MPCN II

Southern Region Farmer Case Study

Hansen Farms

Soil variability demands a flexible fertiliser program

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MORE PROFIT FROM CROP NUTRITION
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Name: Hansen Farms

Location: Coomandook, South Australia

Soil type: Red sandy loam over clay and limestone, grey sand over clay and deeper, non-wetting sand

Farm system: Mixed farming – livestock (sheep and cattle) and broadacre cropping

Average annual rainfall: 375-450mm

Average growing season rainfall: 250-350mm

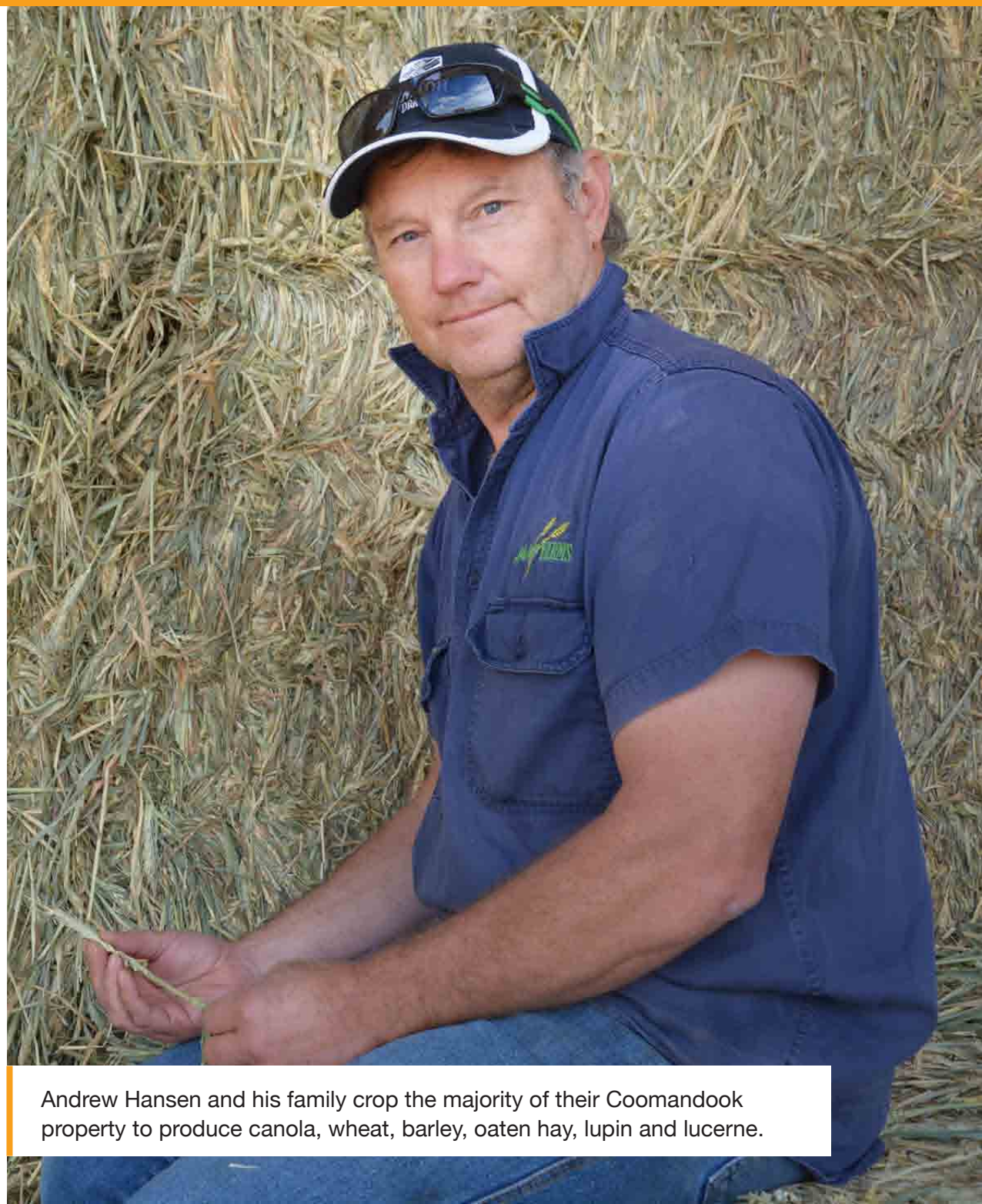
Andrew Hansen manages Hansen Farms, a 8500 ha mixed farming operation at Coomandook, south-east of Adelaide in South Australia. He runs the business with his wife Joanne, brother Gary and sister-in-law Merrawyn.

The majority of the property (80-90%) is cropped annually to produce canola, wheat, barley, oaten hay, lupin and lucerne. The remainder is used for grazing to support a self-replacing Merino flock and turn off 8-10 month-old vealer cattle.

Andrew strongly believes that crop nutrition drives profitability. "We want to be sure we're not under-fertilising our crops in good years, but equally, we don't want to spend too much in the years where we won't get a return," he said.

"Every year is different, and our fertiliser program has some flexibility so we can adapt it to the season."

It was therefore timely for Andrew to attend a More Profit from Crop Nutrition II (MPCNII) workshop at Lameroo in August 2015, to help improve their return on investment from fertiliser. Run by the Birchip Cropping Group (BCG) in conjunction with local cropping consultant Louise Flohr from Agrilink, the workshop was part of the GRDC funded initiative.



Andrew Hansen and his family crop the majority of their Coomandook property to produce canola, wheat, barley, oaten hay, lupin and lucerne.

Variable soil types and yield potentials

The soils on the Hansen farm vary substantially, both in composition and fertility. Deeper sandy soils, are generally non-wetting and create significant challenges because they are quite infertile. Heavier soil types also exist, with shallow limestone being a major subsoil constraint.

Given the range in soil type and associated variation in soil water availability, Andrew uses a range of tools to guide decision making.

"We've established some soil moisture probe networks to determine the crop lower limits and drained upper limits on the rubbly soils."

CSIRO have undertaken some work to characterise bulk densities of some of the farm's 'hard-to-classify' soils. This information is then fed into programs such as Yield ProphetR or Production WiseR to aid decision making.

Soil water was a topic of discussion at the August 2015 workshop. Rainfall to date had been sparse but just in case the spring was kind, the urge to apply potassium (K), sulphur (S) and nitrogen (N) as well as micro nutrients was still strong.

Kate Burke challenged the group to think about yield potential before making post emergent nutrition applications and reassess the target yields based on rainfall received, an estimate of pre-sowing soil water and the potential outcomes of a dry, wet or in between finish. Participants worked through their own examples and Andrew's showed he probably had enough N out already given yield potential was low and the seasonal outlook of El Nino pointed to above average spring rainfall being unlikely.

In 2016, the reverse was true with above average rainfall elevating yield potential and N demand. Andrew topped up with liquid urea ammonium nitrate (UAN) later in the season at a higher rate than normal and was satisfied with the result.

Nutritional challenges

Andrew says the Hansen Farms soils have many "nutritional challenges". The sandy soils lack S, boron (Bo) and zinc (Zn) while copper (Cu) and manganese (Mg) are problematic on stony ground. P is generally lacking throughout the farm, and because hay production makes up about 20% of the cropping program, there are also concerns about potassium (K) deficiency.

To manage these issues, Andrew looks at the long-term yield average in conjunction with soil test results, moisture levels and rainfall history. P is applied at replacement levels (calculated using historical yield maps across the varying soil types) plus an additional 10-12 units. Although variable rate technology had been used to apply P in the past, current machinery only allows single rate application. S is applied down the tube during seeding.

The hay paddocks tend to receive higher rates of fertiliser, to counteract the nutrients removed in the hay. Despite concerns about the potential for K deficiency, trials carried out on the farm (including granular applications down the tube and potash strips sprayed in summer) are yet to show a response.

Micro nutrient deficiencies are something Andrew has always tried to address.

"Boron is an issue on the sandier soils and is applied to canola at a low blanket rate," Andrew said. Zn deficiencies are common in the region and it is routinely put down the tube at sowing. Cu and Mg are applied (where required) as a blanket application later in the season.

Aiming for profit or production?

Hansen Farms had traditionally worked on nutrient removal calculations to guide their fertiliser and nutrient needs. But the MPCNII workshop challenged this approach and got Andrew thinking about the profitability of their nutrition program.

Sean Mason presented findings from two GRDC-funded projects: "Assessing wheat responses to targeted trace element applications" (GRDC project number DAS00146) and "Monitoring of soil phosphorus potassium and sulphur in the southern region how to get the most out of your fertiliser dollar" (GRDC project number UA00140).

Data presented showed that critical levels for S may be as low as 2 mg/kg rather than the 5-7 mg/kg used as a benchmark in the past. Another key point was measuring S below 10 cm when measuring deep N, as roots have access to deep S as well. The lack of data to support S responsiveness had Andrew rethinking his program and his use of soil testing to monitor levels.

Sean also explained that K deficiencies are most common in light sandy soils and less common in heavier soil types or soils with clay in the subsoil. Measuring K at depth is also critical in determining application requirements.

Sean's message about P fertiliser was simple: it's not always required at replacement rates because soil types differ in their responsiveness. Andrew intended on checking his soils PBI (phosphorous buffer index) and DGT (diffuse thin film gradient test) readings as well as traditional Colwell P to better inform his P strategy.

Trace elements and liquid systems

Hansen Farms has invested in a liquid delivery system to address trace element deficiencies and to apply UAN. Andrew says the liquid system has given them a lot of flexibility around their ability to apply products on the sandy and rubble country, which tends to be half-wet and half-dry at seeding.

The ability to apply more than one granular fertiliser was lost with the change in system. However, 2017 sees the Hansens back to using a double shoot, plus three bins and a liquid tank. This will enable a return to variable P and seeding rates—practices not used since the early 2000s—based on yield maps and soil type differences. To assist this, Andrew has 400 soil samples being tested for S, K and N at depth as well as 0-10 pH organic carbon, P, S, K and cations. Andrew is also keen to look at site specific application of K on the deeper sands.

Crop nutrition researcher Sean Mason speaking to growers at the Hart Field-Site in South Australia.

Time well spent

Andrew was pleased he attended the MPCNII workshop.

"We've been doing a reasonable amount on nutrition, but the workshop gave us the confidence that we were on the right track," he said.

"It's a confusing area for farmers. With margins tighter, you can't just put it all out and say 'she'll be right'".

"It's all about time management and finding that balance between managing nutritional requirements across the farm and still getting the basics right such as sowing time and weed control.

"The workshop reassured us that adopting the liquid system was worth it and gave us plenty of ideas about how we can refine our system."

The take home messages

- Think about yield potential before making post emergent nutrition applications. Reassess the target yields based on rainfall received, an estimate of pre-sowing soil water and the potential outcomes of a dry, wet or in between finish.
- Use deep soil tests (0-10cm and 10-60cm) for N, K and S to get a more accurate picture of the status of your soils.
- If you are testing for P, make sure you get Cowell P, PBI and DGT readings as well if possible.
- A liquid fertiliser delivery system gives a lot of flexibility when applying trace elements and UAN, especially in very variable soil conditions.

Useful Resources

Making Better Fertiliser decisions for Cropping Systems in Australia: http://www.bfdc.com.au/interrogator/frontpage.vm

Soil Testing for Crop Nutrition (Southern Region) www.grdc.com.au/GRDC-FS-SoilTestingS

UA00103 - DGT as the soil test of choice for predicting phosphorus requirements of grain crops http://finalreports.grdc.com.au/UA00103