



McDonald's Europe Flagship Farms Tomatoes/Heinz Tomato Ketchup – Benfica do Ribatejo, Portugal

Close collaboration between producer and grower enables sustainable production, while benefitting both the farmer and the producer by sharing and implementing good practice.

This case study shows how tomato production for tomato ketchup can be undertaken in an economically challenging market, whilst reducing input costs, increasing yields, and ensuring food safety.

Here we highlight good practice in water, agrochemical use, producer incomes and food safety.

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.

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

McDonald's Good Practice Matrix

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
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Environment (protecting the planet)

Climate change i Greenhouse gas emissions ii Energy efficiency & renewables	Natural resources – water ✓ i Water pollution ii Water usage efficiency ✓ Natural resources – air i Air emissions	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	Agrotechnology ✓ i Agrochemical usage ✓ ii Bioconcentration & persistent organic pollutants iii Genetically modified organisms	Waste i Production waste ii Hazardous waste iii Waste to landfill

Economics (long-term economic viability)

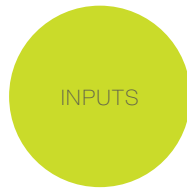
Sufficient high quality production ✓ i Producer income security & access to market ✓ ii Agricultural input costs ✓ iii Crop & livestock disease	Community investment i Local employment & sourcing ii Support for community programmes
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Good practices demonstrated in this case study

Executive summary

Key areas of good practice:



Soil testing for nutrients is undertaken prior to the planting of tomatoes to ensure the correct level of fertiliser is applied.

Seeds selection – HeinzSeeds identifies and develops tomato varieties best suited to the target environment and climatic conditions. This results in optimal yield with minimal resources input, leading to sustainable farming best practice. Benfica do Ribatejo plants these adapted tomato varieties.

Traps for fruitworm are used to monitor occurrence. Once threshold levels have been reached a programme of control is put into place. Capturing these pests also identifies which stage of their lifecycle the fruitworm is at and therefore the most effective treatment can be used.

Sprayer calibration ensures that expensive crop protection products are placed accurately onto the crop and avoids over-application which can be environmentally damaging.



Drip irrigation is used to ensure that water is used in an efficient and effective manner.

Testing of irrigation water for nitrates and pesticides and soil testing for heavy metals ensures that the tomatoes are produced to the highest levels of food safety, ensuring consumer health is protected at all times.

Additional areas of good practice:



The farm is part of a joint collaboration of 46 farms (Producer/Grower Organisation), with a total area of 1500 hectares (3700 acres). This allows the farm access to professional plant technologists who are able to give help and advice with fertiliser, plant protection product applications and water use. The Producer/Grower Organisation deals directly with the tomato processor allowing for a close association which benefits both the individual farmers and the processor.

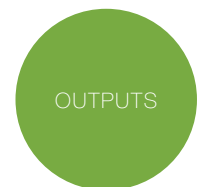
The Producer/Grower Organisation deals directly with the processor, and a contract to supply is drawn up between the two parties. The Producer/Grower Organisation then organises the farms within the group to ensure that the supply criteria of the contract is met, allowing the farms to achieve a good return for their tomatoes.

The farm invests in larger and more technically-advanced equipment which allows for quick harvesting of up to 25 tonnes per hour (hand picking is around one tonne/day/person). Faster harvesting allows for improved crop quality.

A Quality Crop Book provides extensive crop record keeping from soil preparation to harvesting, ensuring all crop inputs and management events are captured, enabling traceability of all harvested tomatoes.






A positive list of plant protection products that can be used by the farm is developed annually between the Producer/Grower Organisation and the processor.



Improved management techniques and the use of hybrid varieties have helped increase average yields by over 50% in the last 10 years whilst input costs have remained in check.

Summary of actions and benefits

Action		Benefits		
		Environment 	Economics 	Ethics 
Management	Farm is a member of a local Producer/Grower Organisation	Direct access to professional advice on fertilisers and PPP, which reduces risk of over application	Provides a platform for individual farms to deal effectively with a larger company	
	Larger and more technically advanced equipment		Ideal harvesting conditions resulting in increased tomato quality	
	Quality Crop Book		Historic data can be used to help formulate real time decisions	Allows traceability of product from field to fork and enables improved agricultural programs
Inputs	Soil testing for nutrients	Reduces risk of nutrient losses into the natural environment	Potential reduction in fertiliser requirements and costs	
	Selection of correct Heinz seeds tomato varieties	Reduced requirement for PPP, water, land, and fertilisers	Reduced input costs whilst yields are maintained or increased	
	Traps for fruitworm	Plant protection products (PPP) applied only when necessary	Timings and product type can be matched to pest lifecycle and is more effective	
	Calibration of sprayer	Prevents over application and risk of contamination	Ensures correct application of expensive PPP	
Operations	Positive list of plant protection products	High risk PPP avoided		Allows accurate testing at processor and reduces health risks
Resources	Drip Irrigation used	Reduced water consumption for irrigation	Increasing yields using reduced water volumes	
	Testing of irrigation water and soil			Testing is undertaken to ensure pesticide, nitrate and heavy metals are within legal limits or stricter (e.g. PPPs 20% of Maximum Residue Levels or lower)
Outputs	Improved farm management techniques		Yield increases of 50% over last 10 years	



Introduction

'Processing tomato' farms are largely located in Mediterranean countries, and to a lesser extent in new member economies such as Poland and Hungary. The European tomato processing industry processed more than 8.7 million tonnes of raw tomatoes in 2008. Italy is by far the most important producer of processed tomatoes in Europe with a 53% share of European production, followed by Spain (21%), Portugal (11%) and Greece (7%). Processing tomatoes are produced on relatively large farms specialised in extensive production of arable crops and vegetables.

José Augusto Santos Castanheira, 46-years-old and married with two sons, farms 40 hectares of tomatoes at Benfica do Ribatejo, Almeirim, Portugal. His father has always grown tomatoes and originally started growing with only 1 hectare, without any mechanisation, using flood irrigation and manual harvesting. José has been growing tomatoes since 1980 and began his farming career with his father, with harvested fruit being delivered to the processing plant. Between 1980 and 1990 the tomato area increased from one to four hectares, although still with manual harvesting. Then between 1990 and 2000 the area increased from four to 15 hectares and in 1998 José bought his first harvesting machine. In 2002 a second harvesting machine with automatic selectors was purchased, and with this mechanisation José has managed to increase the farm's tomato area to 40 hectares. The farm is mainly operated by the family, although at certain times of the year two part-time staff are employed to help out.

José is integrated in a Producer/Growers Organisation (Hortofrutícolas Campelos) which provides technical assistance for the different crops that he grows. This organisation has 46 different growers, with a total area of 1500 hectares of crops such as tomato, carrot, potato, pepper, broccoli and peas.

Management

Producer/Grower Organisation

The Producer/Grower Organisation provides technical assistance to the farm and also operates as a major link in the relationship between the farmers and the processors. The Producer/Grower Organisation employs a specialist agronomist who instructs the farms in the correct application, use and timing of all plant protection products. The agronomist is able to keep up to date with all new legislation and specific requirements from the processors, ensuring that all products applied by the farm are used only when necessary and in the most efficient and effective manner.

Another very important aspect of the Producer/Grower Organisation is the relationship it has with the tomato paste processor. As the processor handles over 375,000 tonnes of tomatoes over the short harvest period (50 days), a continuous flow of product is essential to ensure the factory works to its optimum capacity and to enable all the tomatoes to be harvested at the best possible quality and within the designated time scales. One of the most important aspects behind the planning is the planting dates of the tomatoes; this is assisted by the Heinz hybrid variety cropping cycle (early, medium, late and full season varieties). The Producer/Grower Organisation plans the planting dates with the farmers, based on their soil types; sandy soils – early and late season harvesting (higher risk of rain during this period and these soils allow harvesting in wet conditions), alluvial soils – mid-harvest period. Without this type of organisation by the Producer/Grower Organisation the farmers may end up harvesting tomatoes and not being able to deliver them into the factory, affecting the planned/contracted volumes. Tomatoes are perishable and so the quality will start to deteriorate, affecting raw material price that is paid for the crop, a scenario where all parties lose out.



Equipment

Benfica do Ribatejo uses technically-advanced equipment, enabling quick harvesting and harvesting at ideal crop conditions, leading to optimum returns for the farm due to higher quality tomatoes reaching the factory. Heinz has developed tomato varieties with firm fruits which are especially important for good mechanical harvesting and bulk transportation and also have very good field storage (remain ripe for extended periods of time without deterioration).



Membership of a producer/grower association provides advice and economic benefit to the farm.

"Mechanical harvesting offers farmers as least three ways to maintain good returns. It has (1) reduced costs per unit; (2) contributed to the ability to expand total production volumes; and (3) provided a more reliable, cost-effective replacement for the diminishing labour pool (Thompson and Blank, 2000)."

(Source: C. Jarén et al "Processing Tomato Mechanical Harvesting Cost Evaluation", 2007)



Use of advanced equipment brings economic benefits to the farm.

Records & traceability

The farm keeps extensive records for the tomatoes planted; including previous crops grown in the field, planting dates, tomato varieties used, and number of plants per hectare. All fertiliser use, plant protection products and management practices are recorded, and all this information is sent to the processor prior to the delivery of the crop. At harvest, a unique code is allocated to each load from the field and this follows the tomatoes to the factory where routine testing for BRIX (dissolved sugar-to-water mass ratio), physical quality and pesticides are carried out to ensure quality requirements are met prior to release into the factory. The unique code is retained all the way through the factory process and enables full traceability back to the farm and therefore to the on-farm records. This programme was initiated by Heinz in March 1999.



Good record keeping ensures strong quality control procedures from farm to factory.



Inputs

Soil testing

Soil testing for nutrients is an extremely important factor in environmental protection and in maximising potential returns for the farmer from the crop. This good practice significantly reduces the risk of applying more nutrients than the plant can use, which could possibly then leach into the natural environment. Soil pH levels are also monitored, with optimum readings of around 6.5 required to achieve the best possible growing conditions.

"Soil provides a reservoir of nutrients required by crops and also therefore for animals but not necessarily at optimum levels of immediate availability to plants. The purpose of soil analysis is to assess the adequacy, surplus or deficiency of available nutrients for crop growth and to monitor change brought about by farming practices. This information is needed for optimum production, to avoid transferring undesirable levels of some nutrients into the environment and to ensure a suitable nutrient content in crop products."

(Source: The Potash Development Association "Soil Analysis Key to Nutrient Management Planning", 2005)

"Soil nutrient management is vital to any sustainable agriculture strategy."



Regular soil testing enables optimal nutrient application and growing conditions.

Seed development

All of the tomato varieties used on the farm have been developed by Heinz. The varieties used on the farm are the Heinz9776 and Heinz6803. The high quality of the varieties which have been especially adapted for tomato paste production have increased pest and disease resistance with lower input requirements. These factors have helped increase the economics of the farm's tomato business. All of the tomato plants are developed from natural breeding techniques and no genetically modified tomatoes are planted or used by the farm.

HeinzSeed is recognised globally as a premier hybrid processing tomato seed company. The company develops hybrid tomato varieties that are adapted to various global climates to benefit growers, processors, and end-users everywhere. Heinz's success in hybrid tomato seeds is rooted in research that is dedicated to sustainable agriculture and continuous improvement in quality and safety, while avoiding the use of GM technology. Through the dedicated efforts of specialist research staff, Heinz has made progress in enhancing disease resistance so tomato crops are less prone to blight, mold, viruses, and bacterial diseases. At the same time, fruit quality laboratories evaluate

tomatoes for taste, consistency, colour, soluble solids, uniformity, size, and shape.

Heinz supplies over 6 billion hybrid tomato seeds annually to farmers. High yields per plant confer an important environmental benefit; namely that farmers can produce more tonnes of tomatoes with the same or lower amounts of water and fertiliser. In addition, the seeds produce firm tomato varieties that remain ripe for longer when stored in the fields, and are more disease resistant, meaning farmers can reduce their use of plant protection products.



Use of premier seeds provides high quality products, with strong yields and minimal negative environmental impact.

"We are impressed with the HeinzSeed Program's contribution to sustainable agriculture," said Eric Chivian, MD, director of the Centre for Health and the Global Environment, and a 1985 co-recipient of the Nobel Peace Prize. "The program is proof that the pursuit of profit does not have to be at odds with social responsibility. Rather, when done right, it can produce beneficial results for all of society."

"The goal of HeinzSeed is to help farmers improve their quality of life while reducing the negative environmental impact of over-reliance on chemical pesticides and fertilisers and conserving limited water resources. Created using traditional breeding techniques, Heinz seeds allow farmers around the world to produce high yields of quality tomatoes without genetic modification."

"Through the HeinzSeed program, H. J. Heinz Company promotes sustainable agriculture in developing nations."

(The Corporate Council Award from Harvard Medical School's Centre for Health and the Global Environment, Sunday, Feb. 3, 2008, New York City)



Fruitworm management

The fruitworm has four stages which are egg, larva, pupa and adult (or moth). It passes the winter as a brown pupa about 5 to 15cm below the surface of the soil and moths emerge from these pupae during late April and May. The moths fly and lay eggs at dusk on warm days, with 500 to 3,000 eggs being laid on the host plants (tomato). It is an extremely important insect to manage because of the serious damage it causes in a wide range of plants, especially the tomato. The typical treatment for fruitworm is with a registered insecticide every 5-7 days, when the fruit begins to set. However, Benfica do Ribatejo uses pheromone traps to capture the Fruitworm moth and once threshold levels have been met, a treatment programme can be established. This has the benefit of reducing pesticide applications from the routine 5-7 days, to a targeted methodology, allowing the most advantageous product to be applied, giving better control in the most cost effective way.

Benefits of using pheromone traps:

- Monitors relative levels of pest activity during the season.
- Allows for decisions to be made on basis of reliable estimates of pest numbers.
- Traps are species-specific.
- Used to determine spray requirements.

Sprayer calibration

The farm sends the pesticide sprayer to be tested and calibrated annually by an external company. This is tested to the European standard EN 13790, ensuring not only that the sprayer is expertly checked and calibrated but also that it has been done to a recognised quality standard. The farm feels this is extremely important as improper calibration can mean that pesticides are not being applied at the correct rates. Over and under applications can have severe consequences not only to the environment, but also to pest control and the economics of the farming enterprise.



Optimal pesticide application reduces negative environmental impacts while reducing application costs.

"Studies have shown that many application errors are due to improper calibration of the sprayer. A North Dakota study found that 60 percent of the sprayers were over or under applying pesticides by more than 10 percent of their intended rate. Several were in error by 30 percent or more. A study in another state found that four out of five sprayers had calibration errors and one out of three had mixing errors."

(Source: Vern Hofman and Elton Solseng "Spray Equipment and Calibration" Agricultural and Bio-systems Engineering, North Dakota State University, 2004)

Operations

The Grower Organisation and the processor have developed a positive list of plant protection products which can be used by the farm. This allows the specific approval of all pesticides which can be used by the farm and gives the factory the ability to carry out residue testing to cover these specific chemicals and reject any products which fail to comply with the residue limits set, therefore protecting consumer health.

Resources

The use of drip irrigation for processing tomato production in Portugal began in the early 1990s, and currently represents at least 95% of the total area dedicated for that crop. Drip irrigation began in Portugal in the Ribatejo region with the melon crop, and was subsequently adopted in processing tomato production. Before the emergence of drip irrigation, irrigation was mostly done through the gravity (furrow) method, which limited tomato production to areas with developed surface water systems and levelled fields. The use of drip irrigation has revolutionised the processing tomato industry, allowing production in new areas of the country, increasing yield, acreage of individual growers, and improving the efficiency of mechanical harvesting. Drip irrigation is now used on approximately 95% of the cultivated area of processing tomato production in Portugal and the remaining 5% is linked to irrigation by gravity or sprinkler irrigation (centre pivot). The success of drip irrigation has resulted in:

- Increased fruit yield;
- Reduction in labour, irrigation water (to increase efficiency) and in supplying water to tomato plants;
- Use of nearly any soil, including soil that before could not be used for tomatoes or that resulted in poor yields and fruit quality; and
- Improved crop uniformity at all stages (due to the efficiency of all mechanised activities, such as transplanting and mechanical harvesting).

Benfica do Ribatejo's tomato crop is watered only by drip irrigation, allowing for a more precise method of water application. Over the last 10 years this has meant that water usage has been cut by over 50%, resulting in increased yields due to the plants water requirements being properly managed.

"Drip irrigation has proved to be the most efficient method of irrigation in terms of water saving and yield increase."

(Source: M. J. RUSAN "Prerequisites for Successful Fertigation" Jordan University of Science and Technology, 2004)

Benfica do Ribatejo's irrigation water can be tested and sampled for levels of pesticide and nitrogen. Undetected high levels will increase the risk of consumer health issues and by ensuring water sources are safe prior to use on the crop, food safety is increased. The farm may also be required to provide a soil sample which is then tested for heavy metal levels. The Grower Organisation is contracted by the processor to have one soil test for every 10,000 tonnes of tomato delivered to the factory although the organisation is exceeding this requirement and conducting further soil analysis.



Effective irrigation systems enable the farm to produce high yields of quality products while reducing unnecessary water use and saving costs.

Outputs

Improved farm management techniques, including the hybrid Heinz tomato seed varieties, have led to yield increases of up to 50% during the last 10 years, as well as an overall improvement in fruit quality. The level of sophistication at Benfica do Ribatejo is high; the use of drip irrigation has been a significant success and the investment in mechanisation has also generated improved efficiency and economic benefits. The increased output from the farm ultimately improves economics of the farming business, which is one of the cornerstones of sustainability.

Future developments

Benfica do Ribatejo is currently working towards becoming approved under the Global Gap Assurance scheme, which will initially cover the farm's production of carrots but it is anticipated that approval for tomato will follow in 2010. This will provide independent verification that requirements such as food safety, quality, good environmental practices and record keeping are being met.

"The tomato industry has developed at a rapid rate over the last few years and has gone from small-scale farming, to larger, more efficient and professionally run units. From the aspect of sustainability, yields are increasing, with falling inputs and it is this feature that sets Benfica do Ribatejo apart. The farm is also part of a larger co-operative which gives a platform for the smaller producers to be able to deal effectively with a large processor and gain access to professional advice and support. In today's marketplace it is not always possible for the family-run farm to have the time or resources to develop the communication lines necessary to deal with a large processor. Being part of a grower organisation allows this to happen."

Karl Williams, Flagship Farms Programme Manager, FAI



Appendix

Crops evolution

Fig. 1: Evolution of yield per hectare – Portuguese national average (1998-2008)

