



McDonald's Flagship Farms Oil Seed Rape – Roy Ward Farms Ltd

Introduction

This case study demonstrates how innovation in farm management and practices can drive the development of new machinery and techniques that help reduce inputs and address new & existing challenges. Key focus areas also include improving biodiversity, soil health and concentrating on the benefits of staff engagement.

The key initiatives undertaken on the farm can be summarised as follows:

- Andrew found existing single pass cultivators / drills created too much soil disturbance which increased grass weed problems. He adapted a Simba Solo cultivator and created the Simba Elita, this builds on the single pass characteristics of soil cultivation and sowing and delivers targeted application of liquid fertiliser as the seed is deposited along the cultivated band.
- In early February the Green Area Index (GAI) and Soil Nitrogen Supply (SNS) are measured for every field. This enables a target yield to be set and provides information to help define timing and optimum nitrogen application rate for the crop. The GAI is a measure of crop canopy which provides a basis for achieving the maximum potential yield at harvest by optimising nitrogen requirements.
- All fields are sampled and analysed to provide detailed digital soil nutrient maps which highlight any variations in phosphorus, potassium, magnesium and pH levels within a field. This information provides data for improved management decisions and the maps the variable application rates via the Global Positioning System (GPS) fitted to the tractor and fertiliser spreader.
- Improving soil structure and quality is a key objective of the farm. Since the 1990's all crop residues (straw & green manures) have been chopped and incorporated into the soil. In 2002 due to increased machinery costs, the farm stopped ploughing and switched to a policy of minimal cultivations for crop establishment. These practices have benefitted and increased soil organic matter (SOM) levels.
- The farm is a member of the an environmental stewardship scheme and has established six metre grass and wildflower margins in most fields around the farm, several of these are planted near to footpaths and main roads with the aim of improving the public's perception of agriculture. The farm has also established feeding stations for farmland birds, including songbirds, grey partridge and pheasants.
- Although he only has a small farm team, Andrew appreciates the knowledge and experience his staff has is invaluable so conducts regular meetings to discuss key management, operational decisions and to seek the input of those who work with him. Staff also have a formal annual performance review which provides the opportunity to set objectives and ensure they are happy with conditions and their professional development.
- Photovoltaic panels have been installed on the grain store roof to provide a source of renewable energy. The electricity produced helps meet the farm's requirements over summer and excess energy produced in the winter is supplied into the National Grid.

“ Andrew's 'can do' attitude, along with his ability to innovate and take risks shows a level of determination and commitment to his farming business and the wider agricultural sector which has to be admired. From designing a new type of drill for sowing oilseed rape, along with adopting new technology on farm, to his crucial role in setting up 'Forage Aid', which galvanised the agricultural community into providing forage for farmers badly hit by extreme weather conditions in the north and west of the country. Andrew has quite a list of achievements to his name; the next one he can add is being the first oilseed rape farmer to become a McDonald's Flagship Farm.

Karl Williams, Flagship Farms Programme Manager, FAI

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Summary of actions and benefits

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

Action	Benefits
Assurance & Certification	Red Tractor Farm Assured EN Red Tractor is a recognised farm assurance scheme which helps with product marketability by ensuring farm practices and management are in place to maintain product quality, traceability and environmental standards.
	GAFTA Trade Assurance Scheme (GTAS) EC ET GTAS is a HACCP based scheme for companies in the grain and feed trade which provides customer confidence of the safe storage and handling of food and feed.
Crop Initiatives	Effective & Safe Agrochemical Use EN EC ET Application rates are aimed to be as low as possible whilst remaining effective, using reduced or lower rates than those recommended can favour the development of resistance. The farm also implements a strict 6 metre buffer zone to protect watercourses.
	Utilising biosolids (Treated Sewage Sludge) EN EC This provides significant benefits, the treated sewage has a a nutrient value from nitrogen and phosphorus and adds organic matter to the soil. Utilising this waste stream has also reduced the need to purchase artificial fertiliser and soil testing along with application of sewage is provided free.
	Global Positioning System in Use EN EC All tractors are fitted with GPS steering and the sprayer and fertiliser spreader are both automatically controlled via the GPS system. This has resulted in a reduction of spraying overlaps in the region of 32 hectares across the farm, resulting in reduced agrochemical use, which provides a cost saving and reduced environmental impacts.
	SNS (Soil Nitrogen Supply) is Assessed EN EC Estimating Soil Nitrogen Supply (SNS) is a key step in determining the nitrogen application rate to meet the crops' requirement, this can help reduce over application while ensuring optimum crop growth and yield.
	Green Area Index (GAI) is Assessed EN EC The GAI is an assessment of the crop's canopy in early spring which provides a measure that helps define fertiliser requirements later on in the year, in relation to targeted yields.
Business Planning	Solar Panels Installed EN EC ET Solar panels take advantage of a renewable energy source reducing costs for the farm and benefitting the environment. The panels can also generate an additional income by producing and supplying electricity to the National Grid.
	Design Innovation EN EC Andrew and his team designed and built a single pass cultivator / drill which minimises soil disturbance and applies a targeted application of liquid fertiliser. This decreases weed seed germination and has significantly reduced the cost of crop establishment.
	Contract Rapeseed Storage EC Andrew maximises income by hiring out the farm's grain storage facilities.
Staff Welfare	Regular Staff Meetings EC ET Staff feel valued and are able to contribute to management decisions which builds job satisfaction and engagement.
	Formal Employee Review Process EC ET Being able to set objectives helps ensure that specific targets are met throughout the year and provides the opportunity for staff to feedback on areas for personal development.

Soil Management	Soil Mapping of Nutrients	<ul style="list-style-type: none"> EN Variations in key soil nutrients (P, K, pH) is recorded and mapped across fields. This information is used to form the basis of nutrient management and application allowing for optimal application of inputs. EC
	Planting Green Manures	<ul style="list-style-type: none"> EN Crops such as ryegrass and vetch are planted as green manures helping to capture and recycle nutrients whilst building soil organic matter. Vetch is a member of the legume family so fixes nitrogen in the soil, reducing requirements for artificial fertilisers EC ET
	Increasing Soil Organic Matter Levels	<ul style="list-style-type: none"> EN Incorporating crop residues helps increase the SOM content which improves its fertility, water holding capacity and structure which in turn benefits crop growing conditions. A no plough policy also helps maintain SOM levels. EC
	Limiting Soil Compaction	<ul style="list-style-type: none"> EN Soil structure is key to soil health, the farm limits compaction by minimising the number of field operations, reducing machinery weight and using wide tyres or tracks EC
Biodiversity	Planting Wildflower Margins	<ul style="list-style-type: none"> EN Wildflower margins around the farm count towards the Ecological Focus Area Percentage under the Government's Basic Payment Scheme. This encourages local biodiversity and by positioning areas where the general public can see them provides a positive image for farming. EC ET
	Providing Feeding Station for Farmlands Birds	<ul style="list-style-type: none"> EN Feeding stations are placed around the farm for farmland birds, including songbirds, grey partridge and pheasants. The farm does not undertake or allow any shooting of game birds on the land.
Community Investment	Knowledge Transfer and Industry Engagement	<ul style="list-style-type: none"> ET Andrew is engaged with several industry bodies and associations to provide input and direction to bring benefits to the agricultural sector. <p>In 2013 Andrew founded Forage Aid which provided valuable feed to livestock farmers badly affected by winter weather conditions that killed almost 100,000 livestock.</p>



“ Growing Oil Seed Rape for McDonald's gives me and my staff a huge amount of pride. I place great importance in forming strong relationships with the farming community, our customers and suppliers and our work with McDonalds serves as the perfect example of this. Our farm is driven by innovation and the application of science and being selected as a Flagship Farm recognises and celebrates this commitment. With the popularity and scale of McDonald's we are finding other companies are wanting to be associated with us because of our connection ”

Andrew Ward. Owner Roy Ward Farms

Background

Roy Ward Farms Ltd is owned and run by Andrew Ward. The farm was purchased in 1958 by Andrew's father Roy and extends to a total owned area of 230 hectares, a further 162 hectares are farmed under a tenancy agreement and an additional 305 hectares are farmed under contract, giving a total area of 697 hectares.

The farm has one full time member of staff who has been with the business for 15 years. Andrew's son in law has worked part time on the farm for 3 years and together with Andrew carries out all the spraying operations. During harvest two local part time staff join the team.

The farm's 6,700 tonne storage is used to store all of the farm's wheat, barley and OSR. The grain store is certified with GTAS, a HACCP based scheme for companies in the grain and feed trade and is also used by one large UK trader to store their stock of HOLL (High Oleic, Low Linolenic) OSR (Oil Seed Rape)

The farm supplies HOLL rapeseed to ADM where it is processed into the oil blend used in McDonald's restaurants.

Here Andrew explains more about his farming operation:

Why do you grow OSR?

Cereals form a large part of our rotation so introducing OSR brings in a broadleaf variety, creating a break in what is required of our soil. Using a rotation to control pests and disease and to build fertility and soil condition is key. Controlling blackgrass in particular in our cereal crops is a huge challenge made worse by the growing resistance to pesticides.

What are the main challenges to growing OSR?

Cost effectiveness of crop establishment is one of our biggest challenges. We identified a need through our contracting services and on our own farm to establish OSR more cost effectively. As there was no machinery available to do this we designed, developed and built the Simba Elita on our farm. The finished machine was then exhibited at Cereals 2012.



That is innovative! How is this machine different to others on the market?

The Simba Elita is a one pass machine, sowing the OSR seed directly into a narrow band of soil which has been cultivated to 25cm deep. Working with a designer, a special leg was developed to achieve minimal surface disturbance, which is a key objective in helping control blackgrass. Liquid fertiliser is applied along the same channel before two rollers firm the soil afterwards.

The soil is only disturbed 2cm either side of the tine. Most cultivation equipment disturbs a larger area of soil which can allow weeds, particularly blackgrass on our farm, to germinate. This is particularly important with the resistance we are seeing with blackgrass to pesticides.

If we prevent germination in the first place then this reduces any treatment required. We plant rows 45cm apart, if we were spreading fertiliser conventionally, 48cm of the soil coverage between rows would be wasted. We would be feeding the weeds between the rows, and not the crop.



Drilling with the Simba Elita

It sounds like reducing the amount of fertiliser you use is a real advantage of the Simba Elita, do you have any other techniques for reducing artificial fertiliser use?

We have two key ways of building soil fertility before we turn to bagged fertiliser. Firstly, we use biosolids across the farm: this gives us 24kg of nitrogen, 105kg of phosphorous and 50kg of sulphur per hectare. The sewage also contains a huge number of trace elements and contributes to SOM levels. It costs £50 per hectare which includes soil testing and the company we buy from spreads for us! To get the same nutrient content from bagged fertiliser (which would not include the organic matter or spreading) we would be expecting to pay atleast £115 per hectare.

Secondly, after we harvest our OSR we use green manures planting a mix of ryegrass and vetch on targeted fields. The nitrogen fixing benefits of the vetch legume, in addition to the SOM we get when we chop the crop and incorporate it into the ground contributes positively to our soil fertility. Our organic matter soil levels are 4.55% on the clay soils and 3.5% on the light soils.



Spreading biosolids gives us 24kg nitrogen, 105kg phosphorus and 50kg sulphur per hectare, it increases SOM levels, is 40% cheaper than bagged fertiliser and is delivered and spread for free .

Are there any other techniques you apply to reduce fertilizer use at other times in the year?



The GrowHow fertiliser system and Green Area Index are assessed in the spring meaning we can accurately predict the nutrient requirement of crops later in the year

In the winter we bring in a flock of sheep to graze the ryegrass and vetch this adds a different type of fertiliser to the ground through the manure and helps us to fully utilise the growing crop. We also have the whole farm soil sampled, mapped and scanned by Agrii and with this information, implement variable spreading of fertiliser by GPS. SNS (Soil Nitrogen Supply) is also assessed through the use of the GrowHow Nmin Fertiliser sampling system. The GAI (Green Area Index) is assessed in early February and in conjunction with the SNS and our target yield, the total optimum nitrogen required is calculated and applied accordingly.

Do you employ any other strategies to increase SOM levels?

We have worked hard at maintaining and building our SOM levels and have not removed straw from the land for 23 years. All straw and cover crops are worked into the soil. Depending on the area of the farm we have a soil organic matter of between 3 and 4.5 and have huge worm activity because of this.

As well as increasing SOM levels, reducing soil compaction is important to soil health. What are you doing to reduce soil compaction?

Understanding and protecting the soil has never been more important. Soil compaction has a big impact on crop production so we have adopted a number of measures to limit it. In addition to not ploughing, which we stopped in 2002, we use tracks instead of tyres on the primary cultivation tractor. On other tractors we use wide tyres, twin wheels, reduce the tyre pressures and remove all unnecessary tractor weight.



Crop rotation is another useful strategy farmers can employ to get the most from their soils. What does your crop rotation look like and what are the benefits?

Up until 2012, we worked on a fixed crop rotation making decisions about the following years planting based on what had been grown that year and what the soil type was. Now, we still consider these aspects but in addition look at targeting weed control (particularly blackgrass) spring cropping, cover crops, use of green manures and delayed sowing. Delayed sowing is where we would cultivate the land, allow the blackgrass to germinate and then spray off. We may do this a number of times before planting a late sown Autumn crop or a Spring Crop. Here is an example of how our rotation has changed in the last three years:

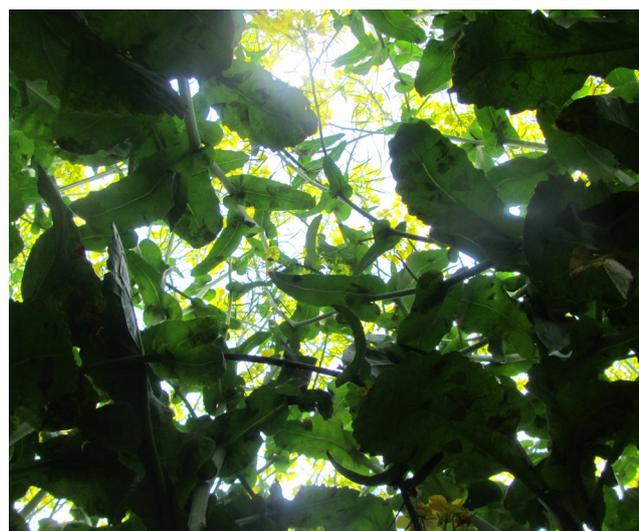
Crop	2012 Hectareage	2015 Hectareage
HOLL OSR	190	205
Winter Wheat	387	156
Spring Barley	22	220
Sugar Beet	62	42
Grass/Wildflower Margin	36	36

Nb: Reduced area in 2015 is due to one contract farm selling 38 ha
Nb: 659 ha total

How else have you reduced OSR establishment costs?

In addition to the cost saved, using low seed rates mean more light can penetrate throughout the canopy. Light penetrating to ground level is especially beneficial as it encourages the OSR pods to form low down; in normal to high seed rates there are no pods below half way down the plant.

HOLL OSR varieties tend to be taller meaning there is more unnecessary plant material or 'bulk' to pass through the combine. With lower seed rate and fewer plant numbers, the plants tend to be shorter and as they are not 'stretching' to compete with other plants for light. This means there is less bulk to pass through our machinery keeping the work rate (hectares/hour) at an optimum and reducing harvesting costs. Reducing bulk also means we have to apply less fertiliser as plants are not wasting energy and nutrients creating excess, unnecessary growth.



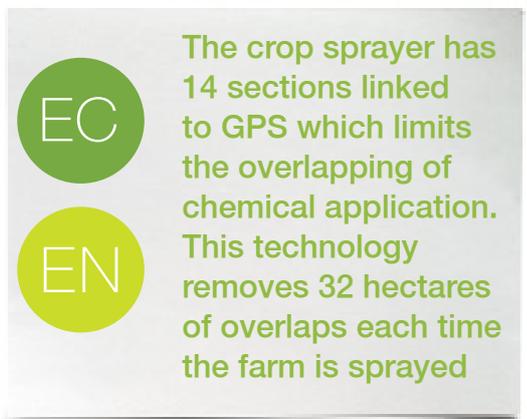
The farm is Red Tractor Assured, what does this mean and what benefits does it bring?

Red Tractor is about providing transparency for consumers about where their food has come from and an assurance that the product has been produced to set standards of food safety and environmental protection as well as being fully traceable. Consumers know that a product has come from an assured supply chain, from farm to fork, when it carries the Red Tractor logo. Being a Red Tractor assured farm benefits me as the customers of my grain and oil seeds have reassurance of the standards to which my crops are produced and stored.

Can you tell us about your approach to pesticide use?

Resistance to pesticides is a cause for great concern and it is our job as farmers to protect every product by only applying where necessary, using robust rates, and to make sure every application goes on in optimum conditions. GPS helps us to do this. All tractors and farm machinery are fitted with GPS steering to ensure accuracy in the field. The crop sprayer has 14 sections linked to GPS which limits overlapping of chemical application. Since this technology was implemented on the farm, it has removed 32 ha of overlaps each time the whole farm is sprayed which is a huge environmental benefit.

We know as farmers that we have to try to solve our own problems; we cannot rely on chemical companies to always have the answer. This has been proven in the case of blackgrass with widespread resistance now seen throughout the UK to the current herbicides on the market. The industry is facing the unknown with no new herbicides likely to become available from manufacturers. Cultural control measures are now our only option.



The crop sprayer has 14 sections linked to GPS which limits the overlapping of chemical application. This technology removes 32 hectares of overlaps each time the farm is sprayed

“ We know as farmers we have to try and solve our own problems, we cannot rely on chemical companies to always have the answer. ”

It sounds like the introduction of GPS has been an important step for the farm.

It has been! We use GPS when fertilising, applying pesticides and herbicides, and also even when seed drilling and cultivating. Before the introduction of GPS in some places we used to overlap applications or planting by up to six to eight inches, now we have that down to one to two centimeters. I estimate that through the GPS we are saving £14,600 per year in seed, chemical and fertiliser costs, and this does not take into account fuel, labour and machinery hours.

What is Biodiversity like on the farm?

Wildflower margins around the farm count towards our 'Ecological Focus Area' percentage under the Government's Basic Payment Scheme, which the farm has now taken part in for 7 years. We have six metre grass and wildflower margins around the farm which we focus on establishing near to footpaths and main roads for the public to enjoy and to help improve the perception of agriculture.

What else are you doing to protect endangered species?

We provide supplementary food across the farm for song and game birds, the abundance and diversity of which is evident. The Food and Environment Research Agency (FERA) conducted a wildlife survey on farm last summer and found a number of International Union Conservation of Nature (IUCN) red listed species present on the farm. We have Yellowhammer, Linnet and Skylark, all of which have suffered declines in the UK due to agricultural intensification. These species have diverse and often complex habitat requirements, including mature hedgerows and year round seed and/or insect availability. We also have good numbers of grey partridge, which are also IUCN red listed and feed off the insects in the wildflower margins we plant. The presence of the species described we feel is a great conservation achievement.

EN

Food provided across the farm encourages rare bird species, including Yellowhammers, Linnets, Skylarks and Grey Partridge

ET

Have you invested in renewable energy?

A 50KW solar panel installation was added to the grain store roof two years ago and is connected to the National Grid. The balance works well as our demand is high during the summer for drying and cooling grain and oilseeds so the solar panels provide the energy we need. During the winter when our demand is low, demand from the National Grid is higher so we can feed into it. We are in the third year of the project and predict the all the initial costs will have been recuperated by 2021.

EC

A 50KW solar panel installation on the grain store helps meet our demand in the summer and feeds the National Grid in the winter

EN

Do you have any water management practice in place?

With the climate in the UK and the type of crops we are growing, we do not have a need to irrigate any crops and therefore are not extracting any water. In fact we have to be more focused on the opposite, keeping our heavy land adequately drained.

We regularly maintain the ditches and dykes surrounding these fields to prevent the soil becoming waterlogged in the winter and have a weather station on the farm and have been maintaining rainfall records for the last 18 years. We use current and historical information to help when making day to day and longer term management decisions: the best time to plant and when to apply fertiliser for example. Recently we have seen two extremes of rainfall levels. In 2010 we had the lowest rainfall amount I have ever recorded and then in 2012 we saw the highest level of rainfall recorded.

You said you have had your eyes opened to the benefits of measuring your own and your staff's performance, can you tell us more about this?

Before I attended the Institute of Agricultural Management Leadership Development Programme at the Royal Agricultural University in 2012, I didn't really think about it. But attending this course opened my eyes not only to measuring staff performance but also my own. We now have a formal review process where the team can be open about how things could be improved, how I can improve and what they would like to achieve. I don't restrict this to a once a year occasion though, we meet regularly to plan our activity as a team. At these meetings, I encourage feedback on an ongoing basis and make sure that I implement the changes which we agree to.

“ We now have a formal review process where the team can be open about how things could be improved, how I can improve and what they would like to achieve. ”

How do you get involved with the farming community?

In 2013 I won the Farmers Weekly Award 'Farming Champion' for supporting farmers during bad spring weather that hit hill farmers that year. After seeing TV news footage of livestock farmers in upland areas that had lost hundreds of sheep due to deep snow during the lambing season, I launched a forage donation scheme that is now known as Forage Aid.

After seeing the footage we sent 50 bales of our haylage to farmers in need in Cumbria. It was quickly apparent this wasn't enough so I contacted Farmers Weekly, spoke on local radio and led a social media campaign asking other farmers, hauliers and agricultural suppliers to help.

The project, which started in April, rallied dozens of farmers and suppliers across the country to donate forage to struggling livestock farmers in Cumbria, Wales, Devon, Derbyshire, Northumberland and North Yorkshire. Following the Forage Aid and the Farmers Weekly Award I was also awarded with an MBE in June 2014 for Services to Farming Resilience in England and Wales.

Where would you like to take things next?

Soon we are going to start using a Yara N Sensor to help us accurately apply Nitrogen in relation to the crop requirement, and we are looking to become more self sufficient by building on the water management practice we already have in place and making further use of the grain store roof area for rain water harvesting.

We are also now looking at direct drilling cash crops into cover crops to improve soil structure and further reduce costs.

Appendix 1– Good Practice Matrix for Roy Ward Farm

The following matrix has been developed by McDonald’s to help assess the sustainability of 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) ET		
Human health & welfare i Employee health & welfare ✓ ii Food safety ✓	Animal health & welfare i Nutrition ii Slaughter iii Genetic selection iv Animal cloning v Husbandry vi Transport vii Medication & growth promoters Slaughter	Business ethics & supplier relationships Rural landscape preservation ✓
Environment (protecting the planet) EN		
Climate change i Greenhouse gas emissions ii Energy efficiency & renewables ✓	Waste i Production waste ii Hazardous waste iii Waste to landfill	Ecosystem protection i High Conservation Value Land (HCVL) ii Habitat & species preservation ✓
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 ✓	Agrotechnology i Agrochemical usage ✓ ii Bioconcentration & persistent organic pollutants ✓ iii Genetically modified organisms
Natural resources – air i Air emissions		
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 ✓	