



McDonald's Europe Flagship Farms Potatoes – Leprince, France

Introduction

The focus of this case study is to show how a family-operated farm has adopted quality systems within the business to help drive efficiencies, achieve best practice and, through the use of up-to-date technology, maximise the effectiveness of all inputs.

Leprince Farm's key initiatives can be summarised as follows:

- Leprince farm became ISO 14001 accredited in 2009, in co-operation with a group of farmers (Terr'Avenir) working together. The ISO 14001 certification comprises a management system that allows the farm to continuously improve its environmental performance. Leprince farm is also GlobalGap assured, and is in the process of becoming part of the High Environmental Value (HEV) programme.
- The farm has incorporated the Mileos® decision support system into its blight management programme. The system gathers information from a weather station, and enables the farm to apply fungicides only when there is an established risk, provide optimum results for applied products.
- Yellow coloured traps are placed in the potato fields to monitor aphid levels. This policy ensures that aphid control is targeted at periods of high activity/infestation and results in the optimum economic and environmental outcome.
- A Global Positioning System (GPS) is fitted to the sprayer and the fertiliser spreader. This limits application inaccuracies by automatically switching off the sprayer boom sections or the fertiliser spreaders when they pass over previously treated areas, or when they go beyond field boundaries. Improving application accuracy saves on inputs (and their associated cost), limits crop stress, and reduces application time and operator stress.
- The farm's regime of irrigation scheduling ensures water is applied in accurate quantities as weather, soil and crop conditions dictate. This guarantees potato crops are able to maintain consistent growth throughout the season and ensures sufficient soil moisture is available during important growth stages such as tuber initiation and potato bulking.

"I am delighted to be recognised as a McDonald's flagship farm. It's a further step in promoting the Good Agricultural Practices used on this farm and more broadly by potato farmers. It will give me the opportunity to communicate to a larger public and demonstrate that we are indeed producing a raw material which is sustainable and preserves our soils for the future generations."

Ghislain Leprince.



The Leprince family

- Soil nitrogen levels are tested in spring to ensure nitrogen application rates are matched to soil reserves and plant requirements, which limits over-application and losses.
- The farm has in place a comprehensive training and development programme, resulting in consistently high quality products, low staff turnover, and good staff morale.



Leprince farm became ISO 14001 accredited in 2009

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

McDonald's has developed a matrix containing 17 key areas of good practice. 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.

Please see Appendix for the Good Practice Matrix for Leprince.

Summary of actions

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

| | Action | Benefits |
|-------------------------------------|--|--|
| Assurance/ Certification | The farm is GlobalGAP accredited | <ul style="list-style-type: none"> EN GlobalGAP covers environmental requirements within its standards EC The farm is able to market its produce as assured and improve marketability ET GlobalGAP standards are designed to control food quality, food safety and worker welfare. |
| | The business is part of a group of farms which have gained ISO 14001 accreditation | <ul style="list-style-type: none"> EN Specific aim is to improve the farms' environmental performance EC Ensures the farm meets all environmental regulations thus avoiding potential fines or penalties |
| | HEV programme: specific environmental measures | <ul style="list-style-type: none"> EN Natural meadows and woodlands are protected and a regime of hedge planting has started, this is improving biodiversity EC Helps in reducing windblown soil erosion ET Improves the landscape for the local community |
| Crop initiatives | Insect monitoring in potato fields | <ul style="list-style-type: none"> EN Reduces applications of plant protection products (PPP) EC PPP are only used when there is an recognised need, this maximises the investment of treatments |
| | Using the Mileos® decision support system | <ul style="list-style-type: none"> EN The system ensures that plant protection products are only applied when disease level/risk demand their use EC Ensures blight treatments are targeted to a recognised risk, maximising the investment of the treatments |
| | GPS system used on sprayer and fertiliser spreader | <ul style="list-style-type: none"> EN System limits over-lapping during application reducing risks to the environment EC Accurate and precise application of inputs improves their effectiveness and reduces the quantity required |
| | Potato storage facility | <ul style="list-style-type: none"> EC The farm can market their potatoes at the optimum time ET Allows provision of consistent product at affordable price |
| Soil | Organic manures used on farm | <ul style="list-style-type: none"> EN Reduces reliance of artificial fertilisers and reduces the carbon emissions associated with the business EC Improved soil health increases crop production output |
| | Soil nitrogen testing in spring | <ul style="list-style-type: none"> EN Ensures applications of nitrogen are matched to crop and soil requirements reducing leaching into water sources EC Accurate nitrogen applications maximise crop production and optimise expenditure on nitrogen |
| Water | Green cover crop planted prior to potatoes and other spring sown crops | <ul style="list-style-type: none"> EN Available soil nitrogen is captured by the growing crop stopping it from potentially getting into water courses EC Reduces subsequent crop nitrogen requirements and costs |
| | Irrigation scheduling for potato crops | <ul style="list-style-type: none"> EN Water is used accurately and in line with potato requirements without being wasted EC Potato crops are provided with optimum water applications to maximise yield and quality |
| Environment | Waste recycling | <ul style="list-style-type: none"> EN The farm separates all the different waste streams and recycles them appropriately EC Some waste streams can provide an economic return |
| Staff | Staff training | <ul style="list-style-type: none"> EN Staff training covers the requirements of the environmental standard ISO 14001 EC Good training ensures staff carry out their roles efficiently and effectively ET Training is important for staff morale and to cover health and safety issues |
| Community | Communicates to the local community on sustainable farming and the best practices undertaken | <ul style="list-style-type: none"> ET The farm is able to showcase what they do and this improves consumer awareness and knowledge |

Background

France is the only European country to be fully self-dependent with regard to food production, and is the European Union's leading agricultural exporter. France's agricultural production makes up around 20% of the agricultural production of the European Union, and accounted for 1.74% of France's GDP in 2009.

The Leprince farm covers 450 hectares and is based in the small village of Béhagnies, which is located 70 km south of Lille, in an area of fertile loamy soils. The business is a merger of four individual farms, owned by the Leprince family (a brother, sister and their mother) which formed the company Leprince SCEA (Société Civile d'Exploitation Agricole) in 1991. The main objective of the merger was to streamline the businesses and optimise equipment use.

Each member of the family has a specific role and responsibility within the business.

Significant investments have been made since the merger, in irrigation equipment, tractors, cultivation equipment, potato harvesters, planters, and a purpose built 2,000 tonne potato store (built in 1998).

In 2006 the farm became certified under the GlobalGAP scheme for the potatoes and then in 2009 it was certified under ISO 14001 (environmental management standard). The ISO 14001 certification was obtained through an association (Terr'Avenir) of farmers working together.

Between the 15th and 18th century, there were at least 40 serious famines in France, due in part to the crop failures associated with growing wheat (which was the staple food at the time). Although the potato was introduced to France at the beginning of the 17th century, its true value as a food was not recognised until the 18th.

In 1748 the French Parliament actually forbade the cultivation of the potato (on the grounds that it was thought to cause leprosy). But by 1803 potato cultivation had reached 1.5 million tonnes and then rose rapidly to 11.8 million in 1865; production peaked in 1960, with a harvest of 14 million tonnes, in 2007 the harvest totalled 6.3 million tonnes. Annually the French consume nearly 30 kg per capita of fresh potatoes and another 25 kg of processed products.



Assurance/certification

GlobalGap

GLOBALG.A.P.



Leprince Farm has been approved to the GlobalGAP standards for potatoes since 2006. The GlobalGap standard is primarily designed to maintain consumer confidence in food quality and safety. Other important aspects of the scheme are to ensure compliance with environmental regulation and to ensure a responsible approach to worker health and safety.

The GlobalGAP assurance scheme for potatoes has a 100% compliance score against the McDonald's Agricultural Assurance Program (MAAP). This means (based on 2009 figures) that all the requirements of MAAP are encompassed within the GlobalGAP potato scheme. (Source: MAAP Supply Tracker database, 2010)

ISO 14001



ISO 14001 is part of a group of international voluntary ISO 14000 standards established to help businesses reduce the environmental impact of their operations. The standard does not prescribe an unconditional set of environmental requirements, but rather is used by businesses as a management system through which they can continuously improve their environmental performance. It applies to those environmental aspects over which the business has control and over which it can be expected to have an influence.

ISO 14001 is known as a generic management system standard, meaning that it is applicable to any type and size of business, and can cover any product or service, in any sector. The fundamental principle and overall goal of the ISO 14001 standard is the concept of continuous improvement.

Leprince farm was certified to ISO 14001 in 2009 in co-operation with an association of farmers working together (Terr'Avenir). The association decided to implement the standard to maintain and improve their environmental management systems and assure themselves of their conformance to environmental law and regulation.

An audit was carried out by an external third party organisation and helped the farm identify parts of the business that needed modernising. This focus has led to improvements in the following areas: pesticide storage, sprayer cleaning, sprayer filling area, sprayer washings disposal, and waste stream segregation. These changes have benefitted the business by insuring stricter environmental controls are in place and working practices are more eco-friendly.

HEV Programme (High Environmental Value)

The farm is also preparing to become certified under the French Ministry of Agriculture's High Environmental Value (HEV) programme. This requires measurement of the farm's performance against a group of key Indicators to rate its compliance with the scheme's regulations.

As part of this scheme, Leprince is also in the process of planting 1.5 kilometres of hedges and trees, which will be used to divide up some of the larger fields, helping to reduce water and windblown soil erosion and improve the wildlife corridors on the farm. Practices such as these are vital to encourage local wildlife and biodiversity, as large fields of mono-culture do not provide adequate or diverse enough habitats to sustain a thriving ecosystem.

Soil Health

There are several complex interactions that occur between the biological, chemical and physical properties of the soil, and good soil management practices should aim to optimise these natural processes to increase production in the most sustainable way. 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.



5 tonnes of CO₂ equivalent are saved for every tonne of artificial nitrogen displaced.

Good soil structure is largely down to skilled soil management and cultivation techniques; incorporating crop residues and waste helps 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 and increases the soil's water holding capacity and stores nitrogen, phosphorus and sulphur in their organic forms.

Soil nitrogen testing in spring

Nitrogen as a nutrient enables farmers to achieve high yields through its effect on chlorophyll and protein production within the plant. However, while fertilizers are effective in driving crop yield improvements, they also frequently have a negative impact on the environment.

The correct use of nitrogen has a substantial economic return for producers, however as most crops cannot absorb all the nitrogen fertilizer applied by growers, much of the remaining nitrogen fertilizer leaches into the air, soil and water and pollutes lakes, rivers, aquifers and oceans.

(N.B. Nitrate is a negatively charged ion and is therefore not attracted to soil particles or soil organic matter, it is also water soluble and can move below the crop rooting zone under certain conditions).

Leprince farm undertakes routine annual soil testing for nitrogen concentrations in the spring. This enables the farm to calculate an

optimum application programme that meets the needs of the potato crop, whilst minimising the environmental impact and maximising the economic return for nitrogen input.

The testing ensures that ideal nitrogen levels can be maintained in the soil to optimise plant



growth and yields, as application rates are based on reliable evidence rather than estimates or speculation.

Organic manures

Leprince farm recognises the importance of its soils and has significantly increased the level of organic manures, which are now being applied extensively across the farmland. It is anticipated that the increase in use of organic matter will improve the soil structure and significantly reduce the amount of artificial fertilisers being purchased (it is estimated this will reduce artificial nitrogen fertiliser use by 40 to 80 units/ha). This will lower input costs, and lower the farm's carbon footprint as artificial fertilisers are highly energy intensive to manufacture.

One way to reduce N losses is to develop and apply technologies that enable farmers to more accurately match the amount and timing of input application to crop growth needs. Soil and tissue N tests are designed to reduce uncertainty about available N. So long as the benefits from this information exceed the cost of obtaining it, adoption would improve farm profitability and reduce environmental costs.

(Source: American Journal of Agricultural Economics, Economic and environmental implications of soil nitrogen testing: a switching-regression analysis by Keith O. Fuglie, Darrell J. Bosch, November 1995)



Good soil structure is largely down to skilled soil management and cultivation techniques

Crop health

Insect monitoring in potato fields

Viruses are among the most economically detrimental diseases of the potato, and those transmitted by aphids can be the most widespread and damaging. Aphid-transmitted viruses fall into two groups: 'persistent' and 'non-persistent'. One of the 'persistent' viruses that affect potato crops is the Potato Leaf Roll Virus (PLRV). There are several non-persistent viruses and it is not uncommon to find potato crops infected with both types of virus.

The first symptoms of PLRV are likely to be rolling of upper leaves which then turn yellow or red. The potato tuber may show evidence of net necrosis which exhibits as brown flecking throughout the tuber and reduces the quality of the potato. Some varieties, such as the Russet Burbank, used by McDonald's, are more at risk than others, and symptoms of PLRV are likely to result in the potatoes being rejected.

The most effective virus management plans target the virus vectors (aphids). The use of plant protection products can and has reduced the incidence of PLRV to negligible amounts, but the aim of any programme of control is to spray at the optimum time and then only when necessary.

It is with all this in mind that Leprince farm uses yellow traps in the potato fields to monitor aphid levels. This concept is effective as aphids (and many other insects) locate plants on which they feed by using visual colour cues. Insects distinguish leaves in varying shades of yellow and blue, and they are attracted to any surface which reflects light at the proper wavelength.

The traps are examined twice weekly and if numbers increase dramatically between the two readings then preventative action can be implemented. This policy ensures that control is targeted at periods of high aphid activity/infestation and this gives the best management result and the optimum economic and environmental outcome.



Yellow coloured traps are placed in the potato fields to monitor aphid levels



Using the Mileos® decision support system

Potato blight is one of the worst disease challenges for the potato grower and can wipe out plants almost overnight. The disease is caused by a fungus and spreads through the air, developing when the weather conditions are warm and humid, causing plant death in field or rotting of infected tubers in storage. 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 7–10 days, although this can be less frequent during prolonged dry spells.



It is estimated that worldwide potato blight costs around £3.5 billion (€4 billion) every year.

Leprince Farm has invested in a decision support system called MILEOS®. This was developed by the French Plant Protection Service (SRPV) and Arvalis Institut du végétal. It is a decision support system which supplies information to the farm on the optimum time to spray and the type of fungicide to use for the potato varieties planted. The system uses hourly weather updates to ensure that the best possible recommendations for crop spraying.

MILEOS® has enabled the farm to apply fungicides only when there is an established risk of blight. The benefits are in reducing the number of applications of fungicide or by providing targeted information on the ideal time to apply fungicides and which products to use (although not necessarily reducing the number of applications, information provided on timing and product choice can supply optimum results).



Potatoe blight

GPS system used on sprayer and fertiliser spreader



GPS is relatively inexpensive and easy-to-use and is suitable for use by all farmers.

The development and implementation of precision agriculture has been made possible by the use of the Global Positioning System (GPS). GPS allows farming equipment to steer itself automatically and control equipment such as sprayers and fertiliser spreaders. GPS is fitted to the sprayer and the fertiliser spreader to decrease application inaccuracies by limiting overlaps. This is achieved by automatically switching off the

sprayer boom sections or the fertiliser spreader when they pass over previously treated areas, or when they go beyond field boundaries.

Many farmers believe that the benefits of precision agriculture can only be realized by large farms with large capital investments and experience with information technologies. However, GPS is relatively inexpensive and easy-to-use and is suitable for use by all farmers.

At Leprince, the system has saved on inputs (and their associated cost), has limited crop stress, and has reduced application time and operator stress (as the driver does not have to calculate when to switch off the application equipment).



One study revealed a significant 6.2% reduction in off-target application after fitting a GPS system to their sprayer.

Potato storage facility

The price of potatoes during harvest is low due to the volume being harvested, so the ability to store product gives the farmer flexibility in marketing. Furthermore, by having access to potatoes all year round the processors are better able to supply McDonald's with a consistent product at an affordable price.

With this in mind, Leprince has invested in a 2,000 tonne potato store. This allows the farm to store the potatoes for weeks or months prior to being graded and despatched, and grants some flexibility in how and when they market their potatoes. As described above, the volume that is contracted to McCain's can then be delivered to suit the processing needs of the factory.



Water

Green crop cover planted prior to potatoes and other spring sown crops

The potential benefits of green cover crops are numerous; firstly, crops that are sown in late summer and grow into the autumn can capture and recycle soluble nutrients which would otherwise be lost through leaching. Cover crops also help suppress weeds, as the planted crop competes for light, nutrients and water. Once the cover crop is established it reduces windblown and water borne soil erosion, which is especially important on lighter sandy soils. In late winter or early spring the cover crop is ploughed into the soil adding valuable organic matter.



Cover crops capture and recycle soluble nutrients and help suppress weeds.

At Leprince farm the sowing of green cover crops during late summer is now an essential part of the management programme for spring sown fields. In the 2010 the farm planted oats as a green cover crop on 80% of the land with the remainder being sown with mustard.

Irrigation scheduling for potato crops

Sufficient soil moisture levels are essential in order to produce profitable, high-quality potatoes; quality can be adversely affected if the plant does not obtain sufficient levels of water during certain periods of growth. However, the sustainable use of water in the production of crops has become a global issue.

The profitability of potato production can be heavily influenced by irrigation management, and correct irrigation applications during tuber initiation are vital. If water stress (lack of water) occurs during initiation, fewer tubers are set per plant thus reducing total yield. If water stress occurs during the potato bulking stage, tuber size is reduced, resulting in misshapen potatoes. Other quality problems such as common scab and hollow heart can be attributed to poor water



Sufficient soil moisture levels are essential in order to produce profitable, high-quality potatoes



The number of irrigation episodes has been reduced by 25-35% per crop.

management during potato sizing. Water stress can also result in increased sugar content in the stem-end, which affects processing quality.

To ensure that water is used efficiently and to produce optimum yields, Leprince farm uses 'Watermark' soil moisture sensors. These are inexpensive and

can measure soil water potential over a wide range from 0 to 200 kilopascals (kilopascal is a unit of pressure measurement); they are easily installed in the potato fields, and require little maintenance. The sensors are buried in the root zone and a handheld digital meter is then used to get an instant reading of moisture tension from 0 (saturated) to 200 (dry) kilopascals, from which irrigation scheduling can be calculated accurately.

By ensuring the potato crop receives an accurate level of irrigation during the critical stages of growth, yields are maximised, quality parameters are met and water is used efficiently. Since the farm has implemented this system it has been calculated that the number of irrigation episodes has been reduced by 25-35% per crop, which is clearly a large saving in both water and power.

(N.B. The degree to which water clings to the soil is the most important soil water characteristic to a growing plant. Soil moisture tension is a negative pressure and as soil moisture tension increases the amount of energy exerted by a plant to remove water from the soil increases. At field capacity most soils have a soil moisture tension between 5 kPa and 33 kPa. In soils the wilting point is identified as the point where most plants cannot exert enough force to remove water from the small pores in the soil.)

Staff training

The LePrince farm has established a training regime for all staff to encourage individuals to improve their knowledge and understanding of all aspects of their role and responsibilities within the business. This also covers the wider context of management and farm economics.

Staff turnover has been eliminated at LePrince, as the present workforce is the third generation of the families which have been working on the farm. The time and expense needed for recruitment has been removed and the knowledge and skill base of the workforce is perfectly matched to the farm's needs.

Good staff training means:

- High quality products
- Minimum wastage
- Broader range of staff skills
- Low staff turnover
- Reduced production costs
- Improved performance
- Good staff morale
- Lower absenteeism



Lorem Ipsum

Environment

Waste recycling

The definition of waste recycling is to pass a material through a system which enables it to be reused. The importance of recycling waste is the subsequent reduction in virgin materials that would otherwise be used. Furthermore, recycled waste reduces the need for incineration and disposal to landfill.

Leprince farm now separates all its waste into designated categories so it can be sent for recycling (for certain types of waste, disposal is the only option). Waste contractors have been taken on to collect and recycle the identified wastes, and the farm tries to minimise and re-use when possible.



Leprince farm now separates all its waste into designated categories so it can be sent for recycling

Community Engagement

Unfortunately the agricultural sector does not have the best reputation for communicating with its customers and the local community. However, by overlooking this most critical aspect of business, farmers are missing an important opportunity to inform the consumer of the great work they undertake. Good community engagement can help alleviate misconceptions and misguided impressions of agriculture and generate a true understanding of what really happens on a farm.



Carbon reduction improves efficiency by lowering operating costs

Leprince farm works closely with a local school and is used as a teaching resource in which the children learn about sustainable agriculture. The farm also has open days where the general public is invited onto the farm and is given information on the good practices that are employed. Other farmers are also invited onto the farm to learn about good management practices, to hopefully spread the message of sustainable agriculture within the sector.

Appendix

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 ✓