Double cropping successes with soybeans

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in a nutshell

- New and ongoing research shows that soybeans are an excellent choice for double cropping situations in the Murrumbidgee Valley, helping to maximise returns on a per megalitre basis
- This article features three case studies of successful double cropping enterprises in which soybeans are a critical component of the system, both agronomically and financially

The newer faster-growing, shorter-season soybean varieties coupled with good crop management help maximise yields in double cropping situations and maximise returns per megalitre in the rotation.

New and ongoing research in the Murrumbidgee Valley has found that new soybean varieties can be sown in the region as late as Christmas, with only a small yield penalty. Growers are, however, reminded not to delay sowing any longer than absolutely necessary.

This article features three case studies of farming businesses which have very successfully grown soybeans in continuous double cropping systems – and are reaping the rewards.

Paul Bellato & family, Coleambally

Growing as many as seven grain crops in a three and a half year time-span would seem daunting to many, but after fifteen years of double cropping, Coleambally farmer Paul Bellato now considers the task "easy".

Paul, his brother David and father Vic, and their wives, farm around 1500 ha and Paul attributes much of the system's success to newer, short season varieties of soybeans.

The family owns six irrigation farms. Last year in the drought, three were treated as dryland farms while the other three were irrigated with water that was recycled on the farm.

The Bellato family has grown soybeans for more than 20 years, and in recent years has moved to the high yielding human consumption varieties. The family also produces rice, maize, faba beans, oats, wool and prime lambs.

Soybeans are the only summer grain crop that can be sown late enough to allow growers in the region to immediately follow a winter crop.

"Soybeans are ideal. They're the only summer crop where you can go double cropping year in year out," Paul said.

Flexible rotations

Paul said his rotations are flexible to adapt to seasonal conditions, but a typical double cropping rotation starts with bed preparation and winter fallow which is sown to maize in October. The following autumn, the paddock is sown to wheat or barley, followed by soybeans, and then followed by another winter cereal. This cereal–soybean rotation can continue for up to two more years.

"Soybeans are the most flexible of the lot. To sow maize, you have to have everything spot-on. Soybeans are the total opposite. You just direct drill and spray."

He said newer varieties such as Djakal have the ideal length of growing season. Unlike rice and maize, soybeans are sown from mid November and harvested in late March to mid April. In some years the seeder has immediately followed the harvester.

Added cash flow

The main benefit of the double cropping system for the Bellato family is the added cash flow it generates. Although yields of soybeans and cereals are slightly lower than when following fallow, the income from two crops more than compensates (Table 1).

The soybeans are graded at the property and sold to a tofu manufacturer in Sydney.

Efficient water use

Much more efficient water use across the farms is another major benefit of the double cropping system. The Bellato soybean crops receive their final watering just before maturity, to ensure high yields and large seed size, which is strongly desired by end-users. The following cereal crops can utilise the near-full profile of residual water from the soybean crop, and this year, the winter crops following soybeans have not been irrigated.

"The following winter crop can be planted on time, directly into moisture and it gets away to a great start. The soybean stubble is spread evenly across the beds by the header's straw spreaders and we have never had an issue of planting wheat through it," Paul said.

"We're making the most of the winter rain. We don't take water for granted."

Soybeans are a low water user compared with other summer crops, and the combined gross margin both on a per hectare basis and a per megalitre basis is better than a single summer crop of rice or maize.

Lower production costs

Another benefit of the system is the fact that soybeans are a legume, and require no nitrogen fertiliser, a major cost for other summer crops.

Paul said that soybeans are lower risk as they have low up-front costs compared with maize.

"Maize costs a fortune to sow. With soybeans, it only costs the seed, and if you've got the water, you can go on with them. It doesn't take a lot of expensive preparation to double crop. We just burn or bale the cereal stubble, pre-water, knockdown spray and sow. If the soybeans are sown following fallow we also band single super and shape the beds earlier in the year."

Paul said the only limitation to double cropping is the risk of a wet harvest for both the winter and summer crops. This can delay harvest and planting of the next crop. That's why maintaining a flexible crop rotation is so important.

"If it's an early break, the wet weather can cause problems at harvest but that is not just a problem for soybeans – it's for all summer crops.

"I think it's easy now. If the weather's on your side, there's nothing hard about it."

Table 1: Gross margins of soybeans and barley in a double cropping system compared with rice and maize, in the Coleambally Irrigation Area. *Note: yields of soybeans and barley as single crops are usually higher, and figures for soybeans as a single crop are indicated in the brackets.*

	Soybeans in double cropping	**Barley in double cropping**	**Double cropping**	**Rice** (med grain, aerial sown)	**Maize**
Yield (t/ha)	3.25 (4.2)	5.5		10	10.5
Price ($/t)	$550	$180		$300	$250
Income ($/ha)	**$1,788 ($2,310)**	**$990**	**$2,778**	**$3,000**	**$2,625**
Cost ($/ha)					
Operations	$156	$123		$264	$199
Seed	$115	$40		$34	$318
Fertiliser phosphorus	$87	$107		$38	$143
Fertiliser nitrogen	$0	$78		$237	$348
Chemicals	$100	$4		$177	$66
Water use (ML/ha)	**7.0 (8.5)**	**3.5**	**10.5**	**14**	**8.5**
Irrigation ($28/ML)	$196 ($238)	$98		$392	$238
Insurance	$20 ($26)	$9		$22	$40
Total variable costs ($/ha)	$674 ($722)	$459	$1,133	$1,178	$1,361
Gross margin per ha ($/ha)	**$1,114 ($1,588)**	**$531**	**$1,645**	**$1,822**	**1,265**
Gross margin per ML ($/ML)	**$160 ($187)**	**$152**	**$157**	**$130**	**$149**

Figure 1: Paul Bellato (left) and Luke Gaynor in a barley crop which is part of a double cropped barley-soybean program

Figure 2: A soybean crop in mid January at the beginning of flowering

Rob Houghton, Whitton

"There are some very profitable marketing opportunities with soybeans," said Whitton grower Rob Houghton.

Rob farms around 500 ha near Leeton, growing rice on bankless channels and soybeans, barley, canola and sometimes wheat and faba beans on beds. He aims to never grow a cereal on cereal or broadleaf crop on broadleaf crop for disease and weed management reasons. As a result of reduced water allocations Rob does not stick to set rotations, saying "we've become seasonal farmers now – I take my hat off to dryland farmers".

Paddocks receive a combination of chicken litter, compost and lime – and the soil texture clearly shows the benefits of the applied organic matter. In the cut areas, gypsum is also used.

Following lasering, Rob sows a cereal – usually malting barley. The cereal stubble is ploughed in and sown to soybeans. Then the paddock may be sown back to barley, then faba beans or a green manure crop, followed by soybeans and barley again. The barley-soybean rotation can follow for a few years, provided water is available. After the third soybean crop, barley is sown and the stubbles are ploughed back, rather than burnt, to maintain organic matter and the beds are busted.

Rob's soybeans are usually sown between 20 November and 7 December, when double cropping.

"Double cropping does hinge on your planting times. If you don't have water to water up, that delays your sowing time. The length of the growing season of Djakal is good. It's given us another week to play with."

Virtually no preparation

Rob said virtually no paddock preparation is required with double cropping, which is a major advantage.

"We just burn stubbles and plant the beans. The fertiliser is banded under the barley crop, so there is no soil disturbance needed prior to planting the soybeans. Pre-irrigation is essential to germinate weeds to kill with glyphosate. Plus, the soil temperature is higher at sowing time with pre-irrigation compared with watering up."

Rob has grown the newer, human consumption varieties Djakal and Snowy in recent years, and with Djakal, "rarely had a crop under 4 t/ha."

Attention to detail

One of the secrets to Rob's success with soybeans is the use of "key checks", ensuring agronomic management is as good as it can be. Rob pays particular attention to management of the crops for high quality, especially the timing of the last watering between 10 and 15 March, to ensure a large, consistent seed size. This also provides residual water for the following winter crops.

Lower water use

Last summer, Rob used 6.8 ML/ha of irrigation water on his soybeans. He normally counts on using 8 ML/ha, but from last year's experience he feels that this may be reduced to 6 ML/ha with no yield penalty by stretching out the time between waterings before flowering. Irrigation scheduling is determined by using soil moisture probes.

"We get the best results with soybean quality if we water late, and double cropping gives us better use of the residual moisture after soybeans for a winter crop. It's too wasteful not to use that water," Rob said.

Rob takes care with herbicide group rotations to minimise selection pressure on weeds. Use of the cultivator and shielded sprayer allows him to handle weeds like Bathurst burr and blackberry nightshade, which can otherwise cause quality problems with soybeans.

Profitable rotation

Rob said that the soybean-barley rotation works well in a drought and is very profitable.

"We aim for a minimum $120/ML profit. Last year, it was in excess of $200/ML."

Rob and his brother John sell all of their soybeans on contract for soy milk, and have always met the quality criteria. Last year, Rob grew soybeans without synthetic pesticides or fertilisers, and is considering becoming an organic grower in the future, to capitalise on the excellent premiums paid for organic soybeans.

Figure 3: Rob Houghton (left) and Luke Gaynor in an emerging barley crop sown into soybean stubble with a double disc opener. Djakal soybean crop yielded in excess of 4 t/ha using only 6.8 ML/ha.

Figure 4: Double disc openers were used to sow the winter cereal on raised beds into the soybean stubble. The drag chain provides a little extra soil cover and levelling when not using press wheels.

Steve Wilson, Grant McMillan & Rick Gilbert, Coleambally

Despite the drought, Steve Wilson, Grant McMillan and Rick Gilbert's soybeans broke records last summer for commercial crops of culinary soybeans yielding up to 4.75 t/ha. The men manage five 200 ha irrigation farms near Coleambally, with 60% of the area on beds and the remainder as rice paddocks. Two farms also have bores. They grow a mix of soybeans, maize and rice, with the proportions of each depending on the allocations and year. Last summer, they grew 160 ha of maize, 80 ha of soybeans and 80 ha of rice. In normal years 75% of the farm is sown to summer crops.

When double cropping, a typical rotation is barley, soybeans, barley, fallow, maize and barley. The beds are then knocked out and renovated. Rice paddocks are used for rice only.

Lower water use

While the main aim of the system is to make money, a major benefit from double cropping with soybeans is reduced water use.

"The overall water used is less. In a normal year, soybeans followed by barley uses 9 megs [ML/ha], compared with maize then barley, which uses 12 megs," Steve said.

Steve, Grant and Rick have adopted the newer variety Djakal, having previously grown the outclassed variety Curringa, which Rick said they "won't go back to". They have also grown the variety Snowy in trials.

"Djakal's good, because it's 12 days earlier maturing than Curringa here."

Easy to grow

"I know some won't agree with me, but soybeans are an easy crop to grow," Rick said.

Their soybeans are sold to a local buyer, who grades them and sells to both domestic and international buyers for products like tofu and soy milk.

Soybean paddocks are normally pre-watered, sprayed with a knockdown, sown and watered up between mid November to late December, at the very latest. Normally 8 ML/ha of water is used on the soybeans, which are normally harvested between late March and early April.

The final irrigation of the soybeans is timed when the crop looks like it is ready for harvest. Research has shown that this maximises yields and seed size (desirable to international buyers) and may possibly increase protein levels.

Residual nitrogen & moisture

The soybeans left 50 kg/ha of available nitrogen for the following malting barley crops this year.

"We sow our winter crops as soon as possible (after the soybean harvest). We don't get delayed by double cropping with soybeans," Rick said.

"It's cost and water efficient to double crop. We have the subsoil moisture, so we don't need as much to water up."

The winter crops normally only need one spring watering, unless the winter is particularly wet. Barley crops have not required watering up in three out of the last four years thanks to the residual moisture from the soybean crop.

"Also, we rarely have weed problems in the winter cereals when double cropping, and don't need a post-emergent spray," Rick said.

There are some time constraints when sowing soybeans after barley. However, the soybeans can be sown straight into the burnt barley stubble and watered up without any fertilisers, relying on residual phosphorus from the barley crop.

"Going out of a summer crop into a winter crop is good, but going from a winter crop into a summer crop is a little harder due to establishment issues. The ground is so dry after the winter crop, that it can take a fair bit of water. There's limited time to burn, then water up and then sow the soybeans," Rick said.

Depending upon the season, growers can either pre-water (which is the preferred option) or water up the soybeans if the season is getting away.

A major reason for pre-watering soybean paddocks is to allow germination and control of problem weeds. Blackberry nightshade and hibiscus are weeds that can stain soybeans, affecting its end use quality. Pre-watering gives cheap control of these weeds before they become a problem.

Insect pests can be a problem for soybeans, particularly affecting the quality of food grade varieties. However, Rick and Steve monitor their soybeans twice a week once established for insects, and call on their local commercial agronomist, John Ronan, for advice if there is a problem.

"If you do everything right, soybeans are not hard to grow. Even in a bad year for bugs, they're not hard – you just have to keep on top of them," Rick said.

Further information

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Figure 5: Rick Gilbert in a barley crop sown following a soybean crop. The soybeans yielded in excess of 4.5 t/ha. This soybean-barley rotation is expected to use about 9 ML /ha of water.