The effect of different water allocations on rice farm profitability in the MIA

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- A new economic model has provided an insight into the impact of reduced water allocations on the profitability of a typical MIA rice farm
- Analysis shows that on average, a typical rice farmer spends 65% of the total farm gross margin, at 100% water allocation, to cover overhead and operational costs
- At a 30% water allocation, the total farm gross margin would not be sufficient to even cover whole farm overheads

The study reported here aims to analyse the economic consequences of the lower level of water allocations on rice farms in the MIA, with and without water trade, using a whole farm economic model.

Severe drought conditions during the past few years with very low water allocations have seriously affected the profitability and economic viability of rice farms and the rice industry. A whole farm model representative of rice farms in the MIA has been developed using local consensus data based on discussions with farmers, NSW Department of Primary Industries extension officers and irrigation officers, the Department of Infrastructure, Planning and Natural Resources, and local irrigation agencies.

The model

The whole farm model represents MIA rice farms in terms of farm size, water allocation, cropping rotation, other physical and financial characteristics. A brief description of the typical MIA rice-based farming system used by the model follows.

Farm resources

The size of a typical single family rice farm in the MIA is 220 ha. The area set up for irrigation is 200 ha; the remaining area is under irrigation water channels, drains, structures and on-farm approach roads. The area normally irrigated is 180 ha and each year 20 ha is kept fallow. At 100% water allocation the farm gets 1400 ML of water annually. The owner operator works full time with the employment of a temporary worker for 10–26 weeks to help during peak periods each year. The main form of livestock is sheep, with numbers ranging up to 200.

Rotations

There is no one rotation that is suitable for every rice-based farming system in the MIA. While developing the whole farm model, the study identified three crop rotations that cover about 80–85% of the total rice farming in the area. These are a pasture-based rotation, a cereals-based rotation and a split-farm rotation. The model is structured in such a way that it allows a comparison of the three rotations without requiring major alterations in input data about the farm capital structure. The rotations are explained as follows.

The *pasture-based rotation* consists of rice, winter cereals and a relatively high proportion of pasture; with 180 ha under cropping, 200 sheep and 10 weeks of casual labour employed. Around 35% of the area in the MIA is under this rotation.

The *cereals-based rotation* consists of rice, winter cereals and a smaller proportion of pasture; with 180 ha under cropping, 100 sheep and 14 weeks of casual labour employed. Around 40% of the area in the MIA is under this rotation.

The *split-farm rotation* consists of rice, summer crops, winter cereals, no pasture and no fallow. Around 5–10% of farmers in the MIA follow this rotation. This rotation requires extra irrigation water bought from the open market and 26 weeks of casual labour is employed. Extra expenses of $2600 per annum spent on weed control in the absence of sheep.

A comparison of the three rice-based farming systems used in the economic model, in terms of crop areas, water used and financial returns, is presented in Table 1.

Table 1 shows that a typical rice farmer in the MIA owns total assets worth around $1.5 million or $6818/ha. This includes the value of land and development (including water), machinery, equipment, livestock and liquid assets (bank deposits, shares, equity in Rice Co-operative Limited, rice bonds and rice marketing equity). The total liabilities include bank overdraft, hire purchase/lease and farm loans which are approximately $300,000 or $1364/ha.

With water trading, income from the pasture-based and cereals-based rotations increased by about 2% in each case through the respective sales of around 119 ML and 121 ML of surplus water (Table 1). On the other hand, the split-farm rotation increased total cropped area to 240 ha requiring the purchase of 179 ML of extra water at $30/ML, over and above the farm's water allocation.

Calculations show that by spending more than 3% of the total cropping income on extra water, the total farm gross margin increased by $10,950 or 6% compared with the gross margin achievable with allocated water.

A comparison between the three rotation systems demonstrates that the split-farm rotation returned the highest farm-operating surplus ($46,000) and business return on equity (3.6%). The pasture-based rotation returned the lowest farm operating surplus of $34,000, which was 74% of the farm operating surplus of the split-farm rotation. The cereals-based rotation returned a farm operating surplus of $35,000 or around 76% of that of the split-farm rotation (Table 1).

Impact of water availability on the whole farm income

A key issue of concern to rice growers during the last few years has been the impact of very low water allocations.

We used the model to compare the farm incomes resulting from each of the representative farm rotations with water availability at 80%, 50% and 30% allocation, with and without water trade. In the drought conditions of 2004–05 it was assumed that farmers would be able to get a minimum of 30% water allocation. Most irrigators felt that in future the maximum water allocation would not be more than 80%. We picked 50% as a representative water allocation between 30% and 80%

It is assumed that with water trade, farmers would be able to buy up to 20% of their water allocation from the open market. The water trading price considered for this analysis was $30/ML for up to 80% of water allocation, $50/ML for 50% and $70/ML for 30% water allocations.

The results of the financial impact of different levels of water allocation, with and without water trade, on pasture-based, cereal-based and split-farm systems are presented in Table 2. The study compared the loss of income at 30% water allocation, with the income earned at 80% water allocation.

The results presented in Table 2 show there is little difference between gross margin, farm operating surplus and business return for each of the rotations. For the 30% and 50% allocation the farm operating surplus is negative indicating the model farm is in the "red", for all rotations. These results show there is a desperate need for the drought to break and allocations to return to normal levels close to 80%.

Table 1
Comparison of three different rotation systems on rice farms in the MIA at 100% water allocation

Enterprise	Yield (t/ha)	Gross Margin ($/ha)	Pasture-based rotation (ha)	Cereals-based rotation (ha)	Split-farm rotation (ha)
Wheat (biscuit)	5.50	545	24	24	24
Wheat (ASW)	5.00	372	50	50	50
Barley	3.50	100	–	–	40
Canola	2.60	284	–	20	20
Annual pasture/sheep	–	109	40	20	0
Medium grain rice	9.50	1657	44	44	44
Long grain rice	9.00	1772	22	22	22
Soybeans	2.75	547	–	–	40
Total crop area sown per year (ha)			180	180	240
Total water usage (ML)			1281	1279	1579
Total water saved (and sold)(ML)			119	121	-179
Total gross margin ($'000)[a]			160	161	177
Farm cash income ($'000)[b]			109	109	122
Farm operating surplus($'000)[c]			34	35	46
Total assets ($'000,000)			1.48	1.50	1.50
Equity ratio (%)			80	80	80
Business returns on total assets (%)			2.29	2.33	3.06

a) The total gross margin shows the total farm gross returns less variable costs
b) The farm cash income is the total farm gross margin less overhead costs
c) The farm operating surplus indicates the "bottom line" ie whether the farm is making a profit or loss. It is the farm cash income less operating costs.

Pasture-based rotation

At 30% water allocation the farm operating surplus is -$57,000 and at 50% allocation, -$28,000. Purchase of extra water helped reduce losses to -$43,000 and -$11,000, respectively. Gross margin at 30% allocation declined by 56% and 49% without and with water trade, respectively compared with the respective gross margins at 80% water allocation. The business returns on total assets declined from 1.6% and 2.03% at 80% allocation, to -5.2% and -3.8% at 30% allocation, without and with water trade respectively.

Cereals-based on rotation

For 30% and 50% water allocation, the farm operating surplus is respectively -$55,000 and -$31,000. At 30% allocation the total gross margins declined by 55% without water trade and 48% with water trade compared to the respective gross margins at 80% water allocations. The business returns on total capital at 30% allocations were -5.1% without and -3.7% with trade, compared with 1.7% without trade and 2.13 with trade at 80% allocations (Table 2).

Split farm

For 30% and 50% water allocation, the farm operating surplus is respectively -$53,000 and -$27,000. Again water trading helped to reduce the losses. The gross margins at 30% water allocation declined by 52% and 47% without and with trade respectively, compared with the without and with water trade gross margins at 80% water allocations.

Critical appraisal of the results presented in Table 2 further show that on average, at 30% water allocation *with trade* the total gross margins declined by $74,000 per farm or $338/ha compared with the *with trade* gross margins at 80% water allocation. For a total area of around 150,000 ha under rice-based farming systems, the rice industry in the MIA would suffer a loss of $51 million per year in total gross margin due to low water allocations.

Take home messages

- In the MIA, a farmer with a typical farm size of 220 ha owns around $1.5 million worth of total assets with equity ratio of over 80%.
- On average, a typical rice farmer spends approximately 65% of the total farm gross margin, at 100% water allocation, to cover overhead and operational costs.
- Under the *without water* trade scenario, at 30% water allocation, the total farm gross margin would not be sufficient to even cover whole farm overhead.
- Buying water at $70/ML, at 30% water allocation, would help to minimise losses compared with not buying water.
- At 50% allocation, all farming rotations make a farm operating loss.
- Rice growers in the MIA would lose $51 million worth of total gross margin at 30% water allocation compared with 80% water allocation.

When the development of the model is completed, farmers will be able to input their own or different cropping-pasture and water allocation combinations to see the impact on their own farm profits. Further, subject to availability of time and resources more interactive versions of the model will be developed for other irrigation districts.

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Further information

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Table 2
Financial impact of different levels of water allocation with and without water trade on typical rice-based farming systems in the MIA

Enterprise	Total farm gross margin ($'000)		Farm operating surplus ($'000)		Business return on total capital (%)	
	Without	*With*	*Without*	*With*	*Without*	*With*
Pasture-based						
80% allocation	145	152	19	30	1.6	2.03
50% allocation	98	115	-28	-11	-2.5	-0.9
30% allocation	65	78	-57	-43	-5.2	-3.8
Cereals-based						
80% allocation	146	153	20	32	1.7	2.13
50% allocation	99	117	-31	-10	-2.8	-0.9
30% allocation	66	80	-55	-42	-5.1	-3.7
Split-farm						
80% allocation	150	160	20	30	1.7	2.00
50% allocation	104	121	-27	-9	-2.4	-0.8
30% allocation	72	84	-53	-41	-4.8	-3.6