



Andrew Burgess – Produce World Ltd & RB Organic

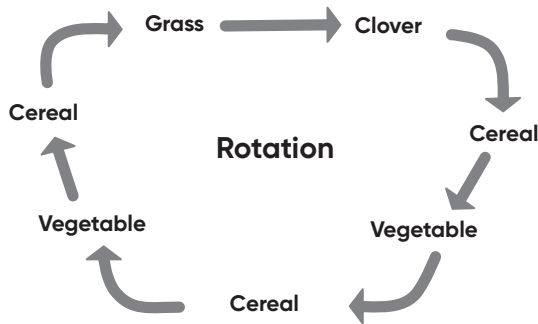
There are around 731,000 tonnes of carrots produced from about 9000 hectares of land each year in the UK.

Carrots require a free draining sandy soil for the roots to develop properly and production areas can be found in East Anglia, Nottinghamshire, Yorkshire, Lancashire and Scotland.

“Necessity is the mother of invention.”

Andrew Burgess, NFU Horticulture Board Member, has worked at the 4,500 acre Houghton Estate for 12 years and has been farming organically for 23; farming everything from 140,000 chickens a year, not owned by the farm, to various vegetables, including 100ha of carrots, 100ha of potatoes and 50ha of onions.

The farm does not have a rigid rotation as it varies depending upon on the soil type and weed burden that year. With livestock present, the rotation can be heavily dependent on soil type as they can only put livestock or grow vegetables in certain areas. The arable rotation is a minimum of 7 years, sometimes getting up to 9 years (see figure). Andrew and Joe Rolfe, farm manager, both come from conventional vegetable growing backgrounds. However, both have chosen to take the organic route and are firm supporters, saying they could not now go back to conventional methods. The agronomy on farm is mainly done in house, though sometimes they will bring in outside help in order to bring some expert opinion to the crops being looked at regularly.



A major hurdle carrot growers have to overcome is the presence of aphids, which can transmit several viruses into carrots when they feed on the foliage. Leaf symptoms from viral infections of carrot are still poorly understood. This variability could be due to several factors, such as the age of the crop at infection, variety, environmental conditions or confusion from plants being infected with multiple viruses. Ultimately, any viral infection that changes leaf colour will affect photosynthesis and have the potential to lower yield. A range of root symptoms such as misshapen roots, stunting, and root browning (necrosis) have been linked to virus infections.

Integrated Pest Management

In looking at how the farm views IPM, Andrew says, “In managing problems, we think more about prevention rather than control. We have a whole systems approach and it is much broader than just a single issue. For example:- I believe blackgrass is a problem that has been made through short, poorly thought out rotations and over reliance on a single point of control.”

As the name suggests, this species overwinters as eggs in willow trees which hatch in February/March. The young aphids then feed on the new crop shoots until they develop wings and travel to nearby umbelliferous plants, one such host being the ubiquitous, cow parsley. It is due to the abundance of willow trees and cow parsley that

Andrew realises that...

“it is not realistic to try and eradicate carrot willow aphid from the environment, it is always going to be there.”

Despite taking an integrated approach, carrot-willow aphid (*Cavariella aegopodii*) is proving to be a difficult pest to control in both conventionally and organically grown carrots.

Andrew and Joe accept that aphids and viruses are present in the local environment and manage the growing of the crop in an integrated way to minimise plants becoming infected. The effect of the virus on the plant has two potential implications: it completely wipes the plant out, or when harvested, the crop isn't viable due to the roots being hairy or misshapen where the aphids have introduced virus. This can be up to 40-50% of the crop if there is a heavy aphid infestation.

With one of the key anchors in an organic system being biodiversity, the farm ensures there is as much biodiversity as possible to help support a large indigenous population of predatory insects, such as ladybirds, lacewings, hover flies and parasitic wasps which predate aphids. These populations are maintained through permanent flower margins devoted to maximising biodiversity. The farm mows the verges to reduce cow parsley prevalence but it's a challenge.

The farm has experimented with the idea of putting biodiversity strips through the field but faced a problem: unless they could establish it in the autumn, which is difficult to do due to the rest of the rotation, it won't flower at the right time to coincide with the arrival of the aphids.

The farm uses forecasting tools to be as prepared as possible for pests, such as AHDB Pest Forecast, trapping and field scouting, which ensures that they have an accurate measure of aphid numbers. Generally the farm release additional beneficials before they see aphids to ensure that there will be a spike in predators at the same time as the pests.



Garford mechanical hoe

“There's no resistance to being eaten.”

When asked whether a hard winter affects their beneficial populations Andrew says, “We don't tend to worry about what we can't control and we can't control the weather. But all of our beneficials are indigenous and evolve naturally in the UK climate – nature has a way of making sure that there are enough survivors to kick things off again in the next season.

“You're never going to get aphids fully out unless you have a sterile environment, which we don't want. They're also a food source for the beneficials.”



“We're trying to work in harmony with nature; we're not trying to beat it, manage it or master it.”

The farm plough to a depth of 18 inches for weed control once every 7 years. This depth is needed to provide a fine seedbed for the carrots to grow straight roots and meet consumer demands.

“Ploughing is necessary to produce the fine seed bed needed to grow root vegetables.”

The soil health on the estate has improved over the 12 years that Andrew has been there; demonstrated through increased organic matter, improved soil structure and appropriate levels of potassium and phosphorus. The organic matter ranges from 1.5% to 2.5%, which, for soil that is Norfolk sand, is high. Andrew recognises that cultivations can be intense, but this is only for the vegetable part of the rotation. He acknowledges the potential to lose soil through water and wind erosion and puts measures in place to minimise this.

The farm is located in a dry part of the UK, receiving only 21-23 inches of rain annually, so crops are never grown without irrigation. Carrots are drilled from mid-April to June. Timing is critical to avoid having vulnerable plants emerging at the same time the carrot-willow aphids are mobile as they could fly into the young crop and introduce virus when they feed. The farm can't

escape the flight of the carrot-willow aphid but they try not to expose the crop to two generations of the carrot fly.

Managing the drilling date also means that the farm can avoid having an emerging crop when the aphids are migrating. If the crop is established and more robust, it may still get the virus but it won't wipe the crop out fully.

The drilling dates are spread in order for there to be progressive maturity in the crop as well as to aid with hand weeding. The farm uses hand labour to remove weeds from the carrot beds. The farm harvests fresh every day and puts straw on the beds to protect the crop from frost over the winter until May. The harvest is later than conventional carrot growing, starting in mid-July rather than June. Because synthetic fungicides cannot be used in an organic system, Andrew says they do get more end of season disease problems and believes that when the carrots get too old they start to lose their flavour. “We aren't giving customers the premium experience that they are paying for. It's better to have seasonality from our partner growers in Italy and Spain, who produce carrots for us on contracts to fill that gap.” This means that by the middle of May, the organic sector is selling new season imported Italian carrots.

The farm has found that some varieties of carrot have been more tolerant than others to aphids as they establish quickly with rich green tops that appear to withstand aphid attacks. However, those varieties are not usually

very high yielding, though breeding work in Holland is currently being carried out to improve yield and flavour.

The carrots on farm are all grown from seed and precision drilled in beds of 3 rows. Companion cropping with marigolds, clovers, garlic and onions has been tried around the outside of the field but Andrew doesn't think it has worked. "A lot of these things tend to work one year and not the next. There is a huge amount of variability and it can be difficult to replicate success each year," says Andrew.

“It's a mind-set though, nothing gives you 100% with organic and it's always a combination of factors. We all make mistakes and we are learning all the time.”

Andrew recognises that growing crops organically is a high risk, namely due to the lack of options to solve a problem. Whilst Pyrethrum insecticide can be used, the farm chooses not to due to the high levels of resistance which have developed. The farm did have use of Savona, a fatty acid that, which, whilst not overly effective, did not harm beneficials or the crop. However, it has not been re-registered in the UK because the market for it was not big enough to justify the cost.

The main pitfall of releasing additional beneficials is that they are expensive to rear, isolate and to breed and nobody in the UK is producing beneficials in the numbers that are needed commercially. Climate change is already having an effect on the farm, not with new pests but indigenous pests that are now able to overwinter.

“The extremes are becoming more permanent; we have to learn to change our management to deal with the extremes and short weather window.”



Hand roguing rig

Weed Management

The farm takes an integrated approach to weed control, with a long rotation being central to minimising the weed seed burden in the soil. Perennial weeds like docks and thistles are a big challenge. Deep ploughing can bury weed seeds and a stale seed bed allows weed seeds to germinate before mechanical destruction at the time the carrot beds are formed. Gas burners are used to destroy weeds before planting, and then a GPS steered Garford hoe is used to remove weeds between the carrot rows once the carrots have emerged. Finally, hand weeding is used to remove any weeds within the carrot rows.

Flaming the soil is effective and it is inexpensive but it does have a big

carbon footprint. Muck from the cattle on the farm is used for organic matter, although the carrots do not need a lot of nutrition in comparison to potatoes, "It's understanding the real requirement. Fertiliser can cause a lot of problems because it makes the crop vulnerable and luscious." Flaming is critical on onions and carrots and is carried out when there are no crops planted. The carrots are then planted at a staggered rate with pre-emergence flaming of the weed bed as late as possible one last time.

If it is a good year for weeds the farm will only need to hand weed once. The cost of labour is £12 an hour and the farm employs 80-120 staff for the 6-8 week long weeding season.

POLICY ASKS

- Public goods: make sure that farming systems that genuinely deliver for the environment are recognised as public goods.
- Try and find a way of rewarding small family/farming businesses - to be thinking in innovative ways you have to be very much in touch with your land. When management and staff are spread thinly they don't have time to be in touch with what they need to be in touch with.
- There needs to be targeted funding of a future ELMS in order to achieve environmental objectives.

“There's only one thing that matters to government policy currently and that's getting cheap food. There are consequences for that and we're paying for them now.”

FOR FURTHER INFORMATION:

<https://langridgeorganic.com/our-growers/uk/RBOrganics/>
<http://britishcarrots.co.uk/>

[Crop Walkers' Guide: Carrots and Parsnips](#)
[carrot-willow aphid](#)
[AHDB Pest Forecast](#)