit trees, hedges and shrubs to make room for bigger fields. Additionally ditches and small ponds were filled wet meadows drained and brooks regulated. During only 15 years 70% of small biotopes in the region vanished.

Old breeds were considered inferior by breeders associations and only modern high yielding breeds were made readily available to the farmer. Even if farmers wanted to keep the old breeds no pure-bred animals were acknowledged for breeding by the authorities. The existing herd-books for old breeds were closed down and intensive replacement crossing with modern breeds was introduced.
As a consequence the gap in profitability between old and modern breeds yawned wider accelerating the extinction of old breeds.

3. Implementation of market solution

3.1 How market creation contributes to resolving problem

3.1.1 Tweed as a traditional high quality product

Scottish Tweed is a high quality product with a well established market. Clothing made of tweed or “homespun” as it was called earlier forms an indispensable part of the British country style. Tweed is a rather heavy cloth weighing 450 to 500 g/m².

According to KUN (1995) only medium hairy wool is well suited for the traditional production of tweed. All old Scottish sheep breeds carry such wool which is used still for this special product. The Old German and Austrian Landrace breeds have a very similar wool quality. The Forest Sheep excels in fineness of the wool fibre. Therefore the wool is softer to the touch than wool of other Landrace breeds. This was the origin of the idea to produce a special Forest Sheep Tweed. After receiving a small sponsoring (ca. € 6000.-) by the local bank Sparkasse and the Austrian Society for Nature and Environment Protection (ÖGNU) for the start of the project the ÖNJ looked for a local partner to process the wool. It was found in the Textilwerkstatt Haslach being able to manufacture a traditional cloth in small charges. The seed financing also enabled the project management to set up systematic activities in marketing of the special product. A German expert in wool quality was invited and an appraisal of the unique properties and quality compared to other cloth was contracted.

The word “Tweed” describes a special technique in wool processing, dyeing and weaving. Usually nowadays the whole wool fat is removed by washing the raw wool. In tweed production the wool keeps a high percentage of natural fat after washing. This is responsible for the waterproof texture and special lustre of the cloth. On the other hand the remaining fat makes processing and dyeing more difficult. Modern high speed carding machines are unable to process wool with a high fat content. For the project an old carding machine built 1922 was found in Leipzig and purchased. This machine now does all the processing in the Textilwerkstatt Haslach.

The wool for the Forest Sheep Tweed is either used naturally coloured or dyed exclusively with natural plant colours. Because of the remaining wool fat and of the dyeing of the fleece instead of the thread the yarn after spinning is not homogenous in colour. The yarn is woven on old special looms at the Textilwerkstatt. In the woven cloth

the various colour shades appear as an attractive changing hue making the surface of the tweed multicoloured. This cloth weighs only 300 to 330 g/m² and is much softer than Scottish tweed. It can be used for Ladies fashion as well as for classic tweed clothing.

3.1.2 Description of market functioning: from production to consumption

The Forest lamb meat as a special product with high nutritional value and positive health image in the population found a ready market in the region. The local gastronomy worked as a multiplier enhancing direct sales from producer to consumer as well. An equally important role was played by satisfied consumers telling of the remarkable quality of the meat.

On the other hand the Forest Sheep Tweed is a very special product targeting at a small market segment with high quality and high prices. Trying to sell the tweed at local shops and at the manufacture did not work out well. A following analysis showed several causes. Firstly most consumers lacked information on the special properties of the tweed. Secondly the market for cloth generally is not very good as most people prefer to buy clothing ready made. Thirdly the classic country style connected with tweed is not traditional in the region. The manager of the Textilwerkstatt found a solution for part of this problem by presenting tweed samples at a meeting of the Upper Austrian Tailors Association. The second outlet was found by the Forest Sheep Breeders Association (Arbeitsgemeinschaft Waldschaf, ArGe Waldschaf) in promoting the tweed along with other Forest Sheep products on farm. To broaden the activities the ArGe Waldschaf contacted a Bavarian tailor selling special fit clothing via internet.

3.1.3 Why market creation was the preferred solution

3.1.3.1 *In situ* Conservation

Even the best gene conservation program will achieve nothing if no engaged and idealistic breeders can be found. Subsidies play an important role to establish *in situ* conservation programs. The drawback is that subsidies alone will not keep a breed alive on farm. Experience with other endangered breeds showed clearly that lending importance to old and endangered breeds by a special product enhances the popularity of the breed with farmers and consumers alike. However the product has to be sold. This can be rather easy if already existing markets can be used as was the case with lamb meat from the Forest Sheep. Here the local advanced

gastronomy did function as an outlet for the special meat providing the guest simultaneously with information about the breed, the extensive grazing project and the Ecologic Island scheme of the Naturschutz and more generally lamb as a special modern high quality food. As a consequence Forest Lamb sells readily either directly from producer to consumer or via small local butchers.

3.1.3.2 Special Product promotion

The Forest Sheep never was a classic meat breed. If Forest Lamb was the only product with a market the breed was liable to change rapidly into a single purpose breed losing the original characteristics of a hardy multiple purpose breed with special wool quality.

Wool products are traditional in the region and can be sold at local fairs and to tourists. In fact the new promotion campaign (2003) refers to the whole Mühlviertel as “Weavers Country”. The Textilwerkstatt Haslach has the technology and experience for manufacturing a very special product besides the usual fleecing, felting, spinning, producing knitting yarn and blankets and pillows from fleece. All these products can be seen at every local agricultural show but the Forest Sheep tweed is a unique product suitable to promote the breed as special.

For marketing an old and endangered breed the promotion in urbane surroundings is very important. Meat being a rather anonymous product the re-identification of the product by consumers is easier with unique product properties. For emphasising the exclusive and high quality the Upper Austrian Tailors Association was the best partner. An exquisitely tailored Forest Sheep Tweed jacket or costume is the best advertisement for the program and the breed.

3.1.3.3 Raising money and awareness for the project

Additionally to public funding and subsidies creating a market for and selling a high quality product contributes to the whole project in several ways. The farmers get better prices for the wool covering at least the costs for shearing. The Textilwerkstatt has a higher income for the processing of the wool than only for fleecing, dying and spinning and the ArGe Waldschaf gets the retailers margin.

Public awareness was increased much in September 2002. Celebrating the 20th anniversary the ÖNGENE presented all endangered Austrian breeds from horses to poultry at the biggest Austrian Agricultural Fair at Wels. In course of the exhibition which was visited by more than 80.000 people a jacket made of Forest Sheep tweed was presented to the Province Governor of Upper Austria. The whole project was presented at the occasion and the echo in the media was very positive.

4. Institutional underpinning

4.1 Institutions and legal context concerning animal breeding

With the ratification of the Convention on Biological Diversity (CBD) in 1995 the legal foundations for a comprehensive National Strategy for Implementation of the CBD were laid. The Republic of Austria acknowledged the general national responsibility for biodiversity and genetic resources. In the Strategy when dealing with farm animal genetic resources the founding of a National Focal Point (NFP) was a central demand. The NFP got operational with the founding of the Institute for Organic Farming and Biodiversity in Thalheim in Upper Austria (Appendix I, Fig. 1.1). A complete gene data base for endangered breeds is one of the main targets of the NFP. The Austrian Gene Bank situated at the Institute supplies breeders of highly endangered farm AnGR with semen for controlled breeding and documents the genetic state of the endangered farm AnGR in Austria.

4.1.1 “Österreichisches Programm für eine umweltgerechte Landwirtschaft” (ÖPUL)

This comprehensive program within the Council regulation EC 2078/92 contains ways for a more extensive, sustainable and ecologic agriculture.

The first ÖPUL contained measures for raising and keeping of endangered breeds with subsidies for participating breeders according to the Council regulation EC 2078/92. This program succeeded in preventing a further drop in population figures of all endangered breeds in the program. However it was not feasible in promoting sustainable gene conservation programs as pure breeding was the only requirement for joining the program. Furthermore the head count for breeds to be ranked as highly endangered was too restrictive and the list of eligible species and breeds was not complete. This was amended in the Council regulation EC 1257/99 and the regulation EC 445/2002.

In Austria all animal breeding matters are in the responsibility of the Provinces. This results in different legislation for animal breeding and the breeders associations responsibilities being limited to their respective Provinces.

With the second ÖPUL program starting in 2000 the NFP tried to eliminate this drawbacks.

4.1.2 “Österreichische Gesellschaft für Generhaltung” (ÖNGENE)

Founded as early as 1982 as a scientific organisation the ÖNGENE now functions as a national platform for all stakeholders involved in the conservation of endangered AnGR. At this forum the representants of the Animal Breeding Departments of the Provinces, the Ministry of Agriculture, Forestry, Environment and Water Management

(BMLFUW), the Universities for Agriculture and Veterinary Medicine, breeders associations and the biggest NGO dealing with conservation of endangered AnGR in Austria, the Verein zur Erhaltung alter Haustierrassen (VEGH) meet regularly. The ÖNGENE developed a coherent system for gene conservation programs which was acknowledged by the BMLFUW. For each endangered breed an Organisation in Charge (OC) was nominated. The OC is an acknowledged breeders association either official or a NGO and is responsible for the breeding standard, the breeding goal and the gene conservation program regardless in which Province in Austria the animals are situated.

Only animals registered in herdbooks are eligible for the program. The duty of registration remains with the breeders organisation in the federal counties; data have to be exchanged with the OC regularly. For most of the endangered breeds the herdbooks are closed now. For highly endangered breeds like the Forest Sheep with less than 1000 registered breeding females or an effective population size of < 50 (FALCONER 1989, SCHMIDT 1998) only planned mating is allowed to prevent inbreeding. The breeders get their mating plans yearly or on demand by the OC. The Institute functions as a control mechanism as the gene data base is updated once a year by the OC and data quality is checked. For breeds with populations in more than one country like the Forest Sheep an international register is recommended. In a yearly report the Institute informs the OC about changes in the population genetics. Several possibilities of lowering inbreeding in closed populations exist. In the Forest Sheep the number of eligible offspring per breeding animal is limited as well as the degree of inbreeding for the whole herd (BERGER 2002).
For information on the first effects of the program see Table 2.1.2.2

4.2 Institutions and legal context concerning protection of the environment and nature

At national level the WWF Austria together with the Austrian Chamber of Commerce has launched a joint project for the implementation of Natura 2000 to harmonise the interests of nature conservation with those of business. The Provinces and the federal government are responsible for preparing co-ordinated standards for matters concerning protection of nature, definition of protection targets and uniform indicators for measuring whether the targets are reached.

Legal measures for the protection of nature are in the responsibility of the Provinces.

At Province level projects for protection of nature are supported by the Province government and carried out mainly by NGOs. The ÖNJ Haslach was founded in 1974 and started the Ecological Island Project in 1984. The Project was supported by the Province government from the beginning and won the following prizes:

1985 Österreichischer Landesnaturschutzpreis

1986 Kosmos Preis, Umweltschutzpreis des Landes Oberösterreich

1987 Österreichischer Umweltschutzpreis

1991, 1992, 1994, 1995, 1996 Umweltschutzpreis des Landes Oberösterreich

1997 Henry Ford European Conservation Award

Today the project is part of the project “Böhmerwald” of the Foundation European Nature Heritage (Stiftung Europäisches Naturerbe, EURONATUR).

5 The role of information and uncertainty in the design and implementation process

5.1 Information about biodiversity value and environmental impacts

5.1.1 Regional approach

Since the start of the program an intensive information by the ÖNJ Haslach took place in the region at first mainly targeting at members and schools. From the founding of the ÖNJ Haslach in 1974 the practical work was centred on protection of endangered species and biotopes. Accompanying information at first included chiefly the young members of the group and local schools. The Ecological Island scheme of the ÖNJ Haslach started in 1984 with 1,9 ha of moor and has grown to 7 Ecological Islands representing widely different but typical biotopes of the region and covering 450.000 m². With official acknowledgement of the work and many prizes more widespread activities were possible. Professional pictures were taken and a very informative homepage now exists (see Appendix I.3). The projects – some of them continuing now for more than 20 years – are linked with Bavarian and Czechian activities in the Organisation “Grünes Herz Europas”.

5.1.2 General information

With the start of intensive information about biodiversity value in general in 1995 (CBD ratification in Austria) a broader approach was reached. The Association for Conservation of Endangered Breeds (Verein zur Erhaltung gefährdeter Haustierrassen VEGH) incorporated the Austrian Forest Sheep breeders into the regional gene conservation program together with Bavaria where the breed had been a registered breed since 1982. Genetic distancing of sheep breeds showed the Forest Sheep to be a genetically clearly defined breed (SÖLKNER et al. 2002, see 2.1.2).

The ÖNGENE published the brochure “Die gefährdeten Nutztierrassen Österreichs” (2002) with financial support from the BMLFUW. It contains detailed information about all 27 acknowledged endangered breeds in Austria as well as a summary of the gene conservation scheme.

5.2 Information about economic impacts:

The ÖPUL subsidies system for endangered breeds provides a better economic situation for mostly small farms in the region. These farms usually are worked part time and more than 50% of the Forest Sheep breeders practise organic farming.

Without the direct payments these farms would vanish rather quickly and many valuable biotopes would be lost. The economic situation of farms is monitored regularly by the BMLFUW.
For the Textilwerkstatt Haslach the economic situation which was very unstable has improved significantly with the project.
The marketing of Forest Lamb as a speciality by local inns and restaurants is an economic success and increases sales for the breeders as well.
In trying to preserve cultural knowledge the ÖNJ Haslach visits old farmers asking about and documenting farming methods, manufactoring methods like hand spinning and weaving, home made products and old breeds. Presently the ArGe Waldschaf is building an archive from old newspaper and journal articles and pictures about the history of the Forest Sheep.

6. Impacts on economy and welfare: what did market creation achieve in terms of economic benefits?

6.1 Measuring gains

6.1.1 Size of market (volume of sales)

Because of the small amount of product available at the moment the market has to be very small. The first charge of 250 m of tweed took more than a year to sell. Since September 2002 the demand is growing but production can only increase significantly if more high quality wool from Forest Sheep is available.
The tweed in a new product of the Mühlviertel. The reviving of old textile techniques in the region and acquiring of new production methods bettered the sales of the Textilwerkstatt. Besides tourism is increasing and especially soft tourism shows promising growth rates. The marketing strategy for the whole region as Weberland Mühlviertel emphasises the high estimation and importance of textile techniques and products.
At the time being no detailed analysis of orders from the Upper Austrian Tailor Association is available but a slight increase is noted.

6.1.2 Valuation of biodiversity gain (monetary/non-monetary)

As the direct monetary gain at the moment is very modest the most valuable achievement is the changed attitude of the breeders considering the gene conservation program now as important and the wool as a valuable product. The Forest Sheep as a breed has a significantly higher within breed biodiversity (BERGER 2002; SÖLKNER et al. 2002) than before the project.
Indirectly the whole region profits from the project with public relations and better tourist attraction but measuring these gains is above the range of this study.
As a second line of non-monetary gain the biotopes are grazed. Without sheep the grass would have to be mowed regularly causing work and the side problem of disposing of the hay. Furthermore the grazed areas show higher biodiversity and the reintroduction of a very rare plant. The Bohemian Gentian is re-established on the pastures of a Forest Sheep farm.

6.1.3 Welfare gains

The Textilwerkstatt employs 21 people in a structurally difficult region. Of the 21 workers 8 are handicapped people who could find no other occupation. As the

Textilwerkstatt is proud to do most of the wool processing for themselves the whole process can be seen and understood by the worker causing a positive identification with the final product.

7. Policy relevant conclusions

7.1 Transferability of the experience

Apart from the more special parts of the program the other conservation schemes in Austria work on a similar basis. The whole gene conservation strategy is built around *in situ* conservation as most important feature. If farm animals are to be kept in their natural surroundings there are several products available. One of them may be landscaping as in the Forest Sheep project or some Alpine projects with cattle, sheep and goats in Austria. But subsidies and landscaping alone will not prevent extinction of a breed. Besides a coherent breeding program to maintain genetic diversity within the breed and to minimise inbreeding a market for the products however small and regional has to be found or created.

7.2 Lessons learned

7.2.1 Networking

As almost all parts of the project were initially launched separately by different societies this shows clearly the importance of creating a network to tackle the problem from all sides simultaneously. Securing the Bohemian Gentian by extensive grazing was the basic idea at the same time trying to conserve an endangered breed. If farmers are to keep such animals there has to be a market for the products supplying at least a part of the costs. Beside the marketing of lamb and mutton as a regional speciality the special wool of the Forest sheep was considered an interesting raw product. Positioning wool products at the saturated market with the price for raw wool being so low proved a challenging task. The link with a social aspect – employing handicapped workers at the Textilwerkstatt – together with the development of a new high quality product was an effective argument in marketing. The farmers getting a better price for the wool suddenly considered their animals to be superior to other breeds with low grade wool. This helps to implement pedigree breeding and the gene conservation program as part of the ÖPUL. To market the product through the ArGe Waldschaf lowers the cost and builds further awareness for the unique quality among the breeders as does the promotion by the Upper Austrian Taylor Association. Finally the subsidies from the ÖPUL for the breeders recompense for the strict gene conservation program which is necessary to conserve an endangered AnGR for the future.

7.2.2 Funding

Sustainability in a project depends largely on the reliability of funding. In animal breeding and in landscaping the short time approach of projects fixed for a few years can cause problems (ÖNJ Haslach 1999). The development of a biotope takes years as proved with the Bohemian Gentian. After nearly 10 years of the project now the Bohemian Gentian starts to return to the grazed areas. If such a project stops too early or too suddenly the whole enterprise may collapse and the funds are wasted.

Funding in animal breeding gene conservation schemes has to think in breeding generations. For Forest Sheep the mean time for one generation is 3,6 years. This time is the average for a breeding animal to produce offspring fit for further breeding. A minimum of five generations is regarded as necessary to save a breed from extinction after a genetic bottleneck event. The roughly two generations of strict conservation breeding in Forest Sheep have so far resulted in a significant decrease in inbreeding as well as increasing the number of engaged and idealistic breeders from 30 to 63. If the ÖPUL would stop the gene conservation program the effect would probably be similar to the fate of the Sumava Sheep in the Czech Republic which decreased from nearly 20.000 head to less than 1000 during only 5 years following the stop of subsidies for landscaping in 1990. The current ÖPUL is secured until 2005.

In 2002 the Forest Sheep tweed project suffered a particularly difficult time as the Republic of Austria withdrew funds for the Textilwerkstatt and the enterprise was threatened with closing down. Fortunately the Province of Upper Austria has agreed to fund the social project for three years more to support the Textilwerkstatt as well as the Forest Sheep breeders.

7.3 Possible policy advice for implementation

The whole project shows the importance of an open and flexible structure. The unhindered flow of information between the GO and NGO sector is crucial. Instead of knitting together various different projects and enterprises much time and energy could have been saved if the necessary structures had been in place from the beginning. The NGO involved in the process especially the ÖNJ Haslach works very professionally in nature protection and documentation. Because of the low activity of the official side on behalf of AnGR until 1997 the animal breeding aspect was rather neglected. With the founding of the Institute for Organic Farming and Biodiversity and the involvement of the ÖNGENE an umbrella organisation for the gene conservation breeders was established. Clear structures and close links between organisations are

a must. The best way for officials to make such projects work seems encouraging the enthusiasm and idealism of all involved parties, facilitating technical and possible financial support as available and functioning as a platform for co-ordination and information for all.

A new Tweed from “Forest Sheep“ Wool
Quality production and the use of a sheep genetic resource for extensive pasturing

by Beate Berger, Department for Biodiversity of the Institute for Organic Farming and Biodiversity, Federal Research Institute for Agriculture in Alpine Regions, Austria

Summary

In the region „Mühlviertel“ in Upper Austria a quality production project was initiated to preserve valuable dry meagre pastures. In these pastures the Bohemian gentian *(Gentianella Bohemica)* is a typical highly endangered plant. It is adapted to poor sandy soil and does not tolerate long grass. As it vanishes quickly in intensive meadows or pastures or in fallow ground it is used as an indicator plant. These dry meagre meadows harbour up to 300 different species of butterflies and more than 200 species of grasses and herbs most of them threatened with extinction. The best means for preserving such habitats is extensive grazing. As most of the pastures are hilly and the nutrient value of the grass is poor only light hardy animals can be used. The climate in the whole region is harsh with cool summers and cold winters. Traditionally sheep have filled this role providing wool for clothing and meat as a by-product with almost no additional work load for the farmer.

During the last 50 years agriculture in this region has been intensified and most of the original ecosystems have vanished or are much diminished. Besides land use for the extension of recreation areas and buildings, afforestation and more intensive management of meadows and fields are the main problems. Sheep husbandry was abandoned almost completely in favour of dairy and dual purpose cattle.

In 1993 a suitable breed for the project was found in the autochthonous Austrian breed “Waldschaf” meaning “Forest Sheep”. This breed is well adapted to the region and can stand the climate with little or no shelter. The animals are rather small but very fertile with lambings all the year. They raise their lambs on grass or hay with supplements of minerals and salt and need no concentrates. They carry a special hairy medium wool with good technological properties for spinning and weaving. The breed is ranked in Austria as highly endangered and takes part in the Austrian Gene Conservation Program. Breeders receive subsidies for avoiding inbreeding by planned mating and genotyping their animals.

The meat of the lambs is of very high quality and finds a ready market in the region. Traditionally the wool (3 to 5 kg/Year) was seen as a nuisance. Usually in Austria prices for raw wool are lower than the fee paid for shearing. After a scientific analysis of the wool in 1995 certifying the unique quality the “Naturschutzjugend Haslach” (Youth for nature protection in Haslach) tried in co-operation with the “Textilwerkstatt Haslach” (textile workshop Haslach), the “Waldschaf” breeders organisation and the Institute for Organic Farming and Biodiversity to create and market a high quality product from the Forest Sheep wool. As a by-product the sheep graze nature reserves.

Originally the “Waldschaf” was kept as an addition to the cattle mainly for supplying the farmer and his family with clothing and some surplus meat in autumn when most of the young animals were slaughtered. The mixed wool has a high amount of very fine wool fibres, long kemp and even some short hair and differs widely from other breeds. This quality is well

suited for hand spinning and weaving and was used for knitted and Loden garments. If the animals are shorn twice a year fleece weight amounts to 3 to 4 kg of raw wool.

The idea was to provide an additional income from the marketing of the wool for the farmers and to create a unique product which is manufactured wholly in the structurally less favoured region.
The problems were
- to build awareness in farmers for high quality wool
- to collect the wool
- and after the technological problems had been solved to find a market for the product.

Most farmers keeping Forest Sheep take part in the project. The breed counts now about 1300 breeding animals (male and female). Most of the breeders are situated in or near the Mühlviertel. Organized by the breeders organisation, farmers bring or send the dry raw wool to the Textilwerkstatt Haslach, where the wool is washed and processed (including spinning and weaving) up to the fabricated “Waldschaf Tweed”. Instead of just getting a better price for the wool they have the possibility of taking back wool products and to use or market it on their own. This paid work method with direct marketing through the farmers brings a profitable price for the wool. At the same time some of the Tweed is marketed by the Textilwerkstatt in the factory shop.

The first charge of “Waldschaf Tweed” was produced in 1999 and two years later about 400 metres tweed were manufactured. It is a very light and soft tweed tanned exclusively with natural dyes. Because of the soft texture it is feasible for female clothes like skirts or blazers. In co-operation with the Upper Austrian Tailoring Association presentations were made at textile fairs and shows. Beside the marketing of the tweed in the Textilworkshop at Haslach breeders take part in the selling of tweed.

As a result of the first success with the high priced “Waldschaf Tweed” there was a need for additional advertisement and public relations: For example, in 2002 the Forest Sheep Project was presented at the biggest agricultural fair in Austria at Wels, and within the fair programme the “Landeshauptmann” (governor) of Upper Austria got a specially made tweed jacket sponsored by the project. This presentation of the Project was shown in all media and did increase sales significantly. At the same time this presentation contributed to raise public awareness for rare breeds and their benefits for preserving biodiversity rich habitats through extensive grazing.

The main problem of the project is the small amount of product available. For one charge of Forest Sheep Tweed the wool production of two years (four shearings) is necessary. A better strategy for collecting the wool is necessary. So there is still some need to improve the interface between marketing a high quality product like tweed and the extensive agricultural production through a special breed like the “Waldschaf”.

On the other hand the integration and interaction with the conservation project of Bohemian gentian *(Gentianella Bohemica,)* seems to be quite successful, as the scientific monitoring project of this endangered plant species, which is organized by the “Naturschutzjugend Haslach”, indicates that the populations of Bohemian gentian are stabilized at the pastures concerning.

Annex 1.2 Literature

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Annex I.3 Adresses and Links

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