High value, low volume cropping

Background

The sequence of crops in a rotation is driven by sustainability (e.g. disease and weed control) and profitability. Many farmers on Kangaroo Island consider canola their most profitable crop arising from its high price per tonne, and due to its relatively low yield, a tolerable freight cost per hectare. This has resulted in many farmers growing canola every second year, with wheat becoming the break crop. However, wheat generally yields 67% higher than Clearfield canola, (personal comment: Bill Crabtree) yet wheat is valued at approximately half canola's price. Calculations using these figures reveal that the percentage of gross income spent on freight per hectare growing wheat is twice that of growing canola. With freight reaching heights of $72 per tonne in the 2008/2009 season, the Kangaroo Island grain growers expressed a need to seek alternative crop species, which were of higher value/return than milling wheat in an attempt to reduce the percentage of gross income spent on freight.

This proposed research aimed to find crop species suitable to Kangaroo Island conditions, which were either:

- of higher value per tonne than currently grown milling wheat, or
- low yielding yet high value to reduce the per hectare freight cost.

What was done

Site Selection

The research was conducted on the property of K. & S. Pledge on East West Two near Vivonne Bay. This soil is a sandy loam over lateritic clay and could be considered representative of soils on the Parndana plateau. Soil tests in the top 10 cm revealed 31 ppm P, 234 ppm K, 10.3 ppm S, pH_{CaCl2} 5.4, 4.03% OC. The site was sown into Dalyup oat stubble. The growing season rainfall is approximately 700 mm (28 inches).

Trial design

Ten cropping varieties (Croxton linseed, Almaz and CICA503 chickpeas, Nipper lentils, Popany vetch, Magenta, Mace and Wyalkatchem milling wheats, Caparoi durum wheat and Buckley soft wheat) were selected based on the criteria that they were either higher value than currently grown milling wheat, or low yielding yet high value to reduce the freight costs per hectare. Each variety was replicated three times to give 30 plots. Each plot measured 2.1m wide by 50m long equating to an area of $105m^2$ per plot. Cereals were kept together and likewise pulses to assist in ease of post emergent activities and reduce likelihood of chemical drift. The surrounding paddock was sown with Mitika Oats.

Crop agronomy in 2009

- 10 May: knockdown achieved with glyphosate and Hammer.
- 14 May: with the exception of linseed, all plots received Treflan and Metribuzin and were sown with 80 kg DAP. Wheat varieties were sown at 100 kg/ha, vetch and lentils at 50 kg/ha and chickpeas at 120 kg/ha.
- 19 May: linseed sown at 40 kg/ha. Bare earth sprayed with insecticide and paraquat.
- 27 June: Axial grass herbicide applied to site.

- 23 July: 100 kg/ha urea spread over cereals and linseed.
- 20 August: trace elements applied according to tissue test.
- 23 August: Tebuconazole fungicide and Axial applied to cereals. Preventative fungicide sprayed on pulses.
- 8 September: Preventative fungicide and Clethodim applied to pulses.
- 16 November: site aerial sprayed for native budworm.
- 16 January: trials harvested.

Measurements

Soil test, plant density, vigour scores, leaf tissue test and grain yield.

Results

Variety	Yield (t/ha)[6]	Protein %	Test weight	Sprouted grain (/300)	Grade	$/tonne[1]	Input[3] Costs (/ha)	Freight (/ha)[4]	Gross Margin (/ha)
Wyalkatchem wheat	4.12	12.20	75.4	1	APW1[2]	$200	$301	$218	$305
Magenta wheat	4.09	10.60	75.8	5	ASW1[2]	$186	$301	$217	$244
Popany vetch	0.37					$1,300	$229	$20	$236
Croxton linseed	0.45[5]					$1,100	$277	$24	$193
Nipper lentils	0.5					$950	$274	$27	$175
Mace wheat	3.44	10.70	72.2	3	AGP1*	$180	$301	$182	$136
Buckley soft wheat	3.93	9.70	66.2	0	FED1*	$150	$301	$208	$80
Caparoi durum	1.74	12.30	69.6	4	FED1*	$150	$301	$92	-$131
Almaz chickpeas	Failed due to wildlife damage					$500	$274	$0	-$274
CICA503 chickpeas	Failed due to wildlife damage					$500	$274	$0	-$274

TABLE 1

Harvest and gross margin figures of the various crop species

[1]Wheat and lentil prices correct on 20/01/10 www.abb.com.au, net of GST and receival fees. Popany vetch price: Sean at Seed Distributors, chickpea price: Centre State Exporters. *Due to low test weight. [2]Assumes falling numbers test satisfied, although not performed. [3]Input costs exclude seed. [4]Freight at $53/t ($10 on island cartage, $43 off island cartage). [5]Severely affected by kangaroo damage. [6]LSD (5%) of cereals only – 0.82t/ha

Discussion and future directions

The results presented in Table 1 were pleasing given the site received 700mm during the growing season, suffering waterlogging and a large weed burden as a result. These wet and waterlogged conditions provided the ideal test for the suitability of these varieties to KI conditions.

Wyalkatchem wheat is currently the most popular wheat grown on the Island and the results from this trial support this practice. Of particular merit was the fact Wyalkatchem made APW1 classification with satisfactory test weight and low sprouting despite the delay to harvest.

Magenta wheat is classified as ASW in SA, although in VIC and WA it is classified as APW. Although graded as ASW1 in this trial, it is likely Magenta would have gone AGP1 or FED1 had a falling numbers test been performed since there were 5/300 sprouted grains. Both Magenta and Wyalkatchem were bred by the WA Dept of Ag and their comparable yield results indicate these two varieties are well suited to KI conditions.

The remaining wheat varieties (Mace, Caparoi durum and Buckley soft wheat) failed to meet test weights resulting in downgrading. Timely harvest may have evaded the rain and hence corresponding reductions in test weight

and the sprouting (although Buckley reported nil sprouting). However, it would have not altered the yield.

Buckley soft wheat was the next highest yielding variety after equal top placers Wyalkatchem and Magenta. Buckley's protein meant that it could have made Soft2. However, its test weight was well below the threshold of 68 kg/hl. Generally Soft1 commands a $40-$60 premium over APW1, which in effect would cover the freight off-Island. More work to assess the suitability of soft wheat varieties on the Island should be conducted.

Caparoi durum is not well adapted to acidic soils and this was reflected in its dismal yield compared to those of the other wheats. Surprisingly however, its protein would have enabled it to make Durum 2 grade had its test weight been above 74 kg/hl. The low yield combined with the poor test weight indicates durum was not suited to the soil and climatic conditions experienced at the trial site.

The yield of Popany vetch was below expectations, due to the severe heat experienced at the start of November. Other Popany vetch growers across SA and VIC also suffered yield penalties, which has consequently resulted in the price of Popany vetch doubling since January 2009. Nevertheless, the high price still failed to compensate for its low yield based on financial returns.

The heat wave also affected the yield of the Nipper lentils. To actually have lentils surviving the 27 inch growing season was a result in itself! The key to their survival was good drainage: they are highly susceptible to any waterlogging stress. Ironically, soils that are well drained also happen to dry out the fastest when the season finishes. Nipper lentils, being a long season variety were still filling grain when the hot weather struck thus severely penalizing grain yield. In light of this, those wishing to grow lentils are advised to select a variety with an early-mid or mid maturity with a strong disease resistance profile and select paddocks carefully based on their waterlogging risk.

Lentils show promise as a new crop species with yields appearing good in areas unaffected by waterlogging and the returns are potentially greater than those generated by existing crops.

Another aspect pertinent to the success of lentils is good nodulation. Acidic soils are a hostile environment to the Rhizobium required for successful nodulation of lentils, meaning every care should be taken to ensure good inoculation.

Another crop species of interest that tolerated the wet winter was linseed. By the middle of December the crop had set an impressive number of seed heads. However, by the time the harvester arrived, kangaroos had foraged on the outer thirds of the plot leaving behind the centre third. This center third produced the majority of the harvested grain. Whilst it cannot be assumed with utmost certainty, had the linseed been harvested in a more timely manner it is estimated to have yielded ~1.35 t/ha (based on the assumption a third of what was originally there was harvested). At $1100/t and using the freight and input costs quoted in the table, the gross margins could have been $1133/ha. However, limited domestic demand means growers should have a contract in place prior to sowing the crop.

The chickpeas were a complete failure in this trial due to their palatability to wildlife. Unless chickpeas can be protected from wildlife, it is not advisable to grow them on the Island.
Overall, the trial harvest results failed to identify a crop species that generated higher returns than that of Wyalkatchem wheat currently grown. Nevertheless, it provided useful insight into potential crop species that warrant further investigation, particularly if harvest could be performed in a timely manner.

FIGURE 1
Flowering linseed October 2009

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Take home messages

- Wyalkatchem wheat reinforces its position in the cropping rotation
- Magenta may be a possible alternative to Wyalkatchem
- Advisable not to grow durum on the lateritic ironstone soils on the plateau
- More research required into suitability of soft wheat varieties
- Linseed tolerates and yields in wet soils, but its marketing requires further investigation
- Avoid growing chickpeas unless you can eliminate wildlife
- Lentils require good inoculation and well-drained soil. Target early or medium maturity varieties.

Funding / Sponsors

- GRDC funded research administered by AgKI
- AWB Seeds: supplied chickpeas, lentils and durum wheat
- AGT Seeds: supplied Mace wheat
- K. and S. Pledge: property and Magenta wheat
- Pontifex: Buckley wheat
- Naracoorte Seeds: linseed
- Aerotech: Native Budworm spray
- Stanton family: harvesting
- KIPG: grain classification