Pulse crops for Central Western NSW

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Overview:

The potential advantages of growing pulse crops are well recognised, such as: increasing soil nitrogen, breaking disease cycles for cereal crops, providing a high nitrogen feed grain and being a cash crop in their own right. Field peas are well suited to the Central West and other pulses are useful, depending on pH, drainage and weed control.

This article gives a summary of pulse research at Gunningbland and Condobolin, funded by the Australian Pulse Co-operative Ltd, NSW Agriculture and Grains Research & Development Corporation over the period 1995 to 1997. The pulse crops covered include: field pea, chickpea, field bean and lupins (in less detail).

Why consider pulse crops?

Pulses should be considered primarily as cash crops which, with good management, can contribute to the profitability of a farming enterprise. However, the financial benefits to subsequent crops should also be included as these may be substantial in more intensive cropping sequences. These benefits include the maintenance or improvement of soil nitrogen, the suppression of cereal diseases, increased weed management options, and contributions to livestock production from stubble grazing and stored grain.

Soil nitrogen after pulse crops

Cereals frequently yield more grain when sown after pulse crops than after cereals, particularly if fertiliser nitrogen is not applied. Grain protein may also be higher, depending on the season. Much of this benefit comes from pulse crops removing less soil nitrogen than cereals, leaving more for subsequent crops. Legumes fix nitrogen from the atmosphere and can even increase soil nitrogen if the amount fixed is greater than the amount exported in the grain.

Pulse yields at Gunningbland

The yields of the various pulse crops over the three years of trials were:

	1995 Yield (t/ha)	1996Yield (t/ha)	1997 Yield (t/ha)
Desi chickpea - Amethyst, Lasseter	**0.9**	**2.5**	**1.0**
Kabuli Chickpea - Kaniva, Bumper	**0.5**	**2.2**	**0.4**
Field Pea - Alma, Laura, Bohatyr, PSH3	**1.3**	**2.8**	1.9
Faba bean - Fiord, Barkool	-	**3.5**	**1.2**
Narrowleaf Lupin - Merrit	0.9	**2.2**	-
Albus Lupin - Ultra	1.3	**2.8**	1.2

The variation in yields between years reflects seasonal conditions, growing season rainfall (April to October) being 207, 469 and 278 for 1995, 1996 and
1996 respectively. Relatively dry autumns delayed sowing until mid to late May in most years, and this would have disadvantaged the longer season crops such as chickpea. A hot dry spring in 1995 termi nated growth early whereas in 1997 a dry August was followed by good rain in September.

Field pea was the most reliable crop, giving the highest yields under the dry conditions of 1995 and 1997 and also performing well in 1996. Disease levels were generally low even under the wet con ditions of 1996 and despite peas having been grown in the area for some years. The trial results confirm the good adaptation of peas to this region; they are suited to a wide range of soil types and soil pH, do not need to be sown early, have the most options for weed control, and have a wide range of uses including hay, green manure, and grain for either human or animal food. The release of new varieties with higher yield and better standing ability in 1998 should encourage their adoption.

Desi chickpea yielded well in 1996 (2.5 t/ha) but less than pea in 1995 and 1997. However, the higher price usually paid for chickpea adds to the financial return from the crop. The large seeded kabuli chickpea can attract a particularly high price and yields in 1996 were very good. However, in the drier years yields were much lower and small seed size would have resulted in a lower grain price. Chickpea performs best on well drained soils of pH greater than 5.0 ($CaCl^2$) and when sown between late April and mid May. Weed control options are less than for pea. Saffron thistle in particular should be controlled in the years before growing chickpea.

Faba bean produced 3.5 t/ha in 1996, demonstrating the high yield potential of this crop. However, it was lower yielding than field pea under the drier conditions of 1997. Disease levels were not severe in either year but weeds were a problem in 1996 and post emergent herbicide options are limited. Faba bean is suited to medium to heavy soils and can tolerate some waterlogging and do best where pH is above 5.0. Their large seed size is not suited to some sowing machinery.

Broadleaf (albus) lupin performed well over the three seasons, yielding close to peas in 1995 and 1996 but less than peas under the dry spring conditions of 1997. The demise of the albus industry in Western Australia has provided good demand for this crop with attractive prices being offered in 1997. Albus lupins are best suited to well drained soils and to early sowing.

Narrowleaf lupin yields were considerably lower, and often command **a** lower price. However, they are the best pulse crop for acid soils and are ideal for storage and use on farm as a high protein feed grain and drought reserve.

Field pea

1. Varieties

Over the three years, released varieties and new lines from all Australian breeding programs and from New Zealand were tested at Gunningbland and Condobolin. At least 10 of these lines will be released in 1998 and 1999. Many of these are erect types which promise easier harvesting. A wide range of seed types (size, colour) are included to suit various markets.

Of the released varieties, Laura, Dundale, Alma, and Bohatyr gave similar yields averaged over a number of years in the Central West. Dundale and Laura are probably better suited to lower rainfall areas and Alma and Bohatyr to the medium rainfall areas.

2. Management

Seeding rate: Optimum plant densities and seeding rates over 2 seasons were:

Variety	**Density**	**Seeding rate**
Alma	40 plants/m^2	100 kg/ha
Bohatyr	45 plants/m^2	140 kg/ha
Bluey	60 plants/m^2	190 kg/ha

Row spacing: Wider row spacings can be used without significant yield loss.

Weed control: Peas are the most tolerant of the pulse crops to herbicides, allowing the use of MCPA for broadleaf weed control.

Harvest: Early harvesting is essential to minimise soil and weed contamination and grain loss

Chickpea

1. Varieties

Released varieties and new lines from interstate were tested over the three years. Five of these have now been released as varieties. Several of these are earlier flowering and more vigorous than current varieties and some are claimed to have better cold tolerance. Chickpea will not produce fertile flowers or set pods at low temperature in comparison to other pulse crops which are sensitive to high temperature.

Desi varieties currently available include Amethyst, Lasseter, Gully, Sona, Heera and Desavic. Initial testing has not shown large differences in yield between these lines. They vary in seed size and colour; Lasseter, Sona and Heera have more vigorous early growth.

Kabuli varieties include Garnet, Kaniva and Bumper. These have given lower yields except in very good seasons. Price is dependent on seed size which tends to be smaller in dry years. The new variety Bumper has larger seed and produces similar yields to the older varieties

2. Management

Seeding rate: Optimum rates over 3 seasons taking seed cost into account were;

Amethyst	80-100 kg/ha
Kaniva	120-150 kg/ha.

These are at the higher end of the range usually recommended.

Row spacing: Wider row spacings can be used without significant yield loss.

Weed control: Broadleaf weeds, particularly saffron thistle, can be difficult. Post-sowing pre-emergent application of metribuzin, Spinnaker and simazine show promise.

Sowing time: Late autumn breaks delayed sowing in all years except at Condobolin where spray irrigation was used in 1997. Plots sown in early May grew more vigorously. Cool temperatures prevented early flowers from setting pods but the plants were taller and carried their pods higher above the ground making harvest easier. Dry sowing may be an option provided weeds can be controlled.

Faba bean

1. Varieties

The major emphasis in breeding is on the development of varieties with better tolerance of the two major diseases, Aschochyta and Chocolate spot. Ascot has good tolerance of Aschochyta while the late flowering, large seeded variety Icarus has good

chocolate spot tolerance. Recently Fiesta has been released, which has some tolerance to both diseases.

Released varieties only were tested in the Central West in 1996 and new lines were added in 1997. Fiord outyielded Ascot at Condobolin in 1996. Barkool performed well at both sites in 1997. New lines out-yielded the current varieties under the tough conditions at Gunningbland in 1997.

2. Management

Seeding rate: Over 2 seasons at both sites, yield increased with seeding rate up to the highest rate of 260 kg/ha! However, seed costs and the logistics of sowing prevent such high rates. Earlier sowing may also allow lower seeding rates and this is being tested in 1998. The current recommended rate is 100-130 kg/ha.

Inoculation: A Condobolin trial measuring N fixation, as well as non-inoculated buffer plots at Gunningbland, emphasised the need for proper seed inoculation to ensure nodulation. Non-inoculated plants were very yellow, grew poorly and in some cases failed completely.

Weed control: Post sowing pre-emergent herbicide application is currently the safest choice.

Disease control: Disease has not yet been a major problem in lower rainfall areas but is likely to increase as the area of the crop increases, particularly in more favourable seasons. Seed should be selected from low disease crops. Fungicides are available but only prevent the infection of treated leaves, flowers and pods. However, the level of tolerance in the new variety Fiesta could be sufficient in these areas.

Row spacing

Trials over 3 years compared up to 8 crops at 5 row spacings, ranging from 175 to 650 mm, each at three seed rates. Seeding rate (recommended, 30% lower, 30% higher) had only small effects and did not interact with row spacing.

Chickpea, field pea, and both species of lupin showed no yield decrease at 350 mm and in most cases at 500 mm. Wheat and barley were more sensitive, with yield reductions at spacings greater than 175 nun in some trials. (Tables 2, 3.)

Table 2: 1996 Gunningbland rowspace trial yields (t/ha)

Yields (t/ha)				
Row Spacing (ram)	**Janz wheat**	**Schooner barley**	**Amethyst chickpea**	**Kaniva chickpea**
175	4.03	3.85	1.66	1.88
263	3.72	3.64	1.55	1.75
350	3.96	3.64	1.47	**1.43**
500	3.66	3.62	1.80	2.00
650	3.41	3.19	1.55	1.56

Table 3: 1996 Condobolin rowspace trial yields (t/ha)

Yields (t/ha)							
Spacing (mm)	**Janz wheat**	**Schooner barley**	**Amethyst chickpea**	**Kaniva chickpea**	**Ultra lupin**	**Merrit lupin**	**Bluey pea**
175	3.16	2.53	1.20	0.91	1.54	1.19	1.77
263	3.37	2.68	1.35	1.18	1.55	1.18	1.70
350	3.05	2.53	1.16	0.96	1.47	1.11	1.88
500	3.17	2.62	1.44	1.15	1.38	1.23	1.92
650	2.63	2.35	1.14	0.88	1.25	0.99	1.70