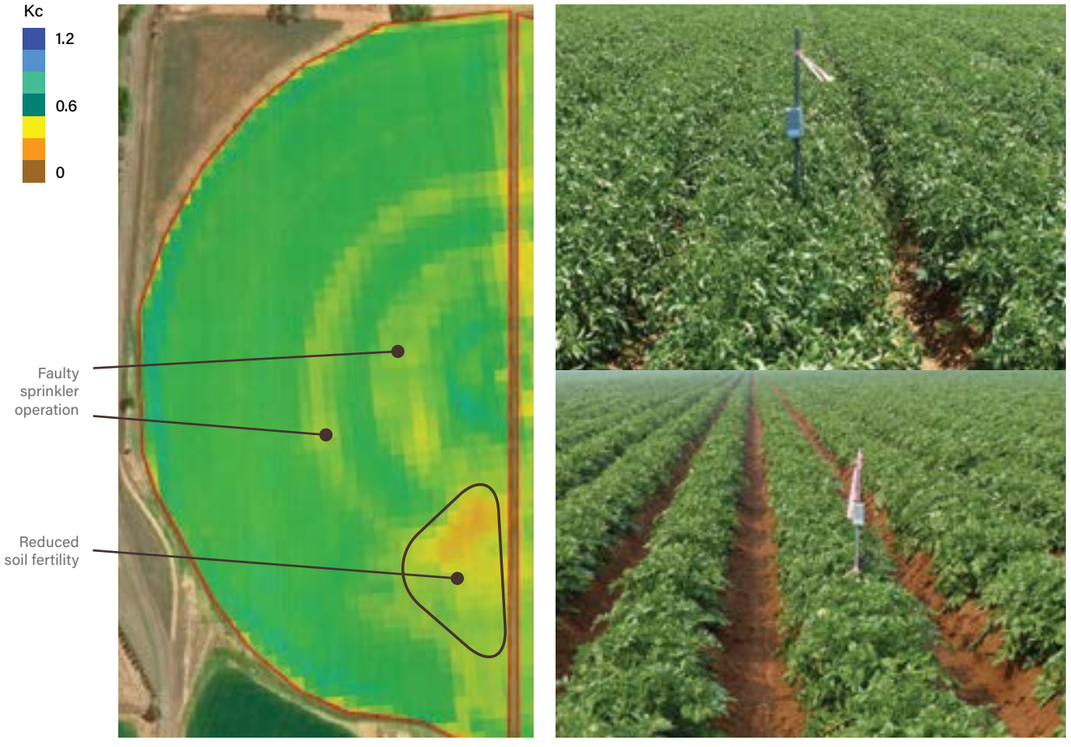

Figure 3. IrriSAT crop factor (Kc) image 49 days after planting, crop coverage is indicated ranging from full (blue) to nil (brown) as shown in the legend. Growth of the potato crop in a good (top) and reduced growth (bottom) areas

Figure 4. A faulty sprinkler head; for this crop, which was grown during hot weather, reduced irrigation limited growth and caused an estimated 10% drop in yield.

Benefits

Using IrriSAT to estimate crop water requirement could have enabled the grower to more closely track irrigation with crop growth. This could potentially have prevented the estimated 10% drop in overall yield that occurred due to moisture stress during tuber bulking.

It was estimated that the issue with the two faulty sprinkler heads reduced the yield in a 3.1 ha zone by 17 tonnes, costing the grower between $4,800 – $6,800. Early identification of this issue using IrriSAT could have prevented this occurring.

The soil problem that was detected under the same pivot reduced yield by an estimated 27% over a 1 ha area. This reduced yield by 10 tonnes, potentially costing $2,800 – $4,000. However, the costs of remediating this area using compost, cover cropping etc need to be considered against the benefits.

Conclusion

There are clear benefits to using this system, if only to monitor crop performance visually over time. New, high resolution images are acquired every seven days, making it easy to check for crop health issues. Linking IrriSAT information to irrigation requires more technical skills. However, there are major benefits for both quality and yield from accurate application of irrigation.

A useful resource on using IrriSAT can be found at www.soilwealth.com.au/resources/articles-and-publications/reference-guide-for-irrisat/

WINTER WARMERS – JOBS FOR JULY

Dr Jenny Ekman reports

In many regions, winter is when growers get to take a well-earned breather. Next season's crop is still a glint in a seed potato's eye, any crops still in are growing slowly and irrigation needs are minimised.

Winter also provides an opportunity for planning next seasons crop, checking equipment and, perhaps most importantly, reviewing the last seasons performance. Which means, there's still plenty to do around the farm.

According to PotatoLink's Tasmanian regional representative Frank Mulcahy, your jobs list should include:

- How's the weather looking – have you checked the long-term outlook?
- How variable is your soil? Have you conducted a soil test?
- Review the performance of your pivots – check operation, maybe cost a variable rate upgrade.
- Think about drainage – need improvement?
- Manage pests and disease – think about your cover crops or rotations and do a PredictaPT test, especially if you suspect a disease hot spot.
- Seed – how is it looking in store? Is it on track to break dormancy at planting? OR is seed supply assured - contact and check.
- COVID is delaying some machinery parts – get your gear ready **now.**

Optimising conditions for storing seed is discussed on p14-19 and delays on machinery supplies are beyond our control. So, let's run through some of Frank's other jobs...

WATCHING THE WEATHER

According to the Bureau of Meteorology, the next three months are likely to be wetter than average, but also warmer.

Even though it's felt pretty cold over the last month or two, with early snowfalls delighting skiers, the models indicate a return to warmer conditions, particularly coming into September. Minimum temperatures are virtually certain to be higher than median values across Australia. Maximum temperatures are also predicted to be higher than median values in many potato growing regions, particularly Tasmania, Victoria, WA and parts of NSW.

Rainfall is predicted to be similar to, or slightly higher than, median values in many potato growing regions.

What this indicates is possible increased pressure from water-loving diseases such as blackleg (*Dickeya dianthicola* and *Pectobacterium* spp.), *Rhizoctonia* and *Phytophthora*. It will also make it easier for overwintering pests to survive.

DIRT DOCTORING

In Frank's experience, yield can vary more than 350% across a single paddock. This means that while some areas are making money, others are costing it. Soil type and nutrition are key factors that can increase or decrease crop yield. This is clearly shown by the yield map in Figure 2; yield in this 7.5ha block ranged from only 30 to 80t/ha, a combination of soil type, drainage and incorrect fertilisation.

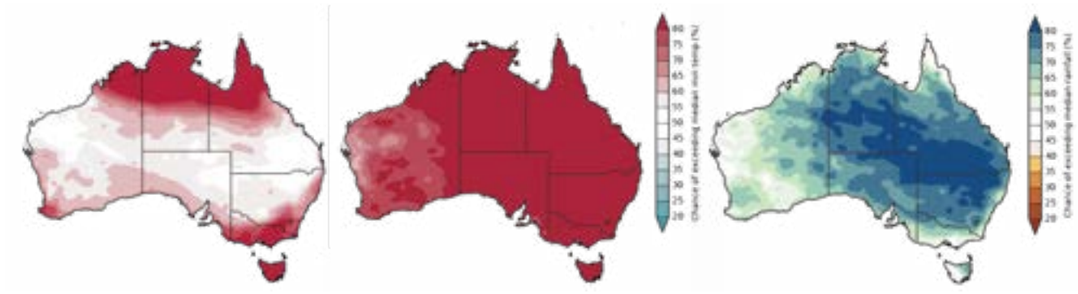

Figure 1. The chance of exceeding median daily maximum temperature (left); median daily minimum temperature (centre) and median rainfall (right) in the three months of July to September 2021 (Charts issued by the Bureau of Meteorology 17th June 2021).

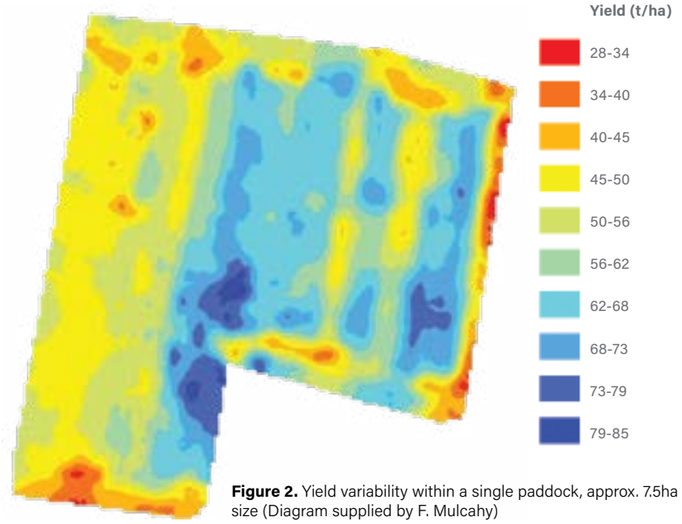

Figure 2. Yield variability within a single paddock, approx. 7.5ha size (Diagram supplied by F. Mulcahy)

A comprehensive soil test is the best way to ensure optimal levels of nutrients such as nitrogen, phosphorus and calcium, as well as a suitable balance of trace elements. Zinc, boron and many other micronutrients are essential for proper growth. However too much of one nutrient can block uptake of another. For example, high nitrogen can reduce calcium uptake, while if the ratio of calcium to magnesium falls below 2 then it is harder for plants to take up potassium.

A full soil fertility test costs a little more than a basic analysis but is likely to include micronutrients, organic matter and nitrates – useful information to have.

If a full soil analysis has been conducted recently and nothing has changed, it may be possible to simply test levels of soluble nutrients; nitrate, borate, molybdate and sulphate. Alternatively, total soil nitrogen is the most critical nutrient affecting growth and can be tested just before planting.

If more than one soil type is present within a paddock, or under a pivot, then these areas should be tested – and treated – separately. Blending two or more soil types together will result in something which is not the same as either. The result could be a paddock where some areas have too much nitrogen – increasing susceptibility to disease and reducing specific gravity – whereas others have too little nitrogen – reducing yield. This is also important if expensive inputs are needed, such as compost; separating soil types allows inputs to be targeted where they are most needed.

It is also best to test the top layer separately to the underlying soil. Soil type can vary considerably with depth, as shown in Figure 3. Calcium, phosphorus and pH can all change considerably with soil depth. Depending on the stratification of soils within the cropping area, take samples from 0 to 15cm and 15 to 30cm.

According to Marc Hinderager, PotatoLink's NSW regional representative, getting the best possible understanding of your soil is the first step towards a profitable crop.

Marc's tips for soil testing:

- Take soil samples well in advance of planting: Samples can take a week in transit and another week for analysis. Time is also needed to interpret the results, purchase nutrients and apply.
- Samples should be taken before any fertilisers are applied, when the area is reasonably dry and preferably before tillage.
- The more soil cores are sampled, the better the results will be: For a 30-hectare plot, combine at least 20-30 cores, using a zig-zag sampling pattern.
- Mix each composite sample thoroughly, breaking up clods and cores and removing plant matter.
- Best practice is to dry samples before submitting for analysis; this can take a day or two, but ensures results are not affected by transport delays.
- Sift 500g of the well-mixed sample into a ziplock bag.
- Label the bag precisely with sample location and depth and fill in the Analysis Request form with matching details.
- Send to the lab by Express post

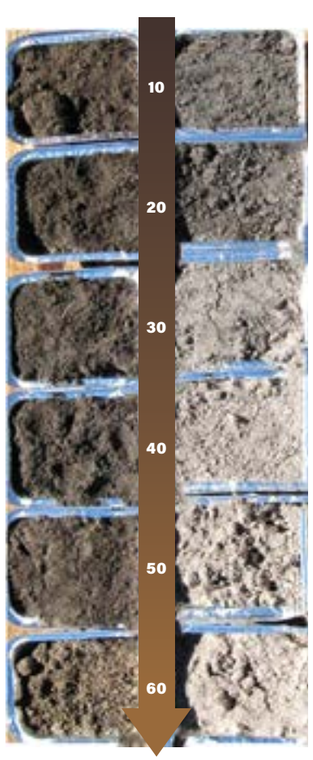

Figure 3. Two Tasmanian soils sampled from within a single paddock, showing colour and textural changes by depth (Photo by F. Mulcahy)

One of the most important jobs for winter is to review the previous season's performance. This is essential to identify and correct issues with soils, drainage and irrigation management (K. Montagu).

IRRIGATION IMPLEMENTED

According to Frank, *"Plants don't eat, they drink. But although plants drink, they don't swim"*

Accurate irrigation management is essential to maximise crop yield, so checking the performance of centre pivots is particularly important. The IrriSAT system (see p20) can be used to check how even the crop growth was at row closure. This will clearly show which areas grew well, and which were slower to develop.

Irrigation breakdown or malfunction, especially during peak irrigation periods, will cost yield. Sprinklers can be blocked by fine trash that moves through the filter. Moreover, sprinkler head packages are designed to operate at set distances and pressures, which may have changed.

Maintenance programmes should check whether:

- Operating pressure has changed.
- Sprinklers spin, wobble or rotate as designed.
- Static plate sprinklers have been damaged by wind or farm machinery.
- Regulators, nozzles and sprinkler plates are clean and unblocked.
- Sprinkler heads are positioned correctly (not put back in the wrong places after cleaning).

VARIABLE RATE IRRIGATION

Variable soil types present a common challenge for irrigation under centre pivots. Adjusting irrigation to sandy soils can result in overwatering of heavier soil types, increasing disease. Conversely, plants will struggle in well drained areas if irrigation is wound back for heavy soils. As with plant nutrition, applying irrigation according to **average** needs can reduce yield over the entire crop.

Variable rate irrigation (VRI) is a well-established technology that adjusts the amount of irrigation provided according to the water holding capacity of soil in different zones. Systems range in precision from simply adjusting pivot speed, to control of spans / zones, to individual control of sprinkler heads.

Irrigation researcher Dr Kelvin Montagu sees both benefits and costs in VRI systems. "Getting irrigation right is critical to maximise yield, especially during tuber formation and bulking. It is especially important under pivots, as once soils dry out it is very difficult to 'catch up', returning the soil profile to optimum moisture levels."

"However, precision systems don't come cheap, especially if retrofitting an existing pivot. Depending on system requirements, a VRI system may be $60,000 to $100,000. They are most likely to give a good return on investment if the paddock includes two or more very different soil types or has quite varied topography."

Electromagnetic (EM) soil mapping is the first step in developing a variable rate irrigation system. In-field soil moisture probes can then be used to develop irrigation prescription maps. The pivot is programmed to provide more or less water to each segment, or turn off completely in low lying areas (Figure 4).

DRAINING THE SWAMP

Poor drainage can have a major impact on crop yield, particularly as wet areas provide ideal conditions for disease. There are estimates that 80% of crop yield loss may be due to too much, or too little, water.

Reuben Wells, from Ag Logic, has many years' experience improving drainage in the rich, loamy soils of Northern Tasmania. His work combines highly accurate elevation maps (including the mounds used to plant potatoes) with water flow modelling software. The software uses this information to develop a dynamic drainage map for under the pivot.

Figure 4. The data graph (left) based on EM soil mapping and soil moisture probe data; sector graph (centre), which adjusts the pivot speed to provide more or less irrigation, concentrating on the outer portions of the cropping area; zone graph (right) which further divides the area into concentric rings, allowing precise irrigation of each area (Images from Reinke www.reinke.com).

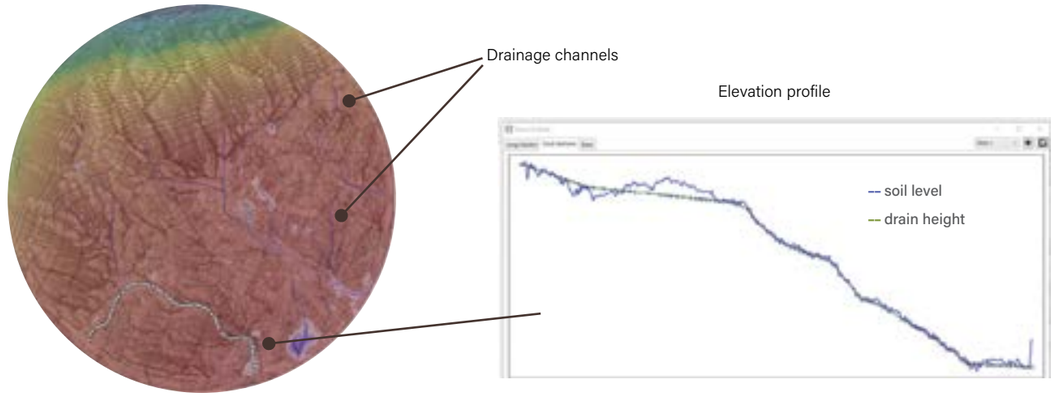

Figure 5. Elevation map of area under a pivot with drains marked in blue, white dots indicate the drain with elevation profile shown at right (Diagrams supplied by Ag Logic Tasmania)

According to Reuben, "drains can be several metres across but are often only 20cm deep. We map the drains onto GPS systems used for planting equipment, keeping them clear."

"The drains are shaped with a flat base and smooth sides. This makes it easy to drive through the crop as normal, without getting 'bounced about' too much. Several systems are available, but we use the John Deere T3RRA Cutta software combined with a Wolverine ditcher. The great thing about the Wolverine is that the soil is thrown well away, preventing development of any lip" (Figure 6).

GET AHEAD OF PESTS AND DISEASE

Crop rotation is key to managing potato diseases. According to Kelvin, "checking images of row closure, can not only indicate a problem with irrigation and drainage, but also a pest or disease. Nematodes, for example, tend to populate in 'hotspots.' Planting a green manure or cover crop in between potatoes is an effective way to help to break disease cycles, as well as enriching the soil. Such crop rotations need to be planned over winter so that, come spring, equipment and seed are ready to go."

Figure 6. Wolverine ditcher operated by Greenvale Ag Drainage (Photo by R. Wells, Ag Logic)

Many growers will already be familiar with the PREDICTA Pt service developed by SARDI. The test determines the amount of pathogen DNA present in the soil. This can be used to categorise the area as low, medium or high risk for diseases such as Black dot, Verticillium wilt and Powdery scab, as well as root knot nematodes.

Where clear links between pathogen population and yield loss have not been established, results are reported as a population density. This information can be used to rank different paddocks for a range of fungal diseases and nematodes, as well as confirm disease diagnosis.

Conducting a test over winter can help growers decide which paddocks should be used for potatoes, and which planted to other crops. However, it is also important to understand that the cultivar planted, weather, nutrition, drainage and other conditions will strongly affect whether disease occurs.

All PREDICTA Pt tests must be conducted through an accredited agronomist. A contact list is available on the SARDI website under the header 'Accessing PREDICTA Pt testing service'.

TRADING PATTERNS CHANGE, BUT EXPORTS STAY STABLE

Wayne Prowse and Linda Drake report

AUSTRALIAN POTATO EXPORTS

South Korea's appetite for imported Australian fresh potatoes surged leading up to April this year, jumping more than a third compared with the previous corresponding period. Over 10 months, they imported 16.5kt, an increase of 36 percent from 12kt previously, accounting for 42 percent of all potatoes exported from Australia in this period.

The increase in exports to South Korea indicates a swap to Australian suppliers from sources in the US, with total demand unchanged.

Overall export volumes and value of Australian potatoes remained reasonably stable, with increases in the Korean market offset by declines in exports to other countries.

According to Wayne Prowse, from Fresh Intelligence Consulting, "the change in the mix of suppliers, as seen in South Korea, also applies to other countries that increased imports of Australian product. The strong demand for exports in the first quarter of the year was influenced by seasonal harvesting, and demand for fresh in-season potatoes for processing from offshore customers."

Exports to the Philippines and Malaysia grew by 12 percent and 15 percent respectively. Along with South Korea, these three customers accounted for more than 70 percent of Australia's fresh potato exports. Both the Philippines and South Korea have preferential tariffs for potato imports used for processing only.

Overall, potato exports rose 3 percent

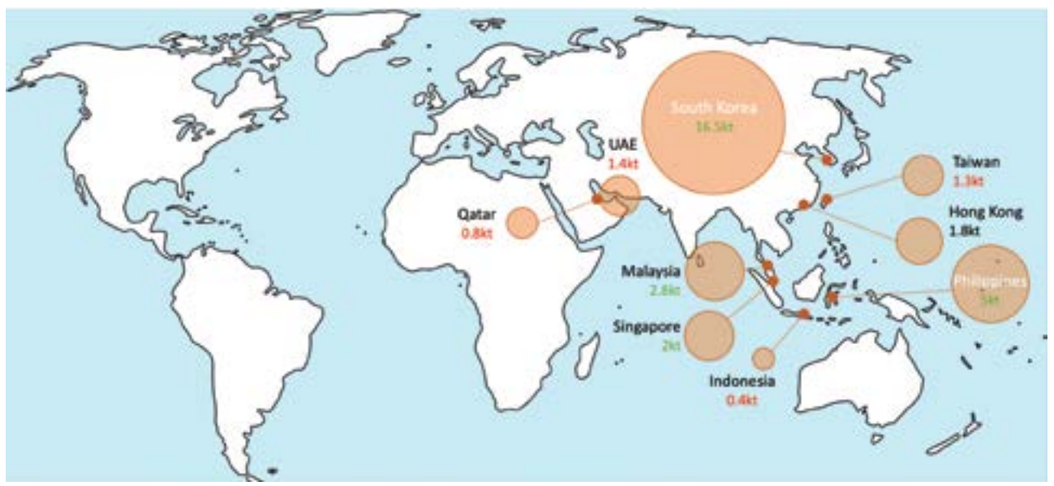

Figure 1. Exports of Australian potatoes (all categories). The circle indicates the relative size of each market. Total kilotonnes are marked in red if exports have declined, and green if increased.