



## McDonald's Europe Flagship Farms

# Lettuce – Thomas Goedelmann, Germany

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### Introduction

Thomas Goedelmann grows lettuce, carrots, radishes and other vegetables on his farm in Weingarten, Germany. In this case study, he describes how he is employing innovative ways of increasing soil organic matter, collaborating with his neighbours to grow more lettuce and trying to reduce inputs and costs.

The key initiatives on the farm are:

- The farm plants Sorghum–Sudan grass as a break crop which produces several tonnes of organic matter per hectare, this is cut and chopped and incorporated into the soil with the aim of increasing Soil Organic Matter (SOM) levels. Sorghum–Sudan grass is fast-growing so smothers out weed growth, and the deep-rooting nature of the plant helps to improve soil structure.
- To reduce the effects of soil erosion, all organic material from Sorghum–Sudan grass and harvested wheat straw is mixed into the soil surface to provide a binding material which reduces soil erosion during the winter period.
- To reduce the frequency with which lettuce is grown within the rotation on the farm's land, Thomas collaborates with neighbouring farmers to exchange land on short-term agreements. This has led to 60% of the farm's lettuce production being grown 'off farm' in fields that have not had salad crops in the previous year. This reduces disease risk, lowers Plant Protection Product (PPP) use and thereby reduces costs and inputs.
- Although the farm has a good supply of ground water, consumption is optimised through the following innovations:
  - Irrigation water is transferred from its source through a system of underground pipes which reduces the risk of contamination;
  - Careful positioning of irrigation sprinklers reduces the effect of wind and limits water loss through driftage;
  - Optimising water drop size to be bigger and heavier makes the water less susceptible to wind and drift;
  - Using a grid sprinkler system to provide a small quantity of water directed very quickly across the field surface ensure that water infiltrates the ground without forming puddles on the plants, which helps to prevent disease occurrence and spoiling;
  - The highest volume of irrigation is undertaken during the night which helps to reduce evapotranspiration;
  - Brief periods of irrigation are carried out during the day to reduce the temperature of the leaves and to decrease the risk of tip burn.
- In collaboration with the Boudelle Fresh agronomist engineer, the farm tests and chooses the best varieties of lettuce adapted to the climatic soil conditions of the region of Palatinate which also meet the market requirements.

“Recognising and addressing the key sustainability challenges within your farming system are fundamental factors for short and long term success. Whilst ensuring that the short term goals and practices are well managed Thomas has an eye on the future of his farming business. The essential component of crop production is soil and Thomas has a clear objective to improve soil fertility and health which will ensure the farm can keep growing quality salad crops sustainably.”

**Karl Williams, Flagship Farms Programme Manager, FAI**

## Summary of actions and benefits

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

Action		Benefits	
Assurance & Certification	GlobalGAP Certification	EN EC ET	Ensures that the farm is working to the principles of good agricultural practice and cover aspects of food safety and quality, environmental care, worker welfare and crop management.
	Linking Environment And Farming (LEAF) Certification	EN EC ET	LEAF principles promote the use of sustainable farming practices and the use of integrated crop management
Crop Management	Lettuce variety trials undertaken on farm	EN EC ET	The farm trials over 50 varieties in collaboration with Bonduelle and the seed producers. The aim is to select the best varieties that suit the local climatic conditions, have good disease resistance, produce good yields and meet market requirements
	Water Quality	ET	To ensure that irrigation water is of the required quality it is tested throughout the year
		ET	Water is pumped around the farm in underground pipes, which reduces the risk of microbial contamination
	Water Optimisation	EN EC	During irrigation, water droplet size is increased to reduce the affects of wind drift
		EN EC	The irrigation system is laid out in a grid to enable targeted water applications which maximises water absorption into the soil and avoids pooling and run-off
		EN EC	Irrigation is undertaken at night to reduce the effects of evapotranspiration from plants and the soil
Business Planning	Sprayer Calibration	EN EC ET	Farm sprayer is serviced and calibrated annually by an independent company which ensures the equipment is operating efficiently and accurately
	Collaborating with neighbouring farmers to exchange land on short term leases	EN EC ET	This policy increases the amount of available land to grow lettuce and reduces the frequency of it being grown within the crop rotation, this reduces disease challenge, improves soil health, increases yields and potentially input costs
	Photovoltaic panels	EN EC	Photovoltaic panels have produced enough electricity to displace non renewable energy emissions equivalent to 120 tonnes of CO2
	Fuel efficiency	EN EC	Fuel efficiency is a main consideration when purchasing a new tractor. The specific field operation and equipment defines the horse power of tractor used. These practices have reduced fuel consumption by 35%
		EN EC	Picking lettuce earlier in the day reduces their temperature meaning less energy is required to cool them prior to transport to processing
Soil Health	Growing sorghum grass as a break crop	EN EC ET	The fast growth rate of sorghum outcompetes weeds and reduces their establishment and growth and this reduces subsequent herbicide applications in following crops. The deep rooting nature of sorghum helps to improve soil structure and reduce issues of compaction
	Incorporation of organic material into soil surface	EN EC	In the autumn sorghum grass and any cereal straw is chopped and lightly incorporated into the top soil, this helps to limit weed growth and reduces soil erosion over winter. The ultimate aim of this practice is to increase soil organic matter levels

	<b>Tractor mounted hoe for weeding between rows of lettuce</b>	<div>EN</div> <div>EC</div> <div>ET</div>	Cameras guide the hoe between lettuce plants increasing the accuracy and efficiency of the operation. This operation disrupts weed growth and contributes to a 20% reduction in herbicide use
<b>Staff</b>	<b>Employee well being is a priority</b>	<div>EN</div> <div>EC</div> <div>ET</div>	Employees are provided with healthcare, accommodation, regular time off and transport to and from work and for shopping etc. This ensures that staff retention is high with over 90% of the staff returning each year
<b>Ecosystem Protection</b>	<b>Maintenance of habitats</b>	<div>EN</div>	Trees and hedges are maintained and protected to provide habitats for local flora and fauna. These features also provide benefits in terms of acting as a wind break to help prevent soil erosion



“It is important for me to grow and produce quality salad crops for my customers. Food safety, protecting the environment and reducing our demands on natural resources are all crucial elements to farming sustainably. By ensuring that we stay focused and committed we aim to improve the land and its productivity allowing me to hand the farm onto the next generation in a better condition for them to continue the journey. Being recognised by McDonald’s as a Flagship Farmer has demonstrated to me we are doing the right thing and I will continue to look for ways to improve ”

**Thomas Goedelmann**

## Background

Thomas Goedelmann inherited his 340 hectare farm from his father, Willibald, in 1983. The farm, which is situated in Weingarten (Pfalz) in South Germany, originally included pigs but Thomas decided to focus the business on growing vegetables with the aim of supplying into the large food companies. Lettuce is the principal crop grown on the farm and the focus is mainly on the Iceberg variety, although it also grows other varieties such as Lollo Rosso, Batavia and Cos.

### Why do you grow lettuce in this region of Germany?

This region is well suited to growing lettuce and there are several benefits to farming here. In general, our summers are hot and dry, meaning the lettuce grows very quickly and the dry climate reduces the risk of fungal diseases. The water quality in the area is also very good which means we can grow high quality lettuce.

We can grow lettuce here until the first frosts begin in autumn, usually at the end of October. The sandy soils warm quickly in the spring and by the first week of March we're already planting the first Iceberg plants. Due to the milder temperatures at the start of the season we plant varieties such as Lollo because we can start harvesting these by the end of April. Shortly after this we will start harvesting the first of the Iceberg lettuces.

### What are the challenges of growing lettuce in this region?

The light, sandy soil is a benefit but also provides some specific challenges. The soil quality can be quite poor and the light sandy soils suffers from wind and water borne soil erosion. We are continually working to improve soil quality and implementing management practices which reduces the risks of soil erosion.



The farm is continually working to improve soil quality and implementing management practices to reduce the risks of soil erosion





### What practices have you implemented to improve soil quality?

For the past three years, we have been growing a Sorghum–Sudan grass hybrid within the rotation. The concept behind this practice is to use the crop as a source of organic material which can be added to the soil to increase Soil Organic Matter (SOM) levels.

We also use a good rotation with the aim of increasing the soil's nutrient content, whilst reducing soil borne disease challenges and allowing for easier weed control. We also work closely with neighbouring farmers to exchange land for lettuce production, this then reduces the frequency that lettuce appears in our farm rotation.

### Why have you specifically chosen to grow Sorghum–Sudan grass?

Sorghum is a plant of African origin that grows very quickly – in less than three months it grows to three meters in height. We sow around 45 hectares of Sorghum–Sudan grass in June of each year. In the September, the Sorghum is cut and chopped and the green material is then mixed into the soil.

EN

Rotation with Sorghum Sudan grass increases soil's nutrient content, lowers soil borne disease risk, reduces need for herbicides and helps prevent soil erosion

There are several advantages to using this species of grass. Firstly, the seedlings, shoots, leaves and roots secrete allelopathic compounds which are comparable to some synthetic herbicides. This compound suppresses the growth of many weed species and secondly as the Sorghum–Sudan grass is fast growing it quickly smothers out any weeds which do manage to establish themselves. This means we do not have to treat the fields with herbicides as the Sorghum–Sudan grass is great at reducing weed populations. The roots are also able to penetrate deep into the soil which improves the structure and reduces compaction.

The large amount of organic material which is chopped and incorporated into the top soil helps provide some protection against soil erosion as the fibres help to bind the soil surface, especially on days of heavy rainfall or on some of the sloped fields. We follow the same practice after harvesting wheat, where the straw is chopped and left on the surface over winter. It acts like a carpet protecting the soil from erosion and suppressing weed growth, again helping us reduce the amount of herbicide we need to apply.



### What other practices have you implemented to control weeds?

All fields where iceberg lettuce is to be planted are harrowed at least once, ideally twice to physically destroy any weeds prior to planting. We estimate that this practice alone means we're using 20% less herbicides to control weeds. The harrow is also equipped with movable tines which help to break up the tracks left by the tractor wheels. This helps reduce compaction and stops rain water accumulating in these areas.

In 2012 we started testing a weed hoe equipped with cameras that can operate between the rows and the plants within the row. Under good working conditions over 95% of the field surface area can be weeded. In good weather conditions we can cover four hectares per day, this enables us to hoe the entire lettuce crop at least once or even twice and reduce the use of herbicides.

### How do you ensure that PPPs are accurately applied?

The application of PPPs is crucially important, we have to ensure their accurate application and to this end all our crop sprayers are independently calibrated annually. We use an independent company to visit the farm and verify the condition and accuracy of the sprayers and ensure they are operating efficiently.

### How do you maintain a good crop rotation whilst increasing the amount of lettuce you are growing?

The lettuce is a fast growing, nutrient hungry crop which can quickly deplete soil nutrients when grown repeatedly in the same fields. Increased inputs of PPPs and fertilisers are needed to maintain soil fertility and control disease and weeds. Therefore rotations are important to benefit soil health and reduce inputs needed.

For more than eight years now, we've been exchanging fields with neighbouring farmers. This has greatly increased the area of cultivable land available for lettuce production. Back in 2005 we were cultivating only 20 hectares of land to produce around 1.6 million lettuces. Today, we produce more than 9 million heads of lettuce (60% of our production) on new fields that have not had salad crops in the previous year.

We also regularly undertake soil analysis to ensure that the soil is at the optimum pH (7) and to ensure optimum nutrients levels for the following crop.



Harrowing prior to planting lettuce has reduced herbicide use by 20%

### Where do you source irrigation water from and how are you applying this to the lettuce?

We pump water from a groundwater well at a depth of 30 metres. The available water is sufficient to guarantee the water supply for all our irrigated crops, even during dry summers. To prevent any water wastage and evaporation, the water is carried around the farm through a primary system of underground water pipes, spanning around 50 kilometres in length. Importantly, we are able to maintain water quality and avoid any risk of contamination from microbial pollutants, this helps to ensure product safety and quality.

The water then passes through the field irrigation lines to a set of sprinklers that are carefully positioned throughout the crop to reduce the effects of wind driftage and ensure optimal placement of irrigation water. We can further reduce the effect of wind drift by slightly increasing the size of the water droplets coming from the sprinkler heads, which makes them heavier and therefore less susceptible to wind drift.



By using an underground pipe system, we are able to maintain water quality and avoid any risk of contamination from microbial pollutants.



Bigger water drops make the water less susceptible to wind drift

### Why have you selected the sprinkler irrigation system?

We selected the sprinkler irrigation system over a gun and hose reel system for several reasons. Firstly, sprinkler irrigation provides a more even distribution of water and we are able to irrigate immediately after the planting. This means that shortly after planting the plugs, we can irrigate with 10mm of water, which helps minimise transplant shock and ensure that the plant has the best start in the field.

Secondly we are able to irrigate more than 50 hectares of lettuce with a small quantity of water, across a large planted area, very quickly. This gives the applied water time to soak into the ground without pooling around the plant or in the middle of the lettuce heads, this helps to reduce disease occurrence and prevent spoiling.

Evaporation from the soil and transpiration from plant leaves also account for a considerable loss of moisture during the day, especially in June and July. To try and reduce these losses, we apply the largest volume of irrigation during the night, with low level irrigation during the day to reduce the temperature of the leaves and to decrease the risk of tip burn.



We take five water samples throughout the season and send them for testing to ensure the water meets required standards of safety and quality.

### How do you ensure that water quality is suitable for irrigation purposes?

The groundwater here is of very high quality, but we still take five samples throughout the season and send them for testing. The samples are sent in collaboration with Bonduelle to an independent testing laboratory for microbial analysis. The results are sent back to us to ensure the water we are using meets the required standard of safety and quality.



### How do you select lettuce varieties to meet the required specification and quality?

We test more than 50 varieties of lettuce per year under field conditions and with the support and advice from the Bonduelle agronomist we select the best varieties for productivity and market requirements. Along with Bonduelle, we also meet with the largest seed companies in order to discuss the desired characteristics of the next generation of lettuce varieties.

### What are the ideal characteristics when selecting a new variety to grow on your farm?

The varieties selected have to meet the requirements of Bonduelle and their customers, meeting the desired average weight and quality for each lettuce head. Yield per plant is also a particular focus and to achieve this we have reduced the crop density per hectare and now only plant five rows of lettuce instead of six. This has reduced the number of plants required per hectare by 15,000, to 65,000; this provides an additional 20% of space for each lettuce and also means we need to buy fewer plants per year. Although this impacts the number of heads we harvest per hectare the additional benefits outweigh the potential losses.

We are selecting varieties which are adapted to the local climatic conditions. For example, the latest varieties we selected in 2014 are resistant to over 31 forms of fungi, helping the plants to withstand these challenges and reducing the requirement and need for applying PPPs.

### You mentioned meeting customer requirements. What other specifications do you meet?

The farm has been GLOBALG.A.P. certified since 2004 and each year we receive an independent audit to certify that all our agricultural practices on the farm are compliant with their criteria for food and environmental safety, and employee health and welfare.

**GLOBALG.A.P.**

In addition we complete self-assessment tools like the McDonald's Food Safety Checklist in order to satisfy their requirements and meet the Good Safety Standard regulations.



The farm is also a member of LEAF (Linking Environment And Farming), which promotes environmentally responsible farming. LEAF gives our customers confidence in the care we take to produce our lettuce. Working within LEAF's principles has helped to reduce inputs while maintaining yield and quality. It helps confirm that our lettuce has been grown and produced in an environmentally responsible way.



**Energy and fuel are expensive commodities, what are you doing to reduce energy consumption on farm?**

Fuel is a big expense on the farm and we want to reduce the amount we consume as a business. When we replace a tractor we are selecting the most fuel-efficient ones and when planning field operations we match the tractor with the best equipment. For some tasks we use our largest tractor and although it consumes more fuel its work rate is higher. We use the smaller more economical light tractors for any field work which requires minimal power, such as planting. Together these practices have allowed us to reduce fuel consumption by 35%.



More fuel efficient tractors and field operations have reduced fuel consumption by 35%



We are tree planting to create nesting habitats for local bird species

In 2009–2010, we installed 2000m<sup>2</sup> of photovoltaic panels on the roof of the farm buildings that now provide electricity for part of the business. We have calculated that this reduces our annual CO<sub>2</sub> emissions by 120 tonnes.

Finally lettuce is being harvested earlier in the morning, which means the heads are cooler when picked and therefore they spend less time in refrigeration prior to being transported to the processing plant.

**What are the important environment features on the farm?**

We aim to conserve as many trees and hedges on the farm as possible. There are many trees and hedges located in the middle of the fields, from a management perspective it would be easier to remove these but we choose to leave them as these areas provide habitats for local flora and fauna and also act as a wind break from any strong winds which can cause soil erosion. We also plant fruit trees along the edges of some of the fields and roads to provide nest-building zones for local bird species.

**How many staff do you employ on the farm?**

We have 20 permanent full-time staff and approximately 100 part-time employees who work on the farm from May until November. Around 90% of these return to the farm every year so they understand the system and work well.

**How do you provide for staff health and welfare?**

Employee wellbeing is very important to the business and we provide good facilities and services to support this. Accommodation is provided on-site in a large, newly renovated building with good facilities. All staff are provided with regular time off and we supply transport to the local shops and supermarkets. Any staff who fall ill are provided with health care and are taken to a local doctor to ensure they receive the best care.

Transport is provided to and from all fields during harvest and these teams start early in the morning so to avoid having to work during the hottest parts of the day.

## Appendix 1–

<http://www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rd-Edition/Text-Version/Nonlegume-Cover-Crops/Sorghum-Sudangrass>

## Appendix 2– Good Practice Matrix for Thomas Goedelmann's 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