McDonald's Europe Flagship Farms

Potatoes – Seefeld Farm, Austria

This case study shows how modern farming can provide environmental benefits for wildlife and biodiversity, whilst producing high-quality potatoes. It focuses on water management, soil testing, and demonstrates how by delivering consistently high-quality potatoes, supply contracts can be established.

In particular it highlights good practice in environmentally-sound irrigation techniques, the continued use of set-aside land to encourage biodiversity throughout the farm, and the use of effective soil testing to optimise quality crops while minimising negative environmental impact.

The McDonald's Flagship Farms scheme has been developed in co-operation with the Food Animal Initiative to showcase good agricultural practices which are environmentally sound, economically valuable and ethically acceptable. A limited number of 'flagship' farms have been selected from within the McDonald's supply chain to represent progressive agricultural practice.

The following matrix has been developed by McDonald's to help assess sustainability within the agricultural supply chain. Farms selected demonstrate good practice in at least one of the matrix key areas, whilst also operating to generally high standards in all other areas. The following matrix has been developed by McDonald's to help assess sustainability within the agricultural supply chain. Farms selected demonstrate good practice in at least one of the matrix key areas, whilst also operating to generally high standards in all other areas.

Symbols EN EC ET are used to highlight good practice in environmental, economical and ethical issues.

McDonald's Good Practice Matrix

✓ Good practices demonstrated in this case study

Ethical (acceptable practices) ET

Human health & welfare ✓
i Employee health & welfare
ii Food safety ✓

Animal health & welfare
i Nutrition
ii Medication & growth promoters
iii Genetic selection
iv Animal cloning
v Husbandry
vi Transport
vii Slaughter

Business ethics & supplier relationships ✓

Rural landscape preservation ✓

Environment (protecting the planet) EN

Climate change
i Greenhouse gas emissions
ii Energy efficiency & renewables

Natural resources – soil ✓
i Soil fertility & health ✓
ii Soil erosion, desertification & salinisation ✓
iii Soil contamination

Natural resources – water ✓
i Water pollution ✓
ii Water usage efficiency ✓

Natural resources – air
i Air emissions

Agrotechnology
i Agrochemical usage
ii Bioconcentration & persistent organic pollutants
iii Genetically modified organisms

Ecosystem protection ✓
i High conservation Value Land (HCVL) ✓
ii Habitat & species preservation ✓

Waste
i Production waste
ii Hazardous waste
iii Waste to landfill

Economics (long-term economic viability) EC

Sufficient high quality production ✓
i Producer income security & access to market ✓
ii Agricultural input costs ✓
iii Crop & livestock disease

Community investment ✓
i Local employment & sourcing
ii Support for community programmes ✓

Executive summary

Key areas of good practice:

RESOURCES

The unique water storage system for irrigation is incorporated within the ditches and wetlands on the farm.

These areas provide crucial habitats for the local wildlife and help to increase the levels of biodiversity.

The stored water allows the potatoes to be irrigated as soil moisture and crop requirements dictate, ensuring optimum growing conditions for the high-quality potatoes needed for processing.

MANAGEMENT

The farm has long-term set-aside, providing natural habitats for feeding and nesting wild bird populations.

Even with the abolition of compulsory set-aside, the farm appreciates the benefit that these areas provide.

There is also an extensive network of hedges and wildlife strips around the farm, bringing benefits to the wildlife and insects, and providing crucial interconnecting wildlife corridors.

INPUTS

The farm uses pig slurry which is produced by the estate's 1000-sow breeding unit, reducing the reliance on purchased artificial fertilisers.

A strict regime of soil nutrient analysis allows slurry to be applied accurately where required.

Low-level application followed by swift incorporation reduces ammonia (nitrogen) losses.

Additional areas of good practice:

INPUTS

Soil testing - the farm undertakes a regime of testing for phosphate and potash (along with trace elements and pH) on a four-yearly basis.

Mobilised nitrogen is tested in the autumn on land where cereal straws have been incorporated to ensure there is 90 kg N/Ha, to allow adequate breakdown of the straw in the soil.

Mobilised soil nitrogen is also tested in the spring; the farm's pig slurry is then applied to the land to ensure adequate nitrogen availability for the growing crop, reducing the need to purchase artificial fertilisers.

RESOURCES

There is sufficient centre pivot irrigation on the farm to irrigate around 800 hectares. Irrigation scheduling has been improved with the introduction of a Dacom system which measures soil moisture levels at three depths.

This allows precise monitoring of soil moisture levels and allows timely application of the correct amount of water to the crop, resulting in optimum water use and top-quality potato yields and grades.

OUTPUTS

The ability to grow quality potatoes has enabled supply contracts to be drawn up and signed between the farm and a local processor, thus setting minimum prices with quality bonuses in place.

This enables costing and profits to be accurately calculated.

Summary of actions and benefits

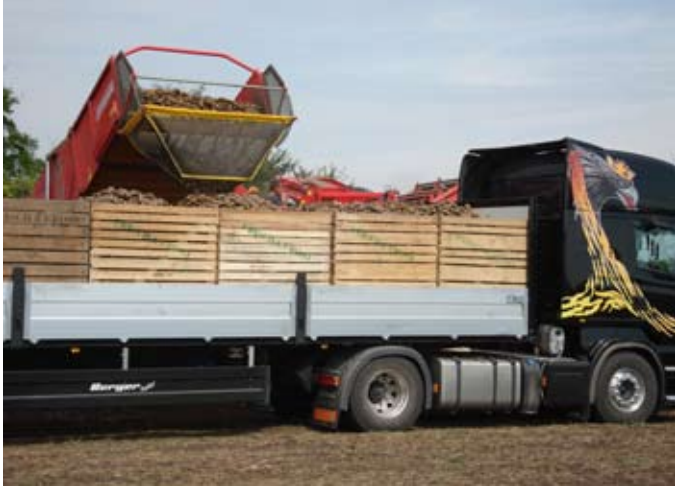
	Action	Benefits		
		Environment EN	Economics EC	Ethics ET
Management	Supply contracts drawn up between farm and processor.		Prices can be calculated prior to planting to ensure growing the crop is profitable.	Ensures the economics of the business and is an important part of the relationship between the farm and the processor.
	Long term set-aside left as wildlife habitats.	Provides a valuable food source for farmland birds and increases biodiversity.		Although the EU has abolished set-aside the farm feels these are important features for wildlife.
	Farm is inspected and approved under the Frisch & Frost Quality assurance scheme and GlobalGAP.	Environmental considerations within standards.	Allows potatoes to be more easily marketed.	Food quality/safety and staff welfare are areas covered.
Inputs	The Dacom soil moisture meters implemented.	Ensures accurate levels of irrigation and avoids excessive applications of water.	Potato yields/quality maximised and water costs controlled.	
	Regular soil sampling for NPK.	Prevents over-application and risk of water pollution.	Targeted applications, maximises yields and efficient use of nutrients.	
	Targeted use of pig slurry.	The carbon footprint of the farms arable enterprise is reduced as there is a lower requirement for artificial fertilisers.	Reduced dependence on artificial fertilisers which lowers production costs.	
Operations	Formation of ditches and wetlands.	Provide valuable areas for biodiversity and wildlife.	Stored water allows the farm to irrigate potatoes which maximises yield and quality.	Wetlands act as a large sponge which absorbs excess water from the river helping reduce flooding incidence. Aesthetically pleasing landscape for the local population.
Resources	Cover crop planted in autumn on land destined for spring planting.	Ensures any excess soluble nutrients are taken up by the plants and not leached out of the soil.	Spring ploughing of cover crops will return vital nutrients and organic matter back to the soil.	
	Centre pivot irrigation in use.	More accurate and efficient application of water over rain gun system – saving water.	Accurate irrigation leads to improved yields and grades and reduces overall water usage.	
Outputs	Good management and input control.	Average yield in Austria is 33 t/ha - the Seefeld farm is achieving almost 50% above this at 50 t/ha.	The controlled inputs combined with high yields improve the economics of potato production.	More food grown per hectare of farmed land.
Community	Stone tracks across the farm can be used by cyclists.			Allows the local community access to enjoy the countryside.

Introduction

Austria has a population of 8.3 million and covers an area of 83,872 km^2, with highly mountainous terrain. Over 3 million hectares are currently used for agricultural production, with some 4.4 million tonnes of cereals and 750,000 tonnes of potatoes grown annually (Source: Lebensministerium, 2006 and Eurostat 2008). There are 210,000 farms within Austria, with an average farm size of 16 hectares (average EU farm size is 18.5 hectares); only 1.5% of farms are in excess of 100 hectares. Agriculture accounts for 2% of Austria's GDP and employs around 7% of the workforce.

The Seefeld farm is situated in Lower Austria in the province of Hollabrunn, close to the Austrian/Czech border, approximately 80 km north of Vienna. The farm consists of 2,300 hectares of arable land, 42 hectares of vineyards and 450 hectares of forest. The estate has been owned by the Hardegg family since 1495, when Emperor Maximillian I sold the estate to Heinrich Prueschenk and bestowed on him and his descendents the title of Count Hardegg. The present Count, Maximillian Hardegg descends directly from Heinrich. Maximillian runs the farm with the help of one manager and six farm employees, although there is a total of 40 staff employed by the estate.

The farm grows an extensive range of crops, including winter wheat and barley, sugarbeet, maize, oilseed rape, spring barley and potatoes. Local annual rainfall is 480mm, with temperature ranges over the year from -20°C to 36°C. The continental climate produces hot, dry summers and cold winters, and the early summer rains facilitate good crop growth.



Management

Although the farm specialises in growing high-quality milling wheat, with the introduction and investment made in the irrigation system, high-quality potatoes can now be consistently grown, enabling supply contracts to be set up.

The farm has a supply contract with a local potato processor, setting out minimum grades which the potatoes are expected to reach, and incentives and bonus payments for quality above that stated in the contract. The contract enables the farm to calculate the profitability of the potatoes and allows inputs and management decisions to be implemented accordingly. Without this, the potatoes would be sold into the "spot market", possibly at a lower price, therefore forfeiting any potential profits. The contract also benefits the processor by assuring a designated supply of a specific grade.

By working together to achieve what is fundamentally the same goal (to produce a saleable product and maximise profits), the farm and the processor are able to improve their business relationship and profitability.

EC

Investment in production practices ensures a strong supply of high-quality potatoes, enabling local supply contracts to be agreed.

Voluntary set-aside was introduced in the EU in 1988 and was designed to reduce overproduction in European agriculture, becoming compulsory from 1992. In 2008 the set-aside rate was set at 0% and from the Single Payment Scheme year of 2009, compulsory set-aside was abolished.
Set-aside land has played a significant role in the preservation of biodiversity, in particular in intensively managed, mono-cropped arable landscapes. It provided ideal habitats for several animals and plants, including weeds, insects and birds. Between the 1st April and the 30th June these areas were required to be left fallow, enabling many species to complete their life cycles there. Set-aside land therefore provided important food sources and habitats for birds and other wildlife, especially in areas dominated by intensive agricultural production. With the abolition of set-aside there could be a serious decline in farmland bird populations which relied on these areas.

The Seefeld farm still has 70 hectares of long term set-aside, along with 100 hectares of wetland and 40 hectares of hedgerows and beetle banks; almost 10% of the farm's arable land. The farm is aware that the loss of these important areas for wildlife and farmland birds could have a dramatic affect on local biodiversity and bird populations. A research project undertaken on the farm by the Game & Wildlife Conservation Trust concluded, "It appears that it is the high number of surviving chicks that is responsible for the high pheasant density at Seefeld. Insects, on which wild pheasant chicks are dependent for the first two weeks of life, were abundant in game covers and set-aside. The higher numbers of insects are mainly due to the relatively hot dry summers that Austria experiences, but minimal use of pesticides and the careful siting and provision of brood-rearing areas no doubt increase the availability of insects for pheasant broods too". (Full report in Appendix.)

Management (continued)

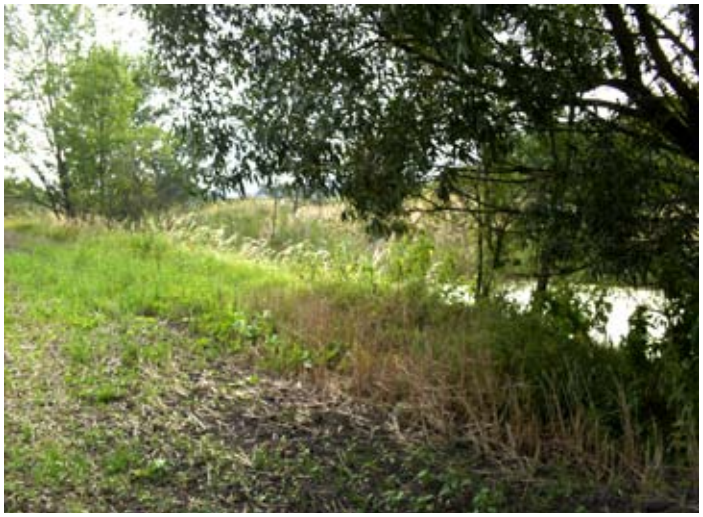
Conclusion of "The importance of set-aside for biodiversity"

By introducing an obligation to turn 10% of a farm's land into an Environmental Priority Area, the alarming decline of farmland species can be limited. At the same time, an ecologically compatible cultivation of these areas is possible. The guideline could easily be integrated into the CAP's system of obligations for receiving direct payments under Pillar I. The design and specific management of EPAs could be additionally supported by agri-environment schemes (payments under Pillar II).

(Source: Facts and recommendations for the establishment of Environmental Priority Areas (EPA) within the Common Agricultural Policy, NABU 2008)

"...a corresponding decline in farmland birds linked to the abolition of set-aside is inevitable".

The Royal Society for the Protection of Birds (RSPB)



In the UK the Secretary of State, Hilary Benn, has challenged farmers and growers to shoulder their environmental responsibilities to ensure that the environment does not suffer as set-aside land disappears. (From this statement it could be assumed that if farmers do not undertake measures then regulation may follow).

Another important aspect of the farming policy at Seefeld is that the average field size is 20 hectares. This is a size which is small enough to be beneficial to local biodiversity while being a sufficient size to be farmed economically.

The farm is inspected under the requirements of the Frisch & Frost farm assurance scheme and the globally recognised GlobalGAP standard, which is inspected thoroughly by the Internationally Accredited Austrian State Company (AMA Gütesiegel). The schemes are primarily designed to maintain consumer confidence in food quality and safety, and to cover other important issues such as minimising environmental impacts, optimising the use of inputs, implementing good agricultural practice, ensuring legislation is followed and guaranteeing that staff health and safety is central to working practices. This ensures that the production of potatoes on the farm is fully compliant with the requirements of the McDonalds Agricultural Assurance Programme (MAAP). *http://www.flagshipfarms.eu/sa4.php*

EN

The farm's long-term set-aside land provides important habitats for local wildlife.

Inputs

Agriculture is a significant consumer of water and the sustainable use of water within the sector is an escalating global issue. Water is required in order to produce profitable, high quality potatoes; the quality is highly dependent on timing, uniformity and volume of water applied. The profitability of potato production is heavily influenced by irrigation management, and correct irrigation applications during tuber initiation is vital. If water stress occurs during initiation, fewer tubers are set per plant thus reducing total yield. Water stress during the potato bulking stage reduces tuber size and results in misshapen potatoes. Dry matter and specific gravity can be reduced whilst other aspects such as common scab and hollow heart can be attributed to poor water management during potato sizing. The sugar content in the stem-end may also be increased, affecting processing quality.

The Seefeld farm has taken the issue of water for irrigation very seriously. From the inception of the water storage initiative on the farm (see Operations), water has been used to the benefit of the local environment, while providing economic and production advantages required for modern potato cultivation. The farm has invested in a Dacom system of soil moisture meters which are placed in the potato fields at three depths (in the region of 10, 30 and 50cm). These then measure soil moisture levels, allowing the farm to monitor and adjust irrigation levels to match soil conditions and crop requirements.

'Currently, significant proportions of irrigators do not use scientific methods for irrigation scheduling but rely on personal experience and judgment; significant water savings could be made by improving the uptake of existing technology'.

(Source: DEFRA Science and Research Opportunities for reducing water use in agriculture (WU0101))

Irrigation is provided by a centre pivot system which is capable of covering 800 hectares of the farm. Irrigating the crop in a timely and cost-effective way is crucial; as little as one episode of water stress can have severe consequences on potato quality, affecting grades and prices paid. The centre pivot system, although expensive to install, does have labour saving benefits and the ability to accurately apply the required amounts of water to the crop.

Total yield generally is unaffected by one brief episode of water stress, but reduced tuber quality can render the crop unprofitable.

(Source: Eldredge et al, 1992)

EC

EN

Innovative water storage solutions, combined with investments in modern monitoring and irrigation techniques, ensure that water use is optimised, minimising waste and maximising crop quality.

Inputs (continued)

The farm is acutely aware that fertilisers can be a major source of water pollution, causing water nutrient levels to rise, which can trigger algal blooms within rivers, affecting the natural aquatic balance. Limiting fertiliser use via careful planning potentially saves the farm money and reduces any negative environmental impacts. Therefore, routine four-yearly soil tests for potash and phosphate are undertaken to ensure reserves are maintained, but not exceeded.

'The use of phosphate and potash fertilisers should be based on regular soil sampling and laboratory analysis. Under most cropping systems, the soil nutrient status only changes slowly and it is safe to use soil analysis results as a basis for fertiliser recommendations for up to 4 years from the date of sampling. Soil sampling and analysis should therefore be carried out approximately every 4 years'.

(Source: DEFRA Fertiliser Recommendations (RB209) 7th Addition)

The farm also tests the soils for mobilised nitrogen levels in the autumn and spring. Testing in the autumn is undertaken to ensure there is an adequate level of nitrogen (target of 90 kg N/Ha) in the soil to aid in the breakdown of incorporated cereal straw from the harvested crop. An insufficient level of nitrogen in the soil leads to possible nitrogen deficiencies in autumn sown crops and inadequate breakdown of incorporated organic matter.

Nitrogen is essential for microbial growth and therefore in the breakdown of organic matter. If the added material is low in nitrogen (such as; cereal straw) microbes will compete with higher plants for nitrogen. This may result in a nitrogen deficiency, if supplemental nitrogen is added, decomposition is stimulated. Often, animal manures can provide all or a portion of this requirement for extra nitrogen.

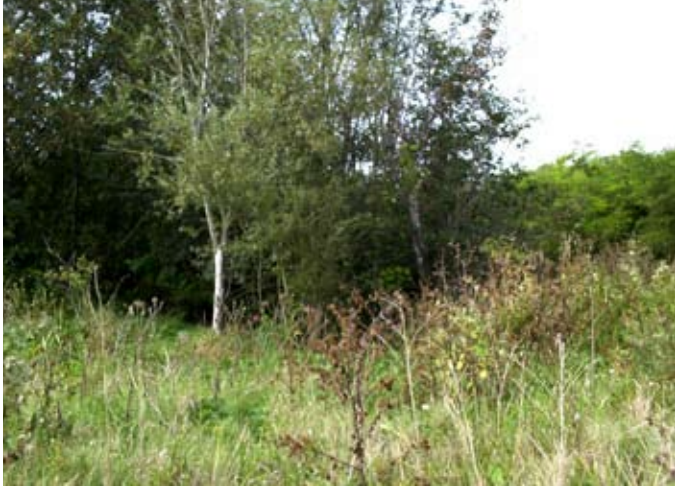
(Source: Decomposition of Organic Matter in Soil)

Mobilised nitrogen is also tested in the spring to guarantee that the required levels of nitrogen are made available for the growing crop. Pig slurry is used to supplement soil nitrogen levels (and phosphate/potash), and is applied to the land using low-level application techniques, followed by swift incorporation into the soil which minimises loss of ammonia. The targeted and specific use of pig slurry allows the farm to reduce its dependence on purchased fertilisers and in turn decreases the farm's carbon footprint (as the production of artificial nitrogen fertiliser relies on the use of fossil fuels in its manufacture).

EC

EN

Regular soil testing, combined with the targeted application of the farm's pig slurry, ensures the farm applies the optimal amount of fertiliser to produce a strong crop while limiting negative environmental impact.



Operations

A wetland has soil saturated with moisture, either permanently or seasonally, and may also be covered partially or completely by shallow pools of water. Wetlands are considered the most biologically diverse of all ecosystems and, due to their lack of potential financial benefits, have historically been the victims of large-scale draining for agriculture and building development, or flooding, for use as recreational lakes. By 1993 around half the world's wetlands had been drained. Wetlands are very effective at filtering and cleaning water and recently, more focus has been put on preserving wetlands for their natural function.

Since the late 1980s the farm has undertaken a number of impressive environmental programmes, one being the large-scale construction of ditches across the farm, and another being the formation of wooded wetland areas. These were constructed to hold water; to enable the formation of wildlife habitats, and as a storage facility for irrigation water. These areas have benefitted the farm economically, as they have enabled other crops to be planted and grown in areas which have traditionally suffered from drought over summer months. By having the wetlands, the farm can reduce flooding by holding back peak water flows when water levels are high, and can store water within the wetland. This results in more gradual discharges of water over longer periods of time, protecting downstream farmland and property from flood damage.

EN

The construction of wetland areas has provided the farm with a valuable water resource while encouraging wildlife and preventing regular flooding.

Belleuropa is a yearly award promoting outstanding initiatives of land rehabilitation and biodiversity enhancement in EU rural lands. In 2008, the jury awarded the prize to Maximillian Hardegg; it was given by Corrado Pirzio Biroli for the rehabilitation of the local river and the creation of wetlands and valuable habitats on Seefeld Estate.

"The northern parts of Lower Austria are among the driest farming areas in the Country. Some 20 years ago, after suffering from severe droughts, we began to create irrigation systems and water storage facilities such as ditches and ponds. Completing this project took much time and effort. Today, we have a complete network of 25 km^2 of wind breaks, water ditches, habitat zones and beetle banks for wildlife. There is a small river, the Pulkau, which runs through the estate for 11km. We restructured the river, raised the river bed level and connected small woodlands and ditches to the river. Today we see the benefits of this work in a favourable micro climate, improved flood prevention and a balanced water household."

Maximillian Hardegg

Resources

The farm plants a green cover crop during the autumn for fields which are to be sown in the spring. If these crops are established early enough they can reduce nitrate losses from the soil, as this is used by the growing plants. This also provides the benefit of reducing the risk of soil erosion, as the growing crop covers the soil and the root system helps bind the soil particles together, avoiding windblown erosion. In the spring, the green crop is incorporated into the soil, adding extra organic matter and providing key nutrients which improve growing conditions for the following crop.

Potential benefits of cover crops are numerous:

1. *Reducing the impact of wind and water passing over the soil surface can reduce erosion.*
2. *Adding organic matter to soil improves its physical condition, or structure.*
3. *Competing for light, water and nutrients may suppress weeds.*
4. *Crops growing late in the season can capture and "recycle" soluble nutrients otherwise lost.*
5. *Providing cropping system diversity may create habitats for beneficial insects.*

(Source: Cover Crops and Green Manures by Vern Grubinger)

Outputs

With the improved management system and implementation of good agricultural practices, the farm's potato yield has increased to 50 tonnes/hectare, over 50% above the Austrian national average of 33 tonnes/hectare. (Source: Eurostat 2008)

Community

The farm has a network of stone tracks which are used as the farm's transport route around the estate. This is also accessible to the local population as cycle tracks, providing a valuable resource and giving easy access to the countryside.

Appendix

Pheasants in Austria by the Game & Wildlife Conservation Trust

Key findings

- *Predation rates of pheasants at Seefeld, Austria are similar to those at Loddington and Tendring Hall in the UK.*
- *Pheasant nesting success is lower at Seefeld than at Loddington or Tendring Hall.*
- *Two in three chicks survive at Seefeld, compared with fewer than one in three on typical managed wild pheasant estates in England.*
- *Chick-food insect availability is high at Seefeld, due to hot, dry summers.*
- *Minimal use of pesticides and careful siting of brood cover at Seefeld increases availability of insects for pheasant chicks.*

In 2003 we completed the final year of our wild pheasant study at the remarkable Seefeld Estate in Austria, which has among the highest densities of wild pheasants on record. The study enabled us to investigate in detail the survival, nesting and brood-rearing ecology of the pheasants and to find out why they are so successful there. The results of the research are applicable to the way we manage wild pheasants in Britain because the estate is a 2,400-hectare efficient arable farming enterprise managed in much the same way as most large British lowland estates that have an interest in shooting.

In collaboration with the University of Georgia, USA, we have radio-tagged and monitored 127 hen pheasants during the last three breeding seasons. We have collected information on the habitat selection of the hens during the pre-breeding dispersal period, the mating and nesting season and during the brood-rearing period. We have studied the nesting success of the birds and the survival of hens and broods. We also collected data on the diet of chicks and availability of insect chick food in different habitats.

Over the three years of the study, 60% of the radio-tagged hens survived the breeding season. Of the 40% that died, the majority of deaths were due to fox predation during the egg-laying and brood-rearing periods, although very few hens were lost while actually incubating their clutch. The levels of fox predation were very similar to predation rates on managed wild pheasant estates in Britain. We monitored 89 nests in the study, the majority of which were in cultivated fields and set-aside land. Set-aside was the habitat chosen most for nesting when the relative areas of all the habitats are taken into account. The proportion of nests that hatched was 41%.

In our radio-tracking studies in Britain, wild pheasant nesting success was 52% at Loddington (Leicestershire) and 49% at Tendring Hall (Suffolk). Of the nests that did not hatch, predation was responsible for the majority of losses. It is not surprising that nesting success was lower because there are a much wider variety of potential nest predators (both mammalian and avian) at Seefeld. However, after losing a nest, virtually all the hens attempted a second or third clutch.

We monitored 20 different broods and analysed their survival, diet and habitat use. They spent a lot of their time in cereal crops, set-aside land and sown game cover. Considering the relatively small areas of set-aside and game cover available, these were the habitats that were strongly selected by broods. Detailed analysis of the brood home ranges enabled us to find out exactly which types of areas they chose. For example, although broods used reedy areas infrequently, many broods selected home ranges that contained reed grass. Perhaps they use it as potential escape cover from predators?

Appendix (continued)

This information can help us site and manage our brood-rearing covers more efficiently and highlights the importance of distributing brood-rearing cover around the farm. The average brood size was 5.9 and chick survival was 67%. In Britain, on managed wild pheasant shoots chick survival is typically around 30%. (see Table 1)

Table 1
Breeding success of wild pheasants in Britain compared with Austria

	Britain	*Austria*
Hen survival (Apr-July)	*50-60%*	*60%*
Average clutch size	*11*	*10*
Nest success (% of nests hatching)	*50%*	*41%*
Chick survival	*30%*	*67%*

It appears that it is the high number of surviving chicks that is responsible for the high pheasant density at Seefeld. Insects, on which wild pheasant chicks are dependent for the first two weeks of life, were abundant in game covers and set-aside. The higher numbers of insects are mainly due to the relatively hot dry summers that Austria experiences, but minimal use of pesticides and the careful siting and provision of brood-rearing areas no doubt increase the availability of insects for pheasant broods too.

"Sustainability was not a word which was greatly used in the 1980s to describe many agricultural practices; this is what makes the investment in the environmental infrastructure at the Seefeld farm even more remarkable. The approach taken was two pronged, the benefits to local wildlife and biodiversity was clear (as it should be with any project of this type), but one of the unique features of the project was the advantages it provided to the farming system. The natural water storage capabilities of the wetlands and ditches is a great benefit to biodiversity and wildlife populations and this stored water also allows crops to be irrigated, which ensures yields and quality can be maintained even through the driest summers. The Seefeld farm is a testament that modern farming techniques can work with, and to the benefit of, the environment".

Karl Williams