## **BASE-UK ROTATIONS**

# Overcoming regen frustrations



Farming following regenerative agriculture principles isn't always sunlit uplands, as shared by speakers at the recent BASE-UK conference. *CPM* provides insight into their challenges and the solutions they've identified to overcome them.

By Mike Abram

rowers frustrated by a seeming lack of progress following the adoption of regenerative agriculture principles often comes back to not adding enough carbon into the system, according to US soil scientist, Dr Kris Nichols.

Speaking at the BASE-UK conference, she noted experiences in North America where farmers and ranchers became frustrated after employing regenerative agriculture for a few years, even decades, and not finding the improvements they expected.

"Why is that?" she asked. "Part of it goes back to carbon and not thinking about the role that it has within the system."

Many experience a leap forward when they switch to a no-till approach but then find the system stagnates, said Kris. "Stopping tillage stops the bleeding – the carbon loss – but it doesn't add any.

"We tell ourselves that leaving



Carbon in the system US soil scientist, Dr Kris Nicholls, said farmers should understand whether a field activity adds or takes away carbon.

### **ROTATIONS BASE-UK**



Moving over to regen

Northumberland farmer Stuart Johnson said he could relate to initially being frustrated with the results from a switch to a soil-health-focused system.

 residue will add carbon, but it doesn't add soil organic matter carbon. Most of the carbon formed goes back into the atmosphere as carbon dioxide within a year or two," she explained.
"The job of residue is to provide armour and protection for the soil surface."

Midwest US growers could tick the boxes for other regenerative agriculture principles, for example, by occasionally growing a rye cover crop after soybeans, or having a neighbour sporadically graze land with cows. Some even consider corn followed by soybeans as a diverse crop rotation, suggested Kris.

"But none of those are adding a significant amount of carbon. What you have to think about all of the time is how you can drive photosynthesis."

It's this which provides food for soil microbes, she added. "That's the one thing you have to do as then they'll do a job and help you out. The more we stimulate biological activity, the more we get carbon that matters – the active carbon that helps to prevent nutrient loss and improve water holding capacity."

Kris emphasised that farmers should understand whether a field activity adds or takes away carbon. "And if you're taking carbon away or not adding it, think about what you can do to start adding it – what's your recarbonisation plan?

"You're not always going to be adding carbon – that's the reality – but understand what is it that you're doing to add it into the system to drive forward momentum." Northumberland farmer Stuart Johnson could relate to initially being frustrated with the results from a switch to a soil-health-focused system. Initially motivated by cost savings, especially for inputs, he experimented with cover crops and notill on what had been a predominantly conventional mixed farm operation.

"The early years as I call them, between 2012 and 2018, we were very scattergun in our approach – just trying different things," he explained.

"We had some good successes but we were also doing things we thought were helping but actually doing more damage. It was two steps forward, and three steps back.

"We were incredibly economically-

focused, saving as much as possible to generate margin, but there was very little thought process for the health of the soil which ironically is the keystone in earning the right to reduce inputs.

"We'd designed a system for how we wanted to farm and then were forcing our will – our way of farming – on the environment without necessarily considering if it fitted the system."

#### **PRINCIPLE-BASED SYSTEM**

The turning point was following Understanding Ag's principle-based system created by Gabe Brown, Allen Williams and Shane New, said Stuart. That moved him from a place where he was drowning in the science of soil function and microbiology to one where he could adopt principleled practical solutions to drive ecosystem function, he explained.

That included daily movement for the beef herd and changing breeds to stabiliser cattle, Innovis foragebased sheep genetics that suited his system better, going to a full no-till system with a SimTech drill rather than using a Claydon, and growing multi-cover crops or diverse swards.

"I can't advocate enough how important livestock are in terms of building soil health," he said. The benefits include higher grass growth which reduces the feed requirements of his arable crops – allowing the farm to switch to a 5:2 rotation of five years of legume herbage swards to build soil health, before cashing in with two years of arable crops.

"We've gone from fairly high input to low inputs – we've not applied bagged P or K for seven years, no fungicides or insecticides for five years, and reduced total N applications from 70-80t/year to less than 10t.

"It boils down to at a very basic level, having living roots to build soil aggregates at depth, to make the soil work for us and allow the reduction of inputs. Yields are slightly back, but the

"We've not applied bagged P or K for seven years, no fungicides or insecticides for five years, and reduced total N applications from 70-80t/ year to less than 10t." margins are there still and we're more resilient to price changes and weather extremes," he shared.

Integrating livestock into an intensive vegetable production business was certainly

challenging, along with implementing the other core principles of regenerative agriculture, explained John Sansome, farm manager at G W Revill & Son in Worcestershire.

Growing eight different vegetable crops from tenderstem broccoli to niche offerings such as baby courgettes, plus combinable crops, John was finding some principles easier than others to introduce at the Vale of Evesham-based business.

However, among his successes has been reducing soil disturbance using a Horizon SPX strip-till cultivator for crop



Livestock integration Integrating livestock into an intensive vegetable production business has proven challenging, explained farm manager, John Sansome.

## **BASE-UK ROTATIONS**

## Trial compares regen system with conventional

Understanding the differences between conventional and regenerative approaches is the aim of a research trial by Harper Adams University post-doctoral student, Joe Collins

he systems-based research compares 24m tramlines – five from each management system – on two fields in North Shropshire, explained Joe, during the BASE-UK conference.

In contrast with conventional research methods which isolate one variable such as tillage or use of a cover crop, and make no other changes, his research looks at the entire management system and allows for multiple adjustments.

Consequently, the work reflects what happens on-farm when growers introduce a regenerative system, said Joe. "You don't just buy a new drill, you change your management approach – your whole farm ethos. And it gets away from the problem where practitioners look at trials and say you'd never drill a crop on that day in a particular system or manage the crop that way."

Each approach is managed by a separate agronomist. In the conservation agriculture approach, three principles are followed: minimal soil disturbance with no cultivation, maintenance of soil cover by chopping straw residue, and a diversified rotation including use of cover crops and companion crops. In contrast, the conventional

system uses tillage when deemed necessary, removes straw when financially beneficial, and

establishment. "When we get it right, the results are exciting. We can spray off a cover crop, then mow and strip-till in one pass before, for example," he said.

"There's no bare ground between rows – the soil is protected. We have a diverse cover crop, keep a living root and move the minimum amount of soil to establish the crop. The only thing missing is livestock integration," said John.

Sheep from a neighbour graze some cover crops and cash crop residues on the farm, but Red Tractor rules add complications. "Depending on the following cash crop, there are different periods of time that must elapse doesn't grow cover crops.

For the first two years, the rotation has been the same in both systems – spring beans followed by winter wheat. Yields favoured the conventional system in both years, but expenditure – both machinery costs and inputs – were also higher, explained Joe.

That meant for the spring beans, gross margins were virtually identical, while for winter wheat there was a statistically significant higher margin for the conventional system. For year three, oilseed rape was the intended crop.

"Unfortunately, in the conservation ag plots, we had poor seed-to-soil contact and the OSR was written off pretty quickly to be replaced by spring barley. In hindsight, it might have also been better to have written off the conventional crop as it underperformed," he commented.

Both systems made a loss from these crops but it was higher in the conventional system, wiping out some of the gains made in the previous wheat crop. During the three-year period, both systems had similar gross margins.

As well as the economics, yields and input costs, Joe is also monitoring soil properties and biology, available nutrients and greenhouse gas emissions.

"So far, we've seen no significant differences in pH, soil biology, soil carbon or soil nitrogen. Bulk density

between grazing and drilling," he noted.

Furthermore, drilling into a cover crop or previous cash crop residue hasn't been straightforward in all veg crops at the farm. "Balanced against protection of the soil surface, we must get tiny seeds into the ground with a high level of accuracy as spacing is so important for a consistent crop," highlighted John.

"Current veg drills can't cope with trash and block, so sometimes our regenerative system falls down at the end because we can't get our cash crop in the ground effectively."

In that situation, John has reverted to the plough, although the area worked is now just 15% compared with



#### **Collecting trial data**

As well as economics, yields and input costs, Harper Adams University researcher, Joe Collins, is also monitoring soil properties and biology, available nutrients and greenhouse gas emissions.

within the conservation treatment has been steadily rising, while there have also been significant increases in the availability of P and K in that treatment."

In-field greenhouse gas emissions from the wheat suggest a higher global warming potential from the conservation ag system, especially when taking into account the lower yield, reported Joe.

"But this is only half the dataset, and doesn't include the manufacture of the products and fertilisers used. I'm now conducting a life cycle analysis to take those into account – my hypothesis is that it'll reverse these results."

The trial is continuing with funding from BASE-UK into a fourth cropping season and potentially beyond, added Joe. "It's important to keep trials like this going to provide the long-term trend data that help farmers with their businesses," he concluded.

around 130% in the past, when land was sometimes ploughed twice in one year for two veg crops. "A veg drill that can cope with trash would help us to make the next leap forward," he said.

A more balanced rotation allowing greater use of cover crops would also help, but a combination of the market-led nature of the business plus soil types and water availability make that difficult, shared John.

Ultimately, balancing profitability and sustainability would remain a difficult act until supermarkets became more genuinely interested, he suggested, with final decisions likely to prioritise price, and length and security of supplies.