

Exploring the profitability of growing rotational crops in the Mossman region

A trial site was established by DAF in the Mossman region during 2022-23 to assess other crops and potential for a double crop rotation system. Soybeans, mung beans and pigeon peas were grown in the dry season followed by sorghum and maize in the wet season. However, planting occurred outside of optimal windows for some crops so yields may not reflect their full potential (e.g. soybeans are typically grown in the wet season). Gross margins were calculated for each crop to explore their profitability (except for pigeon peas due to the absence of a local market).

How was the analysis done?

Gross margins were calculated by subtracting variable costs (growing and marketing costs) from crop revenues. Fixed costs were not included. Given commercial volumes of grain were not produced in the trial, true pay weights (cleaned and graded grains) could not be obtained. Consequently, revenues were estimated based on in-crop yields measured in the trial and local market prices. However, grading fees were included for mung beans as these are typically incurred with commercially sold crops.

Harvesting was conducted using a small plot harvester, which may not accurately represent the yields achievable in larger, more variable fields. Input costs were adjusted to reflect typical operations in the region. For example, harvesting costs were based on contracting rates and machinery costs were calculated assuming equipment was pre-owned (including the planter). Drying fees were not included as they vary depending on the point of sale and drying method.

What do the results tell us so far?

Table 1 shows the estimated revenue, marketing costs, growing costs and gross margin for each crop in the trial. Soybeans produced the highest gross margin of \$489/ha, with gross revenue of \$1275/ha and variable costs of \$786/ha (see Figure 1). Sorghum had the next highest gross margin at \$402/ha. Maize had both the highest revenue and costs and lower gross margin (\$213/ha), while mung beans had the lowest revenue, costs, and gross margin at \$42/ha.

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Key points

- An analysis of the trial results indicates that all crops produced a positive gross margin.
- Undertaking longer-term trials would improve guidance around the profitability of grain crop rotation systems.

Table 1: Crop gross margins (\$/ha)

Сгор	Soy- beans	Mung Beans	Sorg- hum	Maize
Price (\$/t)	\$750	\$1,100	\$400	\$450
Yield (t/ha)	1.7	0.7	3.8	3.5
Revenue	\$1,275	\$770	\$1,520	\$1,575
Marketing costs	-\$81	-\$113	-\$76	-\$151
Freight	-\$68	-\$28	-\$60	-\$140
Levies	-\$13	-\$8	-\$16	-\$11
Grading	\$0	-\$77	\$0	\$0
Growing costs	-\$705	-\$615	-\$1,043	-\$1,210
Land Prep	-\$65	-\$65	-\$65	-\$65
Planting	-\$114	-\$104	-\$98	-\$218
Weed Control	-\$102	-\$102	-\$101	-\$101
Pest Control	-\$157	-\$77	-\$152	-\$199
Fertiliser	-\$67	-\$67	-\$427	-\$427
Harvesting	-\$200	-\$200	-\$200	-\$200
Gross Margin	\$489	\$42	\$402	\$213



Figure 1: Revenues, costs and gross margins (\$/ha).



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Do price and yield changes matter?

It is important to note that the gross margins are based on unreplicated data from a single small plot trial, which was not evaluated under commercial conditions. Therefore, it is useful to understand what the gross margins would be at different yields and prices. Table 2 shows the crop gross margins at a range of yields and prices assuming the same growing costs (see Table 1).

Gross margins were all positive when:

- Soybean yields were above 1.7 t/ha, or prices were above \$850/t.
- Mung bean yields were above 1 t/ha regardless of the market price.
- Sorghum yields were above 3.3 t/ha and prices were above \$350/t.
- Maize yields were above 4 t/ha, or prices were above \$450/t.

Table 2: Gross margin sensitivity to prices and yields.

	\$550/t	\$650/t	\$750/t	\$850/t	\$950/t
1 t/ha	-201	-102	-3	96	195
1.7 t/ha	152	321	489	657	825
2.4 t/ha	505	743	980	1,218	1,456
3.1 t/ha	858	1,165	1,472	1,779	2,086
3.8 t/ha	1,212	1,588	1,964	2,340	2,716

Soybean gross margins (\$/ha)

Mung bean gross margins (\$/ha)

	\$800/t	\$900/t	\$1,000/t	\$1,100/t	\$1,200/t
0.4 t/ha	-358	-319	-279	-240	-200
0.7 t/ha	-166	-97	-27	42	111
1 t/ha	27	126	225	324	423
1.3 t/ha	219	348	477	605	734
1.6 t/ha	412	570	729	887	1,045

Sorghum gross margins (\$/ha)

	\$250/t	\$300/t	\$350/t	\$400/t	\$450/t
2.8 t/ha	-394	-256	-117	22	160
3.3 t/ha	-278	-115	48	212	375
3.8 t/ha	-162	26	214	402	590
4.3 t/ha	-47	166	379	592	805
4.8 t/ha	69	307	544	782	1,019

Maize gross margins (\$/ha)

	\$350/t	\$400/t	\$450/t	\$500/t	\$550/t
3 t/ha	-288	-139	10	159	308
3.5 t/ha	-134	40	213	387	561
4 t/ha	20	218	417	615	814
4.5 t/ha	173	397	620	844	1,067
5 t/ha	327	575	824	1,072	1,320

It is also vital to consider other risks such as potential crop failure and adverse weather conditions that could lead to potential losses.

Are double crop rotations suitable?

Double crop rotation systems can help to improve productivity, profitability, and sustainability. In the Mossman region, it might entail growing soybeans or mung beans during the dry season, followed by maize or sorghum in the wet season.

Given the soybean and sorghum gross margins were the highest in the trial, a soybean-sorghum rotation may be a good option for growers to trial in the region.

Growing multiple crops helps to diversify income by producing crops with different market demands and price dynamics, mitigating risks associated with climate variability, market fluctuations and other challenges.

Additionally, growing legumes may contribute nitrogen fertiliser savings if discounted in subsequent crops. Undertaking longer-term trials would improve guidance on the profitability of double crop rotation systems.

Who are the research team?

Agronomists from the Department of Agriculture and Fisheries conducted the trials in the Mossman region. Agricultural economists from the Department of Agriculture and Fisheries performed the economic assessment of the production results.

For more information on the trials contact Jack Robertson on 0447 108 017, or on the economic analysis contact Preyanat Posuk on 0477 341 739.

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