Precision ag gives the full picture

By Jenny Foxton

Grain and cotton farmers will need to rely less on their instincts and guesswork if they follow the trend of precision agriculture.

As its name suggests, precision ag is the use of various technologies to accurately determine crop yields, moisture levels and soil types within and between paddocks.

Precision ag is able to deal with smaller areas and identify problems with a greater degree of accuracy than broadacre agriculture.

This is done through the use of satellite technology for tractor guidance systems, yield mapping and variable rate seed, fertiliser and chemical application. It also means lower chemical usage and less risk of chemicals turning up in water systems.

One proponent of precision ag in conjunction with controlled traffic is Queensland cotton and grain grower David Alexander of 'Carnamah', Jimbour.

David believes the precision ag approach has the potential to boost yields and reduce the cost of production as well as improve management decisions.

"The farmer's knowledge is essential in reading yield maps in that they are able to identify things such as weeds, water flow and previous management practices unique to that field," David said.

Precision ag means the crop is looked at in total in terms of soil types, moisture holding capacity and yield potential.

New recruit to PA

David is a relatively new recruit to the precision ag movement but is already seeing a more accurate picture of his country and reasons for yield variations.

He has worked with Dalby-based Wesfarmers Landmark precision ag manager Bill Town, to survey, identify and number individual 10–20 hectare plots within his paddocks.

These plots can then be ‘mapped’ according to soil types, soil nutrition, water holding capacity, crop characteristics and yields. Agricultural geography information software (AEGIS) software presents the data in graph form showing mean values of tonnages within each field and the extent of yield variation across the field.

The tools used so far at Carnamah include aerial photographs of soil types, a Case AFS (Advanced Farming Systems) harvester yield monitor, a GPS sender and a farm management program.

“Total property maps are created using Wesfarmers Landmark GPS mapping services. These maps identify each field by shape, area and position and also show houses, sheds, dams and power lines, which is important for controlling spraying and other operations,” said David.

“Copies of the maps are given to spray contractors and agronomists each season. Yield maps on this year’s summer crop have shown that the variations within the crop are much harder to identify than previously thought.

“I always thought that I could pick a reasonable variation in the crop from the driver’s seat of the header, but I would say it is very hard to pick by eye within 20 per cent accuracy and you can’t read the areas clearly.

“I can say I realised there were bad patches within a paddock but I didn’t realise how big they were.”

Yield maps are created by sensors placed in the clean grain elevator of the header which measure crop moisture and volume. Grain flow through the header over various parts of the field is recorded on the yield map using a GPS unit attached to the yield monitor

This identifies high and low yielding areas when the yield map is produced.

The GPS unit on the roof of the header cab allows measurement of distance and position within the field at any one time and the area harvested. It also allows David to identify patches of poor yields, excessive moisture and

David built this general purpose marker bar modified from an old planter frame. It doubles as the frame for a shield sprayer and marks out nine metre rows for spraying and planting. The markers can be adjusted to nine metre or eight metre intervals. Described by David Alexander as “the poor man’s guidance system”.

so on.

According to Bill Town, the US AEGIS software is a professional level package which he uses to create the maps of David's country. Viewpoint is the viewing package David uses to look at the maps on his home computer.

Bare soil imagery

One of the requirements of precision ag is to be able to identify your soil type variations. To do this David has employed bare soil imagery. This process is done by using aircraft using multiple spectrum photography.

Yield maps can be superimposed over the aerial imagery to show what bearing soil type has on crop yields. Soil testing is used to identify differences in nutrition and water holding capacity where excessive variations are showing up on the map. This can lead to more efficient crop nutrition management via variable rate application technology.

"When using variable rate technology you can even out the yield potential by fertilising to the cropping capacity of the soil."

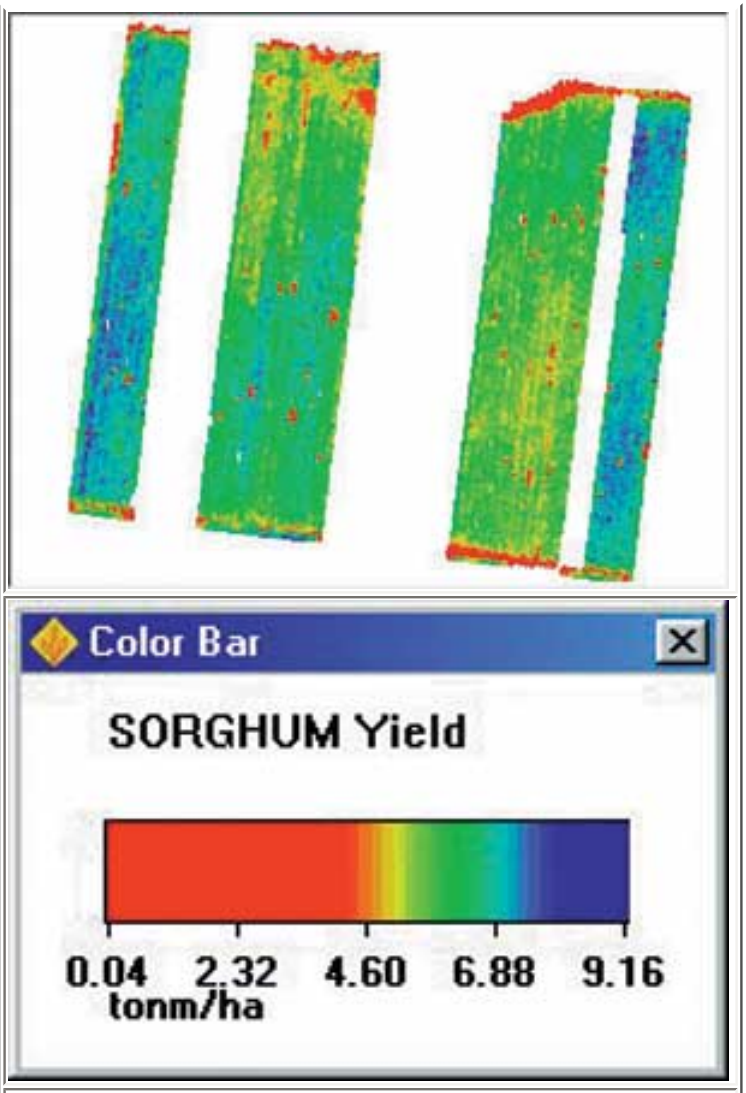
David estimates that only a very small percentage of Australia's farming community are using variable rate technology. He tells of a corn farmer in Iowa in the US who farms undulating country. By using the technology, which increases his plant population and fertiliser application in areas of highest yield potential and reducing them on lower potential areas, he's been able to lift his yields by 28 per cent.

Yield mapping can also identify problem areas of weeds or grasses which show up as yield variation. In David's case, yield variation across one paddock was almost 100 per cent.

"In one particular case a patch of grass showed a yield reduction of 50 per cent from the yield map.

"Where you've got yield reductions of this magnitude, you can quantify what it costs you. In one case the variation was from 4.5 tonnes per hectare to more than seven tonnes per hectare in the one 20 hectare plot."

Every season before planting David takes soil core tests to determine the soil moisture available.



This yield map of a sorghum crop on David Alexander's farm shows various yield results across the crop measured by sensors in the clean grain elevator of the header and recorded by the yield monitor in the cab.

“Using agronomists tied in with precision ag allows us to identify problems sooner and to start asking questions. You can’t measure what you can’t identify and you can’t cure what you don’t know. Ignorance is bliss, but it’s not profitable.”

The PAM farm management program used by David was designed by Fairport Technologies in Perth, Western Australia. The software records paddock management costs and returns and provides graphs and pie charts of input costs which can be cross-referenced with yield maps. The program also determines the breakeven figure in each paddock.

“I can work out the total costs per hour of running individual machinery and based on that, the costs per year. I then put in depreciation and insurance.

“I put the purchase price, expected resale value and life expectancy of that machine into the calculations which makes the figures more accurate with the actual way we operate.

“I can factor in shed or shelter costing and fuel pricing costs per hour to run that machinery. We can work out the economics of running various machines and for example, work out the economics of using a contractor versus our own machinery,” David said.

The PAM program also includes rainfall and produces quality assurance reports on individual crops. Rates and times of chemical application and harvesting details provide the foundation for a QA report.

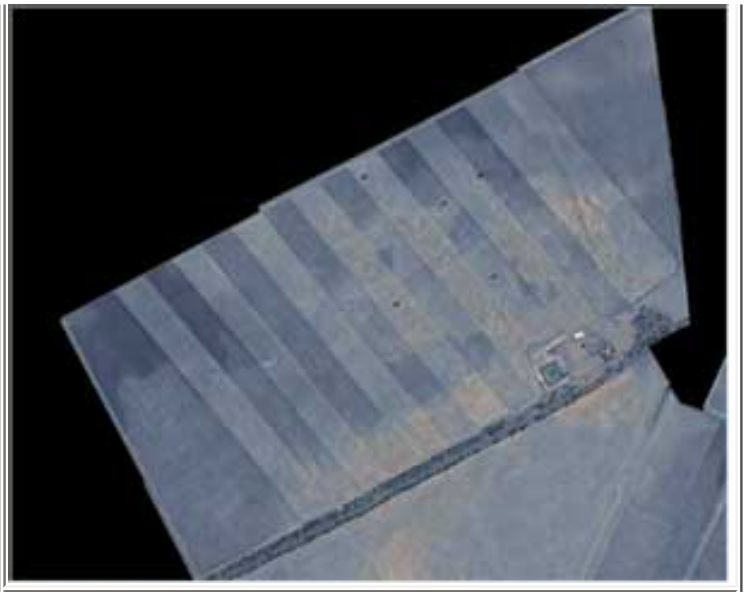
Users can produce a food quality assurance report which contains the history of the crop for marketing purposes.

David attributes the rise of precision ag to advances in technology but says the farming community is only “fiddling around with it”.

“This may be because there have been no clear benefits identified up until recently.

“I think it takes the guesswork out of farming. For example I can work out a patch of weeds costs 0.3 tonnes per hectare of sorghum yield and what this actually costs in dollar terms.

“Any edge I can get, if I can optimise what I’ve got without buying more country, then I’ll use it.



This is a bare soil image taken by aircraft using multiple spectrum photography. These images can be cross-referenced with yield maps to pick up correlations between soil types and yields.

“I want to know if I’m sustainable — environmentally and economically,” David said.

Go back

David Alexander adjusts the yield monitor in his grain header. The monitor links to a GPS sender on the roof of the cab and is fed data from sensors in the clean grain elevator.