NSW GOVERNMENT Department of Primary Industries

primefact

Growing wheat straight after rice

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Introduction

Growing wheat immediately after rice is a great opportunity to improve the productivity of rice farming systems in southern NSW. However, many growers perceive it to be a risky and unprofitable strategy, with a 2016 survey of rice growers finding that only 32% regularly grew wheat straight after rice.

Despite this perception, there are rice growers who regularly and reliably grow 5+ t/ha wheat crops straight after rice.

The following recommendations are a combination of advice from successful growers and the results from crop monitoring and research trials.

Important do's

- **ONLY** select paddocks for double cropping which have:
  - good surface drainage
  - clean toe-furrows and drains
- Set-up a successful wheat crop in the rice crop by:
  - sowing the rice on time to ensure early draining and harvest
  - draining the rice at the right time so bays are dry enough to avoid wheel ruts at harvest
  - drill sowing the rice to make it easier to sow the following crop
  - use straw spreaders on the rice header to distribute trash evenly.
- To overcome cool, wet conditions and insufficient nitrogen for the wheat:
  - sow as early as possible within the variety sowing window, preferably before the end of April
  - use a higher sowing rate
  - use higher fertiliser rates and top-dress early
  - base your top-dress decisions on plant and tiller counts

Important don'ts

- do not sow after 7 May in the eastern Murray or after 14 May in the western Murray or Murrumbidgee Valleys
- do not sow into paddocks with poor surface drainage

  Avoid:
  - contour bays with slope < 1:2000
  - flat, terraced bays without beds
  - paddocks with reverse grades
  - paddocks with known poor field drainage (e.g. natural contour bays).
- Do not top-dress or irrigate if there are insufficient plants or tillers to guarantee a profitable response

Surface drainage

Good surface drainage to remove excess winter rainfall is **essential** for reliable, high yields for crops after rice.

Cropping on permanent raised beds is recommended for double-cropping in rice-wheat systems.

If raised beds do not suit the farm enterprise mix, then shifting to V-bays can improve drainage of winter rainfall in contour systems because:

- the distance from the high to the low point in bays is halved
- the V's in each bay can be land-formed to a recommended 1:1500 slope
- plant rows run with the slope and don't impede run-off

Good surface drainage is difficult to achieve in conventional contour bays because plant rows run across the slope.

Soil type

Self-mulching clays and red-brown earths are quicker drying after rice, have better internal drainage, and are less prone to waterlogging. Yields of wheat grown after rice are likely to be higher on these soils because conditions at sowing and during tillering will be more favourable.

Non-self mulching clays and transitional red-brown earths have poor internal drainage, which makes them good rice growing soils but more prone to waterlogging. Yields of wheat grown after rice can be lower on these soils. Good surface drainage is particularly important on these soil types.

Rice stubble handling

Remove rice stubbles as soon as possible after harvest.

Rolling, slashing or mulching stubbles straight after harvest and then burning is the quickest and easiest method. Use straw spreaders on the header to avoid trash rows where an incomplete burn will impede wheat establishment.

Alternatively, rice stubbles can be cut and baled. This will take longer and delay sowing, which is undesirable.

Seeding into standing rice stubbles is **not recommended** because the stubble restricts warming and drying of the soil.

Wheat sowing time

Sow as early as possible after harvest and before any significant rainfall (within the varieties recommended sowing window).

Sowing into warm soil that is not saturated will favour good establishment and rapid early growth and tillering. This is critical because of the strong correlation between tiller number and grain yield in wheat.

Experience shows that sowing before the end of April is best, particularly in heavy, sodic soils, and/or wetter, cooler autumns.

The eastern Murray Valley is generally either wetter or cooler than areas to the west and north. Sowing early and preferably before the end of April will be more critical in the eastern Murray Valley.

If sowing is delayed by autumn rain beyond a **cut-off date of 15 May**, then it is best to fallow the field and focus sowing efforts elsewhere.

Wheat sowing rate

A sowing rate of 100–120 kg/ha is recommended. Lower rates may suffice in better conditions (self-mulching clays or good red loams, dry autumns, early sowing) but higher rates will be needed in adverse conditions (sodic soils, wet autumns, later sowing).

Table 1 shows theoretical seeding rates to achieve a range of target yields.

Yields of 5 t/ha or more will only be achieved with spring irrigation.

Table 1. Sowing rate required to achieve a **target** yield for wheat sown after rice (assuming a seed weight of 40 g/1000 grains, 2.5 tillers per plant and 60% establishment).

Target yield	Target tiller density	Target plant population	Sowing rate
(t/ha)	*(per m^2)*	*(per m^2)*	*(kg/ha)*
4	320-400	110-130	80
5	400-500	140-160	100
6	480-600	170-190	120
7	560-700	200-220	140

Fertiliser management

Very little available nitrogen is left in the soil after rice, and mineralisation is low in cool, wet soils. Therefore:

- nearly all the crops' nitrogen will have to be supplied from fertiliser;
- fertiliser N is needed early to ensure good establishment and tillering.

A good response to top-dressed N will only be obtained from crops with sufficient tillers. **Count plant or tiller numbers before you top-dress.**

Assuming no available soil nitrogen or mineralisation, then the total nitrogen requirement for wheat sown straight after rice can be estimated for a range of wheat yields (Table 2).

Table 2. Total nitrogen requirement for wheat sown after rice at range of grain yields.

Target yield	Total N required
(t/ha)	*(kg/ha)*
4	160
5	200
6	240
7	280

Fertiliser at sowing

High rates of nitrogen fertiliser applied with the seed at sowing can damage seed and affect emergence. The fertiliser rate must decrease as row spacing increases so the fertiliser concentration near the seed remains below damaging levels.

Table 3 shows recommended rates of DAP fertiliser applied with the seed for a range of row spacings (DAP is preferred to MAP because of its higher nitrogen content).

Table 3. Nitrogen and DAP application rates for fertiliser applied with the seed at planting for a range or row spacings.

Row spacing	N	P	DAP
(cm)	*(kg/ha)*	*(kg/ha)*	*(kg/ha)*
18	33	37	185
20	30	33	165
23	26	29	145
25	23	26	130
28	20	22	110

Phosphorus is important when growing wheat after rice as it becomes tied-up when the rice is drained and the soil dries. As a general rule, 4 kg of phosphorus is required to produce 1 t of wheat, but for crops after rice this should be lifted to 5 kg P for each 1 t of wheat grain.

The rates of DAP given in Table 3 show adequate fertiliser phosphorus for 6 t/ha crops up to a row spacing of 23 cm.

At wider row spacings and for target yields greater than 6 t/ha, it may be better to apply MAP at sowing and increase nitrogen top-dressing rates.

Nitrogen top-dressing

Recommended urea top-dressing rates are given in Table 4 (assuming 30 kg/ha nitrogen is applied at sowing).

Table 4. Recommended **urea** top-dress rates for a range of yields for wheat after rice.

Target grain yield	First top dress	Second top dress	Third top dress
(t/ha)	*(kg/ha)*	*(kg/ha)*	*(kg/ha)*
4	170	100	-
5	170	200	-
6	170	200	110
7	170	200	190

Recommended top-dress timings are:

First top-dress – needed as early as possible after emergence to promote tillering. Apply before a rain event **only if** there are more than 110–130 plant/m^2.

Second top-dress – count tillers in mid-July if there were sufficient plants to justify the 1st top-dress. If there is 3 or more tillers/plant, then top-dress between the 1st and 2nd node stages. If there is less than 3 tillers/plant, then top-dress at mid-late tillering to promote tillering (100 kg/ha urea for a 4 t/ha target yield; 200 kg/ha urea for a 5+ t/ha target yield).

Third top-dress – count tillers in late August if the target yield is more than 5 t/ha. Top-dress before flag leaf fully emerged to support tiller retention through stem elongation, using Table 1 and Table 4 as a guide. **Spring irrigation will be required to achieve 5+ t/ha**.

Soil acidity

Surveys have shown that low pH is common in fields used for growing rice.

Nutrient availability declines once pH in $CaCl_2$ falls below 5.5 and wheat yields will be affected by aluminium toxicity when pH in $CaCl_2$ is less than 4.9.

- test soil pH prior to sowing the rice
- consider a liming program after rice if the pH in $CaCl_2$ is less than 5.2
- sow an acid tolerant variety if pH in $CaCl_2$ is less than 4.9

More information

GRDC Fact Sheet, Irrigated wheat in the Murrumbidgee, Murray.

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