



## McDonald's Europe Flagship Farms Potatoes – DexTerra Farm, Germany

### Introduction

This case study shows how small family farms can work together to build an economically viable and diverse business, whilst enhancing the local environment and benefitting the local community.

The key initiatives undertaken by DexTerra can be summarised as follows:

- The farm is GlobalGAP assured. The environmental requirements ensure that production methods do not adversely affect the natural environment, and the assurance improves marketability of produce grown.
- The business has incorporated the Argus decision support system within its blight management and pest control strategy. This ensures plant protection products (PPP) are used when there is a calculated risk, optimising the timing for PPP application, reducing pesticide use, and saving money.
- Global positioning system (GPS) technology is fitted to the sprayer, enabling accurate application of PPP and ensuring that crops receive the correct amounts of necessary product. This accurate application optimises pest, disease and weed control.
- DexTerra has merged with ten other local farms, now encompassing approximately 1,000 hectares of land. This has enabled the company to restructure and streamline the businesses, benefitting from economies of scale and reducing fixed costs per hectare.
- The business has diversified into renewable energy with the construction of a 700 KwHr anaerobic digester (AD). This has enabled the business to provide full-time employment to one of the families involved in the company and is also a profitable diversification development.
- The business has made and erected 82 bird boxes around the farm, which had a 87% occupancy rate during the 2011 nesting season. There has also been a trial plot of flowering plants sown in one of the wheat fields to encourage increased insect activity, insects being an important food source for the local bird population.
- The farm plants a strip of sunflowers alongside one of the public footpaths specifically for the local villagers to cut and take home.
- A small trailer was given to local teenagers, which has been converted by them into a hang-out on a piece of land just outside the village. This has helped build a strong relationship between the farming business and the local community.



“DexTerra is very proud to have been selected as a flagship farm. We consider this as confirmation that our form of agriculture is sustainable and focused on the future.

We will continue to work with our partners from the processing and distributing industry on the development of agricultural practices and look forward to sharing experiences and new technologies with farmers from all over Europe. ”

DexTerra

## Summary of actions and benefits

The table below summarises the key areas of good practice displayed by DexTerra Farm, and the benefits (EN environmental / EC economic / ET ethical) that arise from taking these actions.

	Action	Benefits
<b>Certification / assurance</b>	GlobalGAP assured	<ul style="list-style-type: none"> <li>EN Environmental requirements within standard ensure that production methods do not adversely affect the natural environment</li> <li>EC Improves marketability of produce grown</li> <li>ET Requirements covering quality, food safety and staff welfare are all independently checked and verified</li> </ul>
<b>Agrotechnology</b>	Argus system used for blight management	<ul style="list-style-type: none"> <li>EN Ensures plant protection products are only used when necessary and application levels are set by the agronomist</li> <li>EC Accurate timing of PPP to give the best outcome on control for the financial investment</li> </ul>
	GPS system used on sprayer	<ul style="list-style-type: none"> <li>EN System ensures no over-application of PPP</li> <li>EC Accurate application of PPP ensures precise quantities are used to achieve the required results giving the best financial outcome</li> </ul>
<b>Sufficient high quality production</b>	Consolidation merger – of 11 farms over 1,000 hectares	<ul style="list-style-type: none"> <li>EC Economies of scale can be maximised and fixed costs per hectare reduced</li> <li>ET Maintains small-business experience</li> </ul>
<b>Energy efficiency</b>	The business has diversified into renewable energy	<ul style="list-style-type: none"> <li>EN Anaerobic digester (AD) producing 700 KwHr from renewable energy which reduces carbon emissions</li> <li>EC Extra income source for the farm with a guaranteed price paid for the electricity generated</li> <li>ET Has allowed the full employment of one of the families within the group</li> </ul>
<b>Soil health</b>	AD digestate used on soil	<ul style="list-style-type: none"> <li>EN Removes need for non-organic fertilisers</li> <li>EN AD digestate used as natural fertiliser reduces costs</li> </ul>
	Minimum cultivation policy	<ul style="list-style-type: none"> <li>EN Reduces soil disturbance and helps increase earthworm numbers, which in turn improve soil structure</li> <li>EC Reduces crop establishment costs</li> </ul>
<b>Water</b>	Irrigation wells sunk on farm	<ul style="list-style-type: none"> <li>EC Ensures yield quality and profitability in times of low rainfall</li> </ul>
	Sprayer loading area concreted	<ul style="list-style-type: none"> <li>EN Any spillages can be cleaned up and not affect local water quality</li> <li>EC Limits the risk of pollution hazard and potential fines for causing pollution</li> </ul>
	20 metre maize buffer strips planted along watercourses	<ul style="list-style-type: none"> <li>EN Reduces possibility of any chemicals/fertilisers inadvertently getting into water courses</li> <li>EC The maize is used as a feedstock for the anaerobic digester which gives a return on investment</li> </ul>
<b>Biodiversity</b>	82 bird boxes and planting of flower strips	<ul style="list-style-type: none"> <li>EN Increases bird populations on farm</li> <li>EN Increases insect activity</li> </ul>
	Sunflowers planted along public footpaths	<ul style="list-style-type: none"> <li>EN Increases insect levels which are an important food source for birds</li> <li>ET Local people are allowed to cut the flowers and take them home</li> </ul>
<b>Community</b>	Amenities given to local young people	<ul style="list-style-type: none"> <li>ET Local young people have an area to hang out without disturbing local residents</li> </ul>

Please see Appendix for DexTerra's Good Practice Matrix

## Background

The DexTerra farm is situated in Schellerten, in the heart of the “Hildesheimer Börde”, a region well known for its fertile agricultural land and production of potatoes and sugar beet. The average farm size in this region is 65 hectares and these small, family-run farms are finding it increasingly difficult to survive as a viable enterprise. This situation led to a few farmers grouping together to form DexTerra. This is now a business partnership of 11 local farms joined to form a larger, more efficient business. The business now farms approximately 1,000 hectares and has reduced costs, improved negotiating power and increased skill base within the business. The farm grows 110 hectares of potatoes (Russet and Innovator for McDonald’s French Fry production) on contract to Agrarfrost. The rest of the rotation is made up of 460 hectares of wheat, 240 hectares of sugar beet, 40 hectares of barley and 150 hectares of maize.

### Facts: Farming in Germany

Germany consists of a total of 35,705,000 hectares of land with around 48% (over 17 million hectares) used for agriculture. Of this, 33% is devoted to crop production. Agriculture accounted for 0.9% of Germany’s GDP in 2009. The main crops grown in Germany are sugar beet, wheat, barley and potatoes. Potato production in Germany has been in decline since 1960 when production was almost 33 million tonnes. Despite this, Germany is the biggest potato producer in Western Europe and the seventh largest producer in the world; output in 2011 was over 11 million tonnes. Currently 3% of Germany’s agricultural land is planted with potatoes with the average yield in the region of 40 tonnes/hectare (average European potato yield in 2010 was 17.7 t/ha).

*(Source EUROSTAT; FAOSTAT)*

## Certification / assurance

### GlobalGAP assured

The farm is GlobalGAP approved and is independently inspected and certified, with the farm being audited under the requirements of the scheme. GlobalGAP is primarily designed to maintain consumer confidence in food quality and safety.

Other important objectives of the scheme include ensuring that the farming operation has a positive impact on the environment, optimising the use of any inputs through best practice, and guaranteeing a responsible approach to worker health and safety.



### Facts: GlobalGAP

The GlobalGAP assurance scheme for potatoes has a 100% compliance score as assessed by the McDonald’s Agricultural Assurance Program (MAAP), this currently means (based on 2009 figures) that all the requirements of MAAP are encompassed within this scheme.

*(MAAP Supply Tracker database, 2010)*



## Agrotechnology

### Blight management & Argus

Late blight or potato blight is caused by the oomycota *Phytophthora infestans*, meaning 'infesting plant destroyer'. A *Phytophthora* outbreak is able to kill a field of potato plants in a few days. Early blight is caused by *Alternaria solani* and is also often called 'potato blight', but is less damaging than *P. infestans* and is easily controlled as part of the routine for controlling late blight.

Symptoms include the appearance of dark brown blotches on the leaf edge/tips and on the plant stem. White mould may appear under the leaves in humid conditions and the whole plant can quickly collapse. Tubers stop growing when around 75% of the canopy has been destroyed. It is estimated that worldwide the disease costs around £3.5 billion (€4 billion) every year.

Regular preventative applications of fungicides are required, as applications are ineffective once infection has taken place. Common practice is to routinely spray the crop every 7–14 days, but this can be less frequent during prolonged dry spells.

DexTerra has introduced the Argus monitoring system, a decision-support mechanism for the management of late blight and early blight, which provides a predictive disease risk assessment for the coming days. The system then recommends when to spray and what type of chemical to use (whether contact, translaminar or systemic) and application rates. The Argus monitoring system enables effective spraying programmes thereby supporting the lowest possible use of chemicals for the control of blight and the application of the most effective chemicals where necessary. The benefits of the system have been demonstrated in field trials (see graph).

### GPS on sprayer

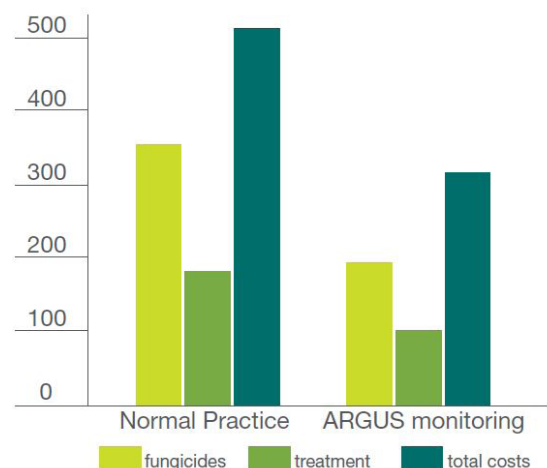
A Global Positioning System is fitted to the sprayer to decrease pesticide application inaccuracies by limiting overlaps. This is achieved by automatically switching boom sections off when they pass over a previously sprayed area, or when they go beyond field boundaries.

This system reduces overlaps, saves on chemical inputs (and their associated cost), limits crop stress, and reduces application time and operator stress (as the driver does not have to calculate when to switch off the sprayer). One study revealed a significant 6.2% reduction in off-target application after fitting a GPS system to their sprayer.

“Our primary interest is the increase of eco-efficiency in conventional as well as in eco-farming due to the ecological reduction of fungicide spraying. Knowing the biology of the plant pathogens and additionally the weather conditions in the fields we can calculate the best application times, the amount and the chemical properties of the fungicides needed. Thus the fungicide input in potato production is typically reduced down to approximately 65% compared to the common practice. In all crops we try to give the farmers the security of the absence of plant diseases in order to produce high quality food.”

Dr. Marcel Thieron – Argus Monitoring

Costs in potato plant protection 2009 (€/ha)



## Sufficient high quality production

### Consolidation

Small, family-run farms are finding it increasingly difficult to maintain their financial viability. Capital constraints affect the ability to invest in new equipment and adopt technical innovations. Small businesses also have limited negotiating strength when dealing with the market. Nevertheless, there are several benefits of being a small business; one of which is the ability to maintain strict control of all aspects of operations.

Through consolidating smaller, family-run farms, DexTerra now manages approximately 1,000 hectares and is a considerably larger business which benefits from economies of scale.



The consolidation of 11 small, family-run farms into one business has provided the local people with employment while generating economies of scale.

“ It appears that larger farms are more likely to have the resources, flexibility and entrepreneurship to pursue diversification. ”

DEFRA Farm Diversification Benchmarking study 2002

However it still benefits from the ‘small business experience’ that the personnel bring, and maintains strict control by appointing a manager to each crop. This allows each manager to react quickly and flexibly to any issues arising, and to develop close personal relationships with stakeholders.

## Renewable energy

### Anaerobic digester

DexTerra has diversified into renewable energy with the construction and commission of a 700 KwHr anaerobic digester. The unique aspect of this diversification project is that it fits perfectly within the current farming system and in part makes use of the existing personnel skill base and the resources that the farm has. The main reason for diversifying was to ensure the economic viability of the business, now and into the future.



Diversification into renewable energy has provided a regular income stream for the business while reducing carbon footprint and providing employment for one of the farming families.



The facility is being run exclusively by one of the farmer members of DexTerra, providing them with full-time employment and a regular income.

The final product of the anaerobic digestion process is a liquid containing solid organic materials (digestate). This is a nutrient-rich fertiliser which is spread on the surrounding farmland. This has several benefits as the organic matter improves the soil structure and this in turn improves soil fertility, water infiltration and retention. Ultimately this reduces the requirement to purchase artificial fertilisers, lowering input costs and improving the economics of the business. The other major benefit is that it reduces the farm's carbon footprint due to the decrease in use of artificial fertilisers which are very energy intensive to manufacture.



Benefits of using digestate are:

- It can be used as a direct replacement for inorganic fertilisers (as the nutrients are mineralised during the AD process).
- Cost savings of up to £180 (€205) per hectare.
- 5 tonnes of CO<sub>2</sub> equivalent saved for every tonne of artificial nitrogen displaced.
- Contains good levels of phosphorus which is a finite resource (in 2007, it was estimated that at the current rate of consumption, the supply of phosphorus would run out in 345 years. However, scientists are now claiming that a “Peak Phosphorus” will occur in 30 years and at current rates of use, reserves will be depleted in the next 50 to 100 years).

## Soil health

### Use of organic digestate

Maintaining soil fertility is critical to ensure sustainable crop production. There are complex interactions which occur between the biological, chemical and physical properties of soil (see box, right), and good farm management should aim to optimise these and increase yields in the most sustainable way.

DexTerra is well aware that they have some of the most fertile soils in Germany and that management and care of this resource is crucial to sustainable crop production. All digestate, cereal straw, and other crop residues are incorporated into the soil to increase soil organic matter (see Benefits of using digestate, above).

The cereal straw is incorporated into the soil as it contains significant amounts of potash, along with some phosphate and magnesium. This practice means only the phosphate, potash and magnesium removed in the harvested grain needs to be replaced. Incorporation of the straw helps maintain soil structure and fertility and brings benefits to long-term productivity.

### Fact: Maintaining fertile soils

Soil organic matter, soil structure, and the maintenance of a flourishing soil microbial population are some of the key elements to maintaining good fertile soils. Good soil structure is down to skilled soil management and cultivation techniques; incorporating crop residues and waste can improve the organic matter within the soil which in turn increases humus levels. Humus is the main by-product of the microbial breakdown of organic matter in the soil and is important in maintaining soil structure. It increases soil water holding capacity and stores nitrogen, phosphorus and sulphur in their organic forms.

A well-structured soil allows roots to grow easily and use a larger area in search of nutrients and water, which in turn provides the ideal growing medium for crops.

### Minimum cultivation

DexTerra's aim is to get the perfect seedbed without undertaking excessive and expensive cultivations. This ‘minimum cultivation’ approach has several benefits, from reducing crop establishment costs, to improving the soil structure. The minimal soil disturbance helps increase earthworm numbers, which in turn facilitates the consumption and removal of straw and organic material which has been spread on the land. High levels of earthworm activity naturally cultivate the soil and improve the soil structure.

#### Fact:

A typical winter cereal straw quantity of 5 tonnes per hectare can return: 6.0kg Phosphate (P<sub>2</sub>O<sub>5</sub>), 47.5kg Potash (K<sub>2</sub>O), and 6.5kg Magnesium (MgO).

Investigations in the US show that fresh earthworm casts are 5 times richer in available nitrogen, 7 times richer in available phosphates and 11 times richer in available potash than the surrounding upper 150mm of soil. In conditions where there is plenty of available humus, the weight of casts produced may be greater than 4.5kg per worm per year, in itself an indicator of why it pays the farmer to keep worm populations high.



## Water

### Irrigation wells

In a normal year the farm experiences adequate levels of rainfall to ensure yields and quality are optimal for the profitability of the crop. However, there have recently been years where the rainfall level is below normal and this has impacted on yields and profitability. To counter this problem, two wells have been sunk on the farm to provide irrigation water for the potatoes (if needed) during the summer growing period. The farm has also invested in a rain gun and reel irrigation system which is able to cover the majority of the potato growing area.

The benefit of investing in this system is that it gives the farm the opportunity to irrigate the crop in case of reduced rainfall.

### Facts: the importance of water for potato growing

The profitability of potato production is heavily influenced by water availability for the crop (either from rainfall and/or irrigation). If water stress occurs during 'tuber initiation', there will be fewer tubers set per plant, and this will reduce the total final yield.

Further, water stress during the potato 'bulking' stage reduces tuber size and results in misshapen potatoes. Dry matter and specific gravity (a measure of potato quality) can be reduced whilst other aspects such as common scab and hollow heart can be attributed to periods of water stress during potato sizing. The sugar content in the stem-end can also be increased, which negatively affects the processing quality of the tuber.

### Pesticide handling

Pesticides are a vital part of the armoury in modern farming. Without these products the losses incurred by agriculture to plant disease and pests would be enormous and drastically increase food costs. Although they are vital, it is crucial that they are handled and applied in the best possible way. Disregarding good practice could potentially bring further regulation to the industry and could increase the risk of harming the natural environment, with water being most at risk from poor handling and application methods. Spillages and pollution of water courses often create bad publicity and damage the public perception of the agricultural industry.

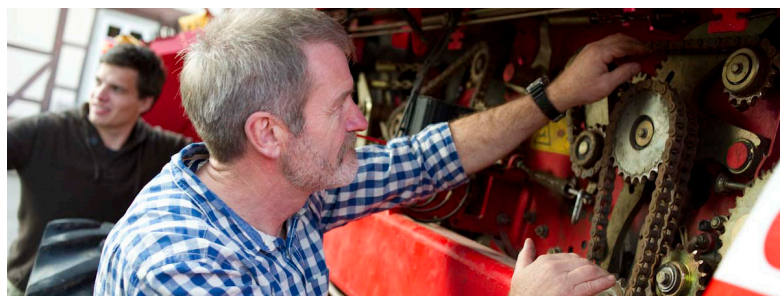
According to UK industry data, over 40% of pesticides that are found in water come from farm handling/filling areas. Any farm applying plant protection products requires an area to fill the sprayer, and with any quantity of pesticide there is a risk of spillages occurring. Subsequently the most important factor is how these can be easily contained and cleaned up.

In response to this issue DexTerra has converted an area in a covered building and constructed a concrete pad on which the sprayer sits whilst being filled. Any spillages, however minor, are captured and an absorbent material used to soak them up.

### Facts: dangers of polluting waters with pesticide

A significant proportion of pesticides reaching ground and surface water may come from pesticide handling areas. Water is vulnerable from tiny splashes and spills that occur when filling the sprayer and when rinsing the container. Inappropriate wash down, cleaning and disposal activities can also have significant adverse environmental impact. Just one dropped foil seal can contain enough pesticide to increase residues above the 0.1ppb standard in 30 km of stream. In one study it was possible to reduce the pesticide residues coming from the handling area by 99%.

*(Source: The Voluntary Initiative, Pesticide Handling Areas, October 2007)*



### Maize buffer

When planting potatoes in a field containing a watercourse, DexTerra plants a 20 metre buffer zone of maize alongside the water. Potatoes often receive multiple applications of plant protection products and it is imperative that any natural water sources are protected from the potential effects of spray drift. The 20 metre distance, combined with the height of the maize, provides good protection and goes beyond any legal requirements currently in place.

When harvested, the maize crop is used as a feedstock for the anaerobic digester which gives a return on investment.

## Biodiversity

### Bird nest boxes

DexTerra wants to farm in a way which not only protects the environment, but also ensures that the biodiversity on the farm increases. One programme supporting this approach is the construction and erection of 82 bird boxes around the farm to provide suitable nesting sites for birds. These areas have been selected carefully and are especially important in parts of the farm which contain mature trees, as these do not provide the most suitable cover or nesting places for small birds.

The farm carries out its own census to monitor bird levels to check that the local bird population is benefitting from the farm's actions. This is the only credible way to show that the work being undertaken on the farm is actually having the desired effect of increasing the population. The boxes had an occupancy rate of 87% in 2011.

The second part of improving the local biodiversity has been the introduction of flower plots in some of the cereal fields. These increase insect activity by providing a food source, and the insects in turn, provide a food source for birds. These plots provide an important habitat on agricultural land which is traditionally dominated by large fields of single crop species. The bird population is intrinsically linked to an appropriate habitat which is able to support both breeding and feeding. DexTerra is committed to improving habitats on the farm and working with the environment to improve local biodiversity.

### Facts: Farmland birds

Research has shown that the population of Europe's farmland birds has declined by almost 50% in the past 25 years.

These results, collated by the Pan-European Common Bird Monitoring Scheme (PECBMS) – a partnership led by scientists from the European Bird Census Council, BirdLife International, the RSPB (BirdLife in the UK) and Statistics Netherlands.

The data were collected from 20 independent breeding bird surveys across Europe over the last 25 years, all of which were coordinated thanks to the concerted efforts of national programmes involving thousands of dedicated volunteer birdwatchers.

The results confirm the extent to which farmland birds have declined. Across Europe as a whole from 1980 to 2005, common farmland birds have on average fallen in number by 44%.

Species like Eurasian Skylark (*Alauda arvensis*), Red-backed Shrike (*Lanius collurio*), Corn Bunting (*Miliaria calandra*), Northern Lapwing (*Vanellus vanellus*) and Eurasian Tree Sparrow (*Passer montanus*) are familiar names in the list of declining farmland bird species.



## Community

### Community footpath

With a small amount of thought and investment DexTerra has developed a strong community relationship which, although providing no tangible benefits, has strengthened the relationship between the business and the local community. The farm has planted sunflowers along some of the public footpaths which run through the land. Anybody using the footpath is allowed to cut the sunflowers and take them home. This has been a very simple and easy way to connect with the local community, as they see and receive a gift from the farm. Another project that forged strong community relations was the provision of a run-down trailer, by DexTerra, to the local village teenagers. The young people spent time converting the trailer into a den and DexTerra provided a small area of land on which the trailer could be situated. This provided the teenagers with an engaging project and somewhere to 'hang out'.



Well-chosen projects ensure good will is maintained between the farm and its local community.



“The really impressive feature of DexTerra is how 11 farms have come together to form a larger, more efficient, viable business, whilst still maintaining the traditions and attention to detail of the small family farm. The practices implemented by DexTerra could be used by any farming business to improve their outlook and approach in this dynamic industry. ”

Karl Williams, Flagship Farms Programme Manager, FAI

## Appendix – Good Practice Matrix for DexTerra Farm

The following matrix has been developed by McDonald's to help assess the sustainability of the agricultural production within the supply chain. Flagship farms have been identified that demonstrate best practice in one or more of the 17 key areas in the matrix, whilst also operating to general high agricultural standards in all other areas.

A ✓ in the matrix below indicates good practices demonstrated in this case study.

### Ethical (Acceptable Practices)

#### 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)

#### 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)

#### 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 ✓