Department of Primary Industries
Department of Regional NSW

Rice variety guides

NSW DPI MANAGEMENT GUIDE

Brian Dunn and Tina Dunn

www.dpi.nsw.gov.au

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Acknowledgements

The research reported in these Primefacts comes from several projects which were a joint investment between AgriFutures and NSW DPI. Many experiments have been conducted in commercial fields and we acknowledge the exceptional support we have received from many growers over several seasons.

Image acknowledgements

Unless otherwise stated, the images in this guide have been sourced from NSW Department of Primary Industries.

Cover photo

Rice variety experiments like this one in Coleambally are conducted across regions to provide the data require to determine variety yields, phenology and growing characteristics.

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Rice variety guides

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About the authors

Brian Dunn is a research agronomist based at Yanco Agriculture Institute. Brian grew up on a family rice farm where he worked before joining NSW DPI in 1987, working for the rice breeding team. He has been growing rice either commercially or experimentally for over 40 years. Working in farming systems, soil and water research teams, Brian has been involved in many areas of irrigation research. More recently, he has been involved in research covering a large range of issues associated with water productivity and rice agronomy. His research interests include remote sensing, agronomy, nitrogen and irrigation management of rice.

Tina Dunn is a Technical Officer with over 30 years of experience in agricultural research. During this time, Tina has developed strong practical skills and extensive knowledge in agronomy, plant physiology and soil and plant chemistry. Her wide skill set, attention to detail and accuracy makes Tina an essential component of the rice agronomy team. As well as being involved in all the field experiments, Tina has been responsible for managing the laboratory, looking after the NIR, the seedling vigour and lodging research.

Figure 1. Brian Dunn, Tina Dunn and Jess on the way to sample another experiment.

Contents

Figure 2. Many experiments are sampled at panicle initiation and harvest so varietal differences can be determined.

Department of Primary Industries
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DPI Primefact

Rice variety guide

June 2023, Primefact 1112, 13th edition

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District variety agronomy experiments

All new rice varieties are tested in variety agronomy experiments conducted in growers' commercial crops (Figure 3) in a range of seasons and locations before release. Their performance is compared with standard varieties in different agronomic and environmental conditions and sowing methods. The results are recorded and used to make recommendations presented in this publication and the individual variety growing guides (page 17 to page 51).

Figure 3. Drill sown variety × nitrogen experiment in a commercial rice crop at Yenda in the 2021–22 season.

Choosing a rice variety

This rice variety guide provides information to help growers and agronomists decide which rice variety to grow. Each field and individual growing situation has specific characteristics that suit some varieties more than others.

Consider all agronomic characteristics of each variety when determining the variety most suited to a field and situation. This section provides a comparison of all varieties while the individual variety growing guides give more detail on each specific variety.

If growing a large area of rice, it is recommended to have a mix of varieties with a range of sowing dates and methods to minimise the risk of severe cold weather reducing grain yield in all crops.

Left: rice nitrogen and variety experiments in a grower's field at Benerembah.

Yield potential

The grain yield potential of each variety is a major consideration when determining the variety to grow. The grain yield of each variety is compared with the standard variety Reiziq(b) in the Murrumbidgee Valley (Table 1a) and the Murray Valley (Table 1b).

The data in tables 1a and 1b are derived from experiments conducted in commercial fields using different sowing methods at recommended sowing times and with varied nitrogen (N) rates. All sowing methods, i.e. aerial, dry broadcast, drill and delayed permanent water (DPW), have the same grain yield potential when managed appropriately, so the data are combined to add rigour to varietal differences.

Grain yields obtained in experiments are often higher than average yields from commercial fields. These differences are valuable when assessing the yield risk associated with growing a specific variety. The five-year industry average yields obtained from commercial fields, separated into growing regions, are shown in Table 2.

Table 1. Variety grain yields relative to Reiziq(b) (%) from agronomy experiments conducted in commercial rice fields in the Murrumbidgee (a) and Murray Valley (b). The average of aerial, dry broadcast, conventional drill and delayed permanent water (DPW) growing methods are included.

1a. Murrumbidgee Valley	Grain yields relative to Reiziq(b) (%)							
Harvest year	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**Average**	
Average Reiziq(b) yield (t/ha)	**12.02**	**11.09**	**13.23**	**12.77**	**13.19**	**10.57**	**12.14**	**Number of experiments**
Reiziq(b)	100	100	100	100	100	100	100	26
V071(b)	–	–	114	104	112	114	111	11
Sherpa(b)	110	110	105	108	101	116	108	17
Viand(b)	95	95	98	111	97	110	101	14
Langi	95	98	89	90	–	97	94	15
Topaz(b)	88	84	87	–	–	94	88	10
Doongara	102	109	100	–	–	100	103	10
Colours represent yield ranges		<89	90–96	97–104	>105			

1b. Murray Valley	Grain yields relative to Reiziq(b) (%)							
Harvest year	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**Average**	
Average Reiziq(b) yield (t/ha)	**11.66**	**11.75**	**11.13**	**11.00**	**13.26**	**10.26**	**11.51**	**Number of experiments**
Reiziq(b)	100	100	100	100	100	100	100	18
V071(b)	–	–	121	117	113	115	117	13
Sherpa(b)	108	107	122	116	103	112	111	11
Viand(b)	94	106	–	93	98	113	101	6
Opus(b)	102	91	111	96	105	103	101	12
Koshihikari	86	88	92	94	–	–	90	7
Colours represent yield ranges		<89	90–96	97–104	>105			

Table 2. Five-year (2018–2022) industry average commercial grain yields (t/ha).

Variety	Five-year average yield (t/ha) by region				All regions
	MIA	CIA	EMW	WMV	
Reiziq[PBR]	11.4	9.3	9.6	9.9	10.6
V071[PBR]	12.4	12.0	11.9	11.7	12.0
Sherpa[PBR]	–	9.9	11.0	10.8	10.9
Viand[PBR]	9.0	8.8	7.3	7.7	8.4
Langi	9.5	9.0	9.3	–	9.4
Topaz[PBR]	9.1	7.9	9.5	–	8.9
Doongara	11.7	9.1	10.4	–	11.2
Opus[PBR]	–	–	10.4	10.4	10.4
Koshihikari	–	–	7.9	7.6	7.8
All varieties	11.1	9.4	10.2	10.3	10.5

[PBR] Plant Breeder's Rights granted by IP Australia. Yield data provided by SunRice Grower Services.

MIA: Murrumbidgee Irrigation Area, CIA: Coleambally Irrigation Area, EMW = Eastern Murray Valley, WMV = Western Murray Valley.

Maturity

When comparing varieties, maturity is measured as days from sowing or first flush to mid-flowering. Maturity as an average of data collected from experiments in commercial fields in different regions and seasons, using different sowing methods at commercial N rates, is shown in Table 3.

Table 3. Rice variety agronomic characteristics.

Variety	Maturity (days different to flower than Reiziq[PBR])	Cold stress tolerance	Establishment vigour	Lodging tolerance	Shattering tolerance
		1 = weak, 5 = strong		1 = prone, 5 = resistant	
Reiziq[PBR]	Standard	3	5	5	1
V071[PBR]	0	5	5	5	3
Sherpa[PBR]	-3	5	4	4	3
Viand[PBR]	-13	4	4	2	3
Langi	-3	3	2	2	2
Topaz[PBR]	2	1	1	5	4
Doongara	3	1	3	5	3
Opus[PBR]	0	4	3	3	4
Koshihikari	3	4	3	1	5

Rice maturity (days to flower) is lengthened by cool temperatures, increased N and by reducing the ponding time (i.e. drill sowing and DPW). ReiziqΦ takes, on average, 108 days to reach mid-flowering, but this varies with the sowing method, taking an average of 102, 106 and 115 days for aerial, drill and DPW sowing methods, respectively. ViandΦ is the only short-season variety currently grown in southern NSW and takes, on average, 13 days less to reach mid-flowering than V071Φ (Figure 4).

The duration from mid-flowering to harvest maturity (22% moisture) varies with variety, crop N level and temperature. For average temperatures and N levels, medium grain varieties take 56 days from mid-flowering to 22%, short grains 54 days and long grains 49 days. The long slender grain types dry down quicker than the plumper grain types.

Figure 4. The difference in maturity between ViandΦ (left) and V071Φ (right) at flowering.

Cold stress tolerance

The ranking of each variety's relative tolerance to low temperature at microspore (MS) and flowering is provided in Table 3. Each variety's susceptibility to cold-induced sterility is increased with excess pre-permanent water (PW) N, but is less affected by N applied at panicle initiation (PI). Varieties with a weak tolerance to cold (i.e. TopazΦ and Doongara) must be sown at the recommended time to reduce their chance of exposure to low temperatures.

Establishment vigour

All varieties have been assessed for establishment vigour in several field and laboratory experiments where all varieties are exposed to the same conditions (Table 3). ReiziqΦ and V071Φ, which have the largest grain size, also have the best establishment vigour, while TopazΦ has the weakest establishment vigour and requires extra care to ensure good establishment.

Lodging

Lodging increases harvest time and cost and reduces grain yield. Aerial sowing increases lodging potential compared with drill sowing, as does excessive N applied pre-PW and dense plant populations. Varieties have different tolerances to lodging (Table 3). The most susceptible, Koshihikari and Viand$^{\Phi}$, should only be drill sown. Lodging due to 'haying-off' results from draining the water from the field before the crop is ready and is not variety-related.

Grain shattering

Tolerance to shattering (Table 3) is an important trait with delayed harvest and is worse with severe weather conditions. Give the highest harvest priority to varieties prone to shattering (i.e. Reiziq$^{\Phi}$ and Langi).

Variety characteristics

Reiziq$^{\Phi}$ is a semi-dwarf, bold, medium grain variety with high yield potential. It has strong establishment vigour and is resistant to lodging, but is moderately susceptible to cold during the reproductive period. In cool seasons its development is delayed, so it should not be sown late. Reiziq$^{\Phi}$ is a loose threshing variety with the potential for shattering if harvest is delayed after the crop is mature.

V071$^{\Phi}$ is a semi-dwarf, bold, medium grain variety with high yield potential, outperforming Reiziq$^{\Phi}$ in grain yield in all our district experiments. V071$^{\Phi}$ has high cold stress tolerance and reduced shattering compared with Reiziq$^{\Phi}$. V071$^{\Phi}$ has a similar growth duration to Reiziq$^{\Phi}$ but has the advantage of continuing to develop during periods of cool temperature.

Sherpa$^{\Phi}$ is a semi-dwarf, medium grain variety with high cold stress tolerance and moderate establishment vigour. It has high yield potential and maintains grain yield levels better than Reiziq$^{\Phi}$ in cooler seasons. Sherpa$^{\Phi}$ is a hard threshing variety.

Viand$^{\Phi}$ is a short-season, semi-dwarf medium grain variety with similar yield potential to Reiziq$^{\Phi}$. It has strong establishment vigour, is moderately resistant to cold during the reproductive period, but is moderately susceptible to lodging. To reduce lodging, it is recommended that Viand$^{\Phi}$ only be drill sown and N applications split between pre-PW and PI.

Langi is a semi-dwarf, long grain soft cooking (low amylose) variety grown only in the Murrumbidgee Irrigation Area (MIA) and Coleambally Irrigation Area (CIA). It has moderate establishment vigour and cold stress tolerance, and is moderately resistant to lodging. Early harvest is recommended as it is a loose threshing variety with the potential for shattering if left to stand in the field.

Topaz$^{\Phi}$ is a semi-dwarf fragrant long grain variety only grown in the MIA and CIA. Topaz$^{\Phi}$ has poor establishment vigour and care should be taken to ensure good establishment. Topaz$^{\Phi}$ is highly susceptible to low temperatures during the reproductive period, which can significantly reduce grain yield. Topaz$^{\Phi}$ is susceptible to straighthead but resistant to lodging.

Doongara is a semi-dwarf long grain hard cooking (high amylose) variety with a low glycaemic index (GI) and is resistant to lodging. It is susceptible to low temperatures during the reproductive period, which can significantly reduce yield. It is also susceptible to straighthead.

Opus$^{\Phi}$ is a semi-dwarf short grain sushi variety only grown in the Murray Valley. It has moderate establishment vigour, is resistant to lodging and moderately resistant to cold during the reproductive period. It is a pubescent variety and is susceptible to straighthead with symptoms presenting as floret sterility.

Koshihikari is a premium short grain Japanese variety that is tall. It is a lower yielding variety, but a premium is paid to compensate. Koshihikari is very susceptible to lodging and should not be aerial sown. To minimise lodging, reduce the total applied N by 50% compared with Reiziq$^{\Phi}$. Koshihikari is a pubescent variety and is susceptible to straighthead.

Ideal sowing time

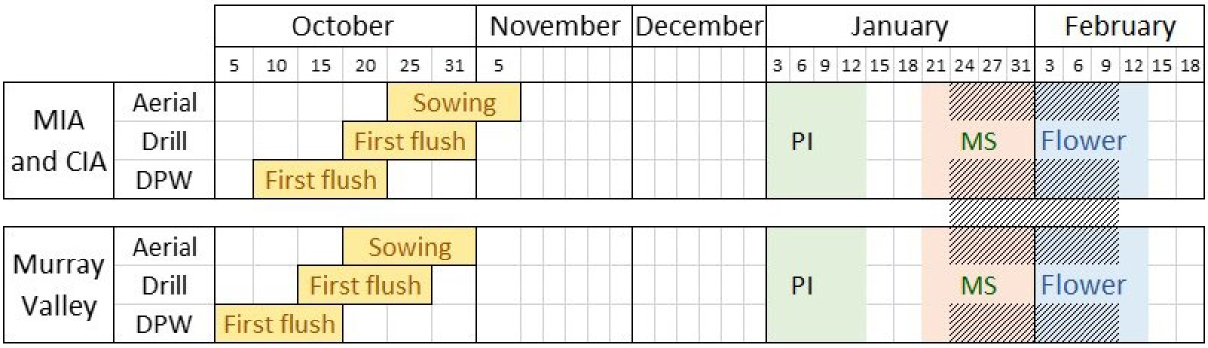
The recommended sowing window for each variety is based on the crop reaching the cold-susceptible MS and flowering stages when there is the least risk of low temperatures. Griffith and Deniliquin temperature data show the period of least risk is between 18 January and 12 February (shown by the hatched areas in Table 4).

Panicle initiation is, on average, 30 days before mid-flowering, so PI should be between 1 January and 12 January for MS and flowering to occur when there is the least risk of low temperatures.

Sowing earlier or later than the recommended sowing window increases the risk of cold-induced sterility and reduced grain yield. Temperatures in the Murray Valley are generally a couple of degrees lower than in the MIA and CIA, slowing crop development. Therefore earlier sowing dates are recommended for crops grown in the Murray Valley (Table 4).

Sowing method and water management both affect crop development; the longer a crop grows before PW is applied, the slower it develops. Therefore, crops planned for DPW should be sown earlier than conventional drill sown crops, and aerial sown and dry broadcast crops should be sown last as they develop the fastest (Table 4).

Table 4. Recommended sowing and first flush dates for Reiziq(PBR), V071(PBR), Topaz(PBR), Doongara, Opus(PBR) and Koshihikari and the subsequent panicle initiation (PI), microspore (MS) and flowering timing when sown in the recommended period for each district and sowing method. The hatched area shows the time of least risk of low temperatures.



MIA – Murrumbidgee Irrigation Area, CIA – Coleambally Irrigation Area, DPW – delayed permanent water.

The recommended sowing and first flush dates for all varieties, regions and sowing methods are shown in Table 5. The earlier maturing varieties are sown later than the standard varieties, so they go through PI, MS and flowering when they are at least risk of being exposed to low temperatures at critical times.

Table 5. Recommended sowing and first flush dates for rice varieties, regions and sowing methods.

Variety	**MIA/CIA**			**Murray Valley**		
	Aerial/dry Broadcast	**Drill**	**Delayed permanent water**	**Aerial/dry Broadcast**	**Drill**	**Delayed permanent water**
Reiziq(PBR), V071(PBR), Opus(PBR), Topaz(PBR), Doongara, Koshihikari*	20 October–5 November	15–31 October	5–20 October	15–31 October	10–25 October	1–15 October
Sherpa(PBR) Langi	25 October–10 November	20 October–5 November	10–25 October	20 October–5 November	15–30 October	5–20 October
Viand(PBR)	10–25 November	5–20 November	25 October–10 November	5–20 November	1–15 November	20 October–5 November

*Do not aerial sow or dry broadcast Koshihikari as this will increase lodging potential.

Recommended sowing rates

Aim to achieve plant populations between 100 plants/m² and 200 plants/m² (Figure 5). Research has shown plant populations between 40 plants/m² and 400 plants/m² achieve similar yields. The rice plant maintains grain yield at a low plant population by increasing the number of tillers per plant and increasing the number of grains per panicle to compensate. High plant populations increase the risk of lodging, so avoid sowing higher than the recommended rates, especially for varieties with high lodging potential, e.g. Koshihikari.

Figure 5. Between 100 plants/m² and 200 plants/m² is optimal to obtain maximum grain yield.

Sowing rates are the same for all sowing methods. Research has found similar seed establishment percentages for aerial sowing with pre-germinated seed (45%) and drill sowing (48%). See NSW DPI Primefact 1476: Rice plant population guide.

Establishing 200 plants/m² requires a maximum sowing rate of 140 kg/ha at a seed establishment percentage of 45%. As little as 25% establishment will result in 100 plants/m², which is enough to achieve maximum grain yield. When drill sowing, rates can be reduced by 10–20% if sowing at a consistent seed depth and in good soil structure and drainage.

Recommended sowing rates are based on seed size and varietal establishment percentages (Table 6). Varieties with a smaller seed size, such as OpusⓅ, have more seeds per kilogram and require a lower sowing rate to achieve the same plant population.

Table 6. Sowing rates (kg/ha) required to achieve 200 plants/m² based on seed size, 95% germination and 45% establishment vigour.

	Variety								
	ReiziqⓅ	**V071Ⓟ**	**SherpaⓅ**	**ViandⓅ**	**Langi**	**Doongara**	**TopazⓅ**	**OpusⓅ**	**Koshihikari**
Sowing rate (kg/ha)	140	130	130	130	130	130	140*	110	100**
1000 grain weight (g)	29.5	27.7	26.7	26.8	25.8	25.2	23.6	23.6	24

*TopazⓅ has a higher sowing rate due to poor establishment vigour. **Koshihikari has a lower sowing rate due to high lodging risk.

Nitrogen management

There is a strong relationship between the pre-PW urea rate and grain yield for each variety (Figure 6). Although the yield potential for the varieties is different, the amount of N required for many of the varieties to reach their yield potential is similar. The exception is Koshihikari, a tall variety requiring very different N management. Varieties with high lodging potential or susceptibility to cold stress require less N pre-PW and more at PI.

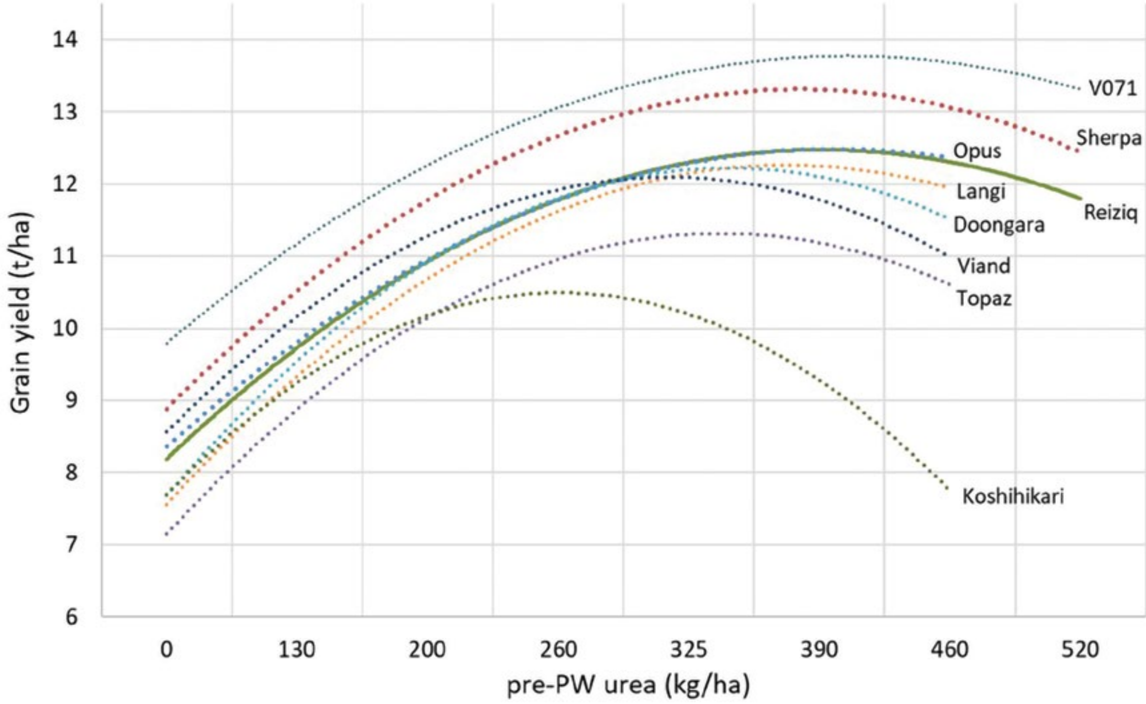


Figure 6. The average relationship between the rate of urea applied pre-permanent water (PW) and grain yield (t/ha) for commercial varieties. Data were collected from 52 experiments over 8 seasons, using all sowing methods and in all regions.

Reiziq⊕, V071⊕ and Sherpa⊕ have similar N requirements to reach their yield potential. They require N from the soil and pre-PW fertiliser to reach a target PI N uptake of 100–140 kg N/ha (Table 7). A PI N uptake below this range can prevent the crop from reaching its yield potential, while a higher PI N uptake could result in lodging and cold-induced floret sterility.

All other varieties have a lower PI N uptake range due to their increased risk of lodging or cold damage. This further limits the amount of N that should be applied pre-PW (Table 7). Factors such as field cropping history, land forming cut and fill, soil type, and legume history will all modify the pre-PW urea requirement range by influencing soil N supply.

Once the PI N uptake target range is achieved, the crop can be top-dressed with N at PI if required. This can be measured using the PI tissue test to determine accurate N top-dressing rates. More information on nitrogen management in rice can be found in Primefact 22/619: Managing nitrogen in rice.

Table 7. Average pre-permanent water (PW) urea requirement and target panicle initiation nitrogen (PI N) uptake range for each variety; the factor most limiting pre-PW N application compared with Reiziq⑷. Cut areas might require more N and fields with legume history less.

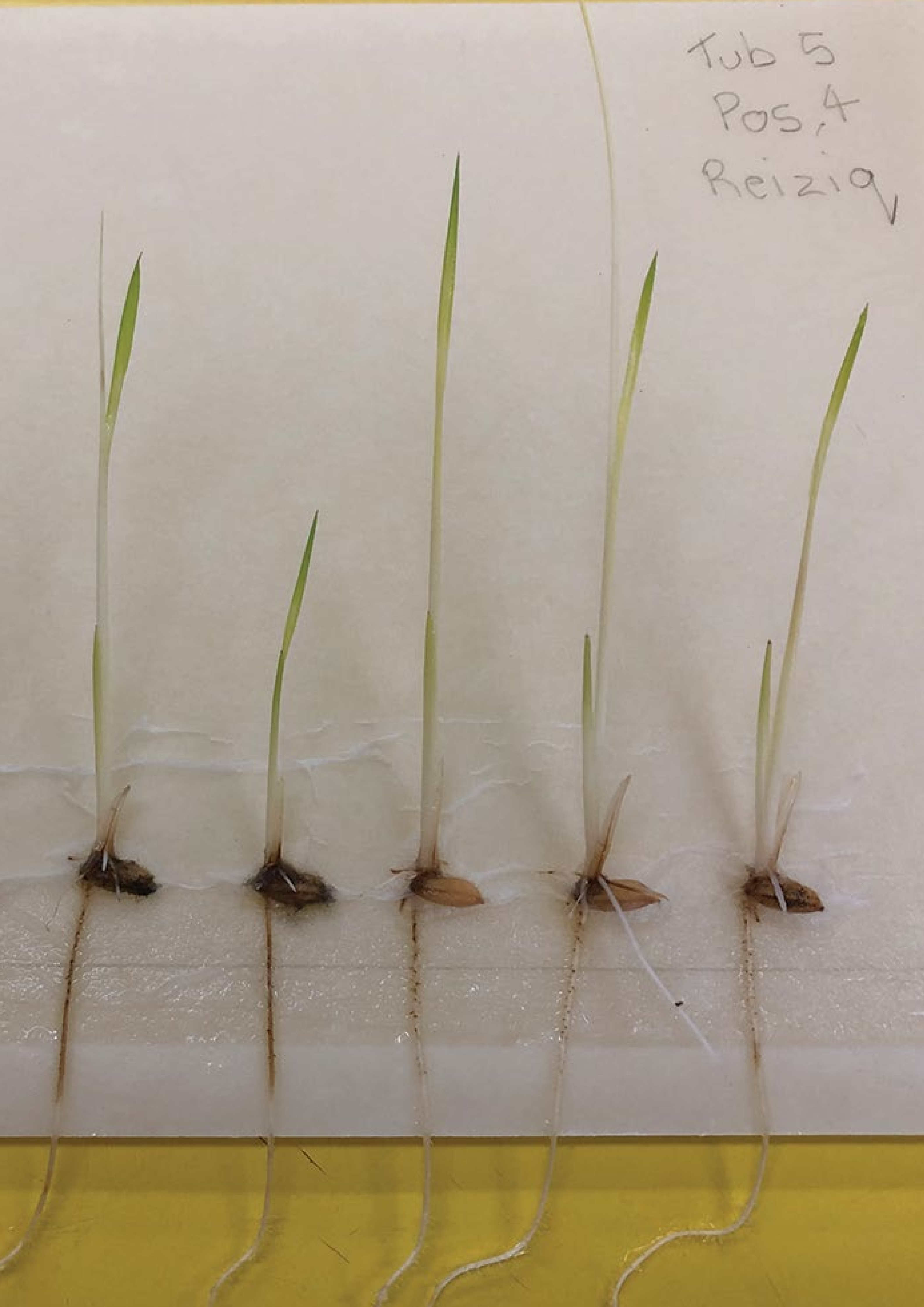
Variety	Pre-PW urea (kg/ha) range	Target PI N uptake (kg N/ha)	Pre-PW nitrogen limiting factor
Reiziq⑷	200–340	100–140	–
V071⑷	200–340	100–140	–
Sherpa⑷	200–340	100–140	–
Opus⑷	200–300	100–130	Protein
Viand⑷	180–260	90–120	Lodging
Topaz⑷	180–260	90–120	Cold risk
Doongara	180–260	90–120	Cold risk
Langi	180–260	90–120	Lodging and Cold
Koshihikari	100–150	70–90	Lodging

Individual variety growing guides

Comprehensive rice growing guides are available for each variety on the NSW DPI website.

Acknowledgements

We acknowledge the input provided by Josh Hart, Rice Extension and the SunRice Grower Services teams in updating this publication.



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Reiziq⦶ growing guide

June 2023, Primefact 1644, fourth edition
Brian Dunn, Research Agronomist, NSW DPI, Yanco
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Reiziq⦶ is a semi-dwarf, bold, medium grain rice variety with an elongated grain length.

Yield potential: Reiziq⦶ has a high grain yield potential (Table 8).

Table 8. Five-year average experiment and commercial field grain yields for Reiziq⦶.

5 year average yield (t/ha)	MIA/CIA	Murray Valley
Experiment average	12.8	11.6
Grower average	10.8	9.8

MIA: Murrumbidgee Irrigation Area. CIA: Coleambally Irrigation Area.

Establishment vigour: experiments have shown Reiziq⦶ to have the strongest establishment vigour of the current varieties.

Sowing method and date: all sowing methods i.e. aerial, dry broadcast, drill and delayed permanent water (DPW) are suitable for growing Reiziq⦶ and have the same grain yield potential when managed appropriately. The recommended sowing and first flush windows for Reiziq⦶ are listed in Table 9.

Table 9. Target sowing and first flush dates for Reiziq⦶ for different sowing methods and regions.

MIA/CIA			Murray Valley		
Aerial/dry broadcast	Drill	Delayed permanent water	Aerial/dry broadcast	Drill	Delayed permanent water
20 October–5 November	15–31 October	5–20 October	15–31 October	10–25 October	1–15 October

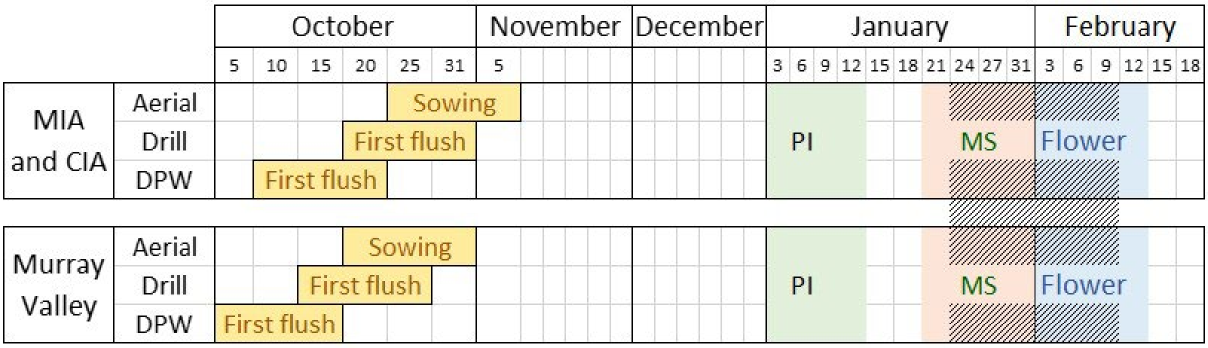
MIA: Murrumbidgee Irrigation Area. CIA: Coleambally Irrigation Area.

Sowing date recommendations for Reiziq⦶ aim to ensure the critical microspore (MS) and flowering periods align with the least risk of low temperatures (Table 10). Sowing earlier or later than recommended increases the risk of exposure to low temperatures during MS and flowering, which can reduce grain yield.

Reiziq⦶ development will be delayed in cool seasons; do not moisture stress the crop between flushes or use DPW if sown later than recommended.

Left: the slant board method uses root and shoot lengths to determine seedling vigour differences between varieties.

Table 10. Recommended sowing and first flush dates for Reiziq$^{(d)}$ and the subsequent panicle initiation (PI), microspore (MS) and flowering timing when sown in the recommended period for each district and sowing method. The hatched area shows the time of least risk of low temperatures.



MIA – Murrumbidgee Irrigation Area, CIA – Coleambally Irrigation Area, DPW – delayed permanent water.

Sowing rate: Reiziq$^{(d)}$ should be sown at 140 kg/ha for all sowing methods, aiming to establish between 100 plants/m² and 200 plants/m². Sowing rates can be reduced by 10–20% when drill sowing if seed is placed at a consistent depth and in good establishment conditions.

Sow a compound fertiliser containing phosphorus and zinc with the seed when drill sowing.

Cold tolerance: Reiziq$^{(d)}$ has a moderate tolerance to cold stress during the early pollen MS and flowering periods.

Plant height: Reiziq$^{(d)}$ is, on average, 810 mm tall at commerial nitrogen (N) rates.

Lodging potential: Reiziq$^{(d)}$ has moderate resistance to lodging, which can be induced by applying excessive N pre-permanent water (PW). Warm seasons and high grain yield increase lodging. The effect from pre-PW N application rates on lodging in Reiziq$^{(d)}$ is shown in Figure 7.

Grain shattering: Reiziq$^{(d)}$ should be harvested early as it is susceptible to shedding grain once the crop is mature. It is the most prone of all current commercial varieties for shattering.

Nitrogen management: it is recommended to apply between 200 kg/ha urea and 340 kg/ha urea to Reiziq$^{(d)}$ pre-PW. Fields with a history of legumes might require less pre-PW N and some continuously cropped fields with heavy clay soils could require more pre-PW N.

Reiziq$^{(d)}$ is a durable variety with a long plateau before grain yield declines due to sterility or lodging becomes a problem from excess N applications (Figure 7).

Increased pre-PW N increases yield and cold induced sterility potential, but as occurred in the 2020–21 season, cold can reduce grain yield regardless of the pre-PW N rate (Figure 8).

Any major field variability in N should be amended pre-PW. Red edge imagery of previous rice crops grown in the field is a good resource for identifying soil N variability.

In warm seasons, maximum grain yield can be achieved by applying all the crop's required N pre-PW. However, in seasons with low temperatures during MS or flowering, excess pre-PW N can increase sterility and reduce grain yield.

Panicle initiation nitrogen (PI N): for maximum grain yield with reduced lodging, use red edge imagery and the PI tissue test to determine PI N top-dressing rates. Higher than required N applied at PI can increase lodging and reduce profitability.

Sufficient N must be applied pre-PW to achieve a N uptake of approximately 100 kg N/ha at PI or grain yield potential can be reduced (Figure 9).

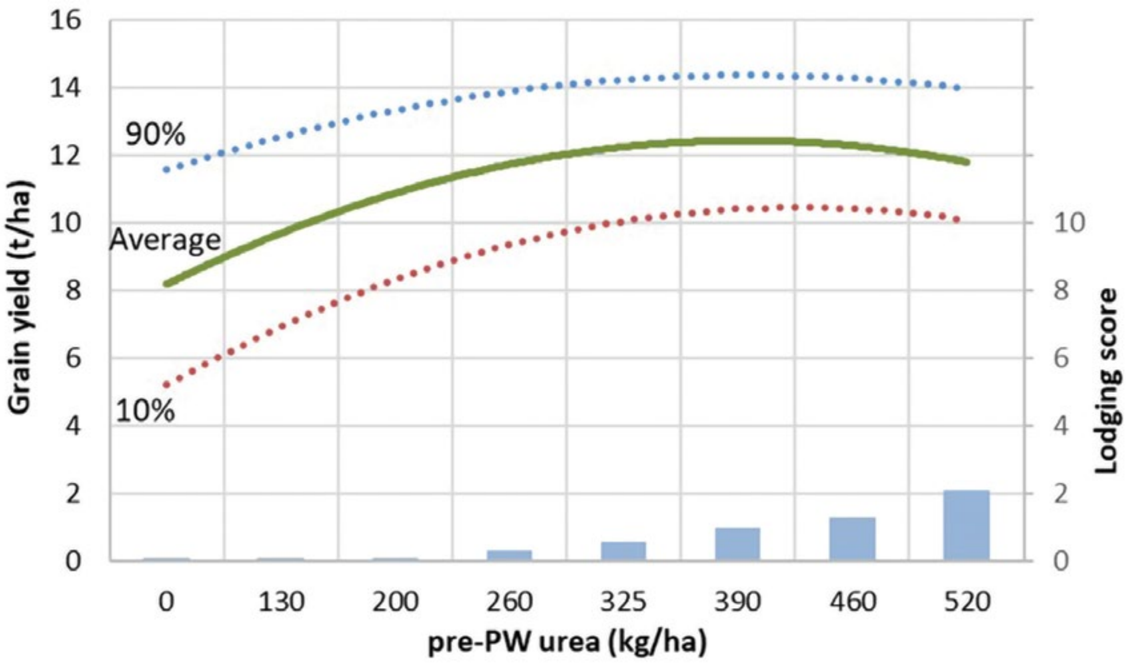


Figure 7. Reiziq[⊕] grain yield (average, 10 and 90 percentile) and average lodging score (0=standing, 10=flat) results for pre-permanent water (PW) nitrogen (N) rates (no panicle initiation (PI) applied nitrogen). Results are from 607 plots in 52 experiments conducted over 8 seasons with a range of soil types, fertility levels and sowing methods.

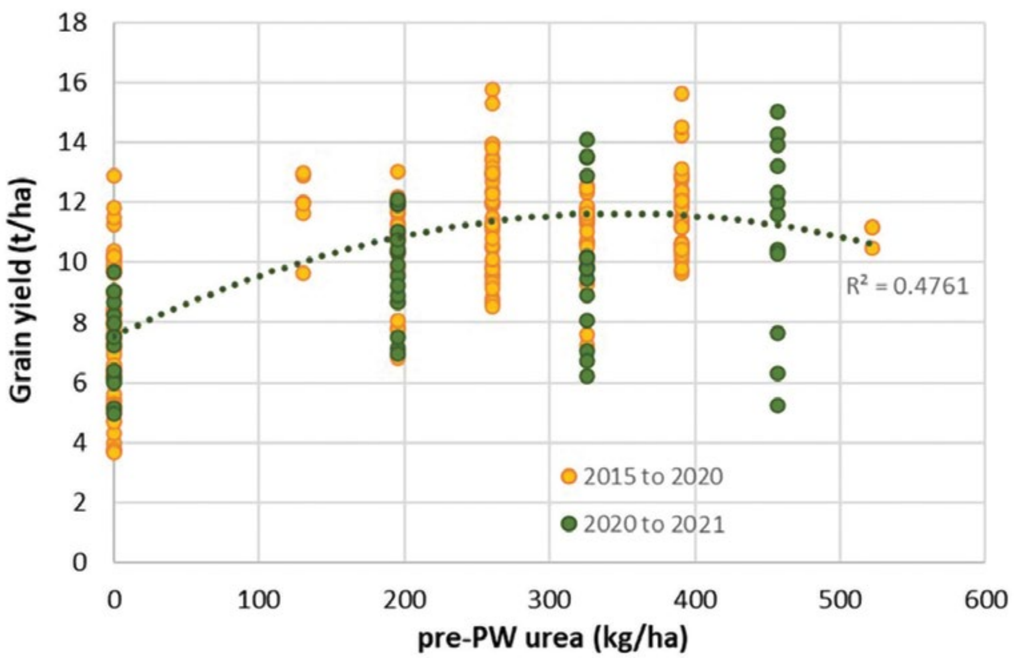


Figure 8. Grain yield of Reiziq[⊕] for a range of pre-permanent water (PW) nitrogen (N) rates from 42 experiments over 6 seasons in the Murrumbidgee and Murray valleys. The 2020–21 season was cooler than the previous 5.

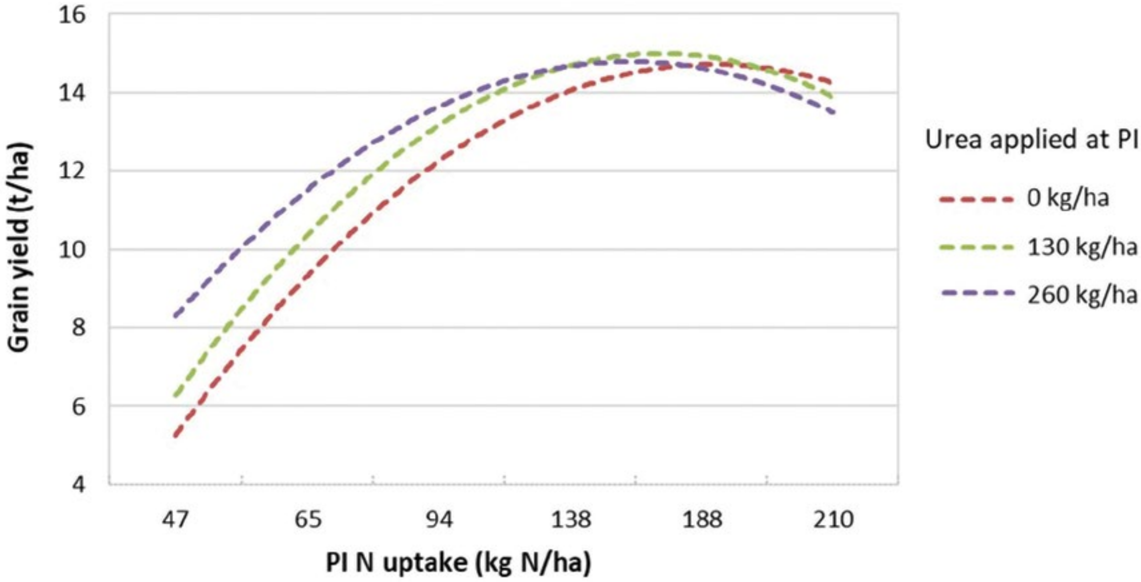


Figure 9. Grain yield of drill sown Reiziq⁽ᵈ⁾ where 0 kg/ha, 130 kg/ha and 260 kg/ha of urea was applied at panicle initiation (PI) at a range of PI nitrogen (N) uptake levels (Leeton in 2019–20 season).

Harvest: be prepared to start harvesting Reiziq⁽ᵈ⁾ as soon as the grain moisture drops to 22%. Delaying harvest after the crop is mature will increase the risk of grain shedding and lodging.

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NSW GOVERNMENT

DPI Primefact

V071$^{\phi}$ growing guide

June 2023, Primefact 21/448, second edition

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V071$^{\phi}$ is a semi-dwarf bold, medium-grain rice variety with high grain yield potential, outperforming Reiziq$^{\phi}$ in all our district experiments. V071$^{\phi}$ has superior cold tolerance and reduced shattering compared with Reiziq$^{\phi}$. V071$^{\phi}$ has a similar growth duration to Reiziq$^{\phi}$, but has the advantage of not delaying its development during periods of low temperature.

Yield potential: V071$^{\phi}$ has a high grain yield potential. In 4 seasons of experiments conducted in commercial fields, V071$^{\phi}$ always yielded higher than Reiziq$^{\phi}$ (Table 11).

Table 11. Average grain yield of Reiziq$^{\phi}$ and V071$^{\phi}$ from experiments and commercial fields over 4 seasons.

4 year average yield (t/ha)	Reiziq$^{\phi}$	V071$^{\phi}$
Experiment average	12.1	13.5
Grower average	10.6	12.0

Sowing method and date: all sowing methods, i.e. aerial, dry broadcast, drill and delayed permanent water (DPW), are suitable for growing V071$^{\phi}$ and have the same grain yield potential when managed appropriately. The recommended sowing and first flush dates for V071$^{\phi}$ are shown in Table 12.

Table 12. Target sowing and first flush dates for V071$^{\phi}$ for different sowing methods and regions.

MIA/CIA			Murray Valley		
Aerial/dry broadcast	Drill	Delayed permanent water	Aerial/dry broadcast	Drill	Delayed permanent water
20 October–5 November	15–31 October	5–20 October	15–31 October	10–25 October	1–15 October

MIA: Murrumbidgee Irrigation Area. CIA: Coleambally Irrigation Area.

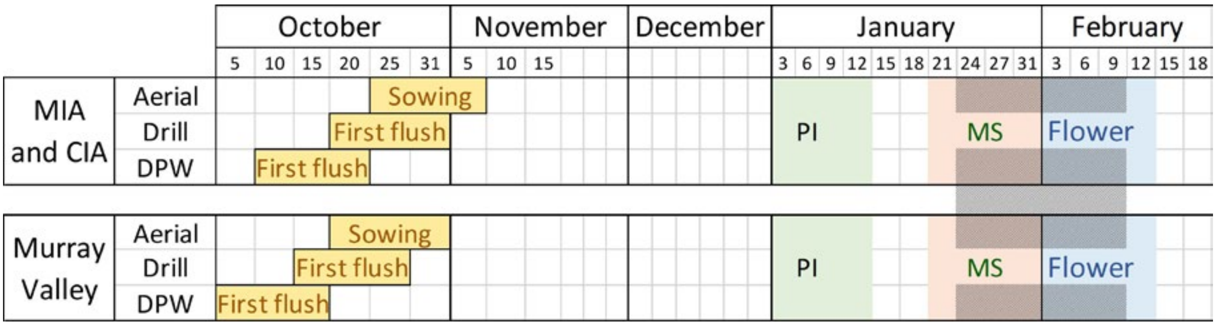
Sowing date recommendations for V071$^{\phi}$ aim to ensure the critical microspore (MS) and flowering periods align with the period of least risk of low temperatures (Table 13).

Sowing earlier or later than recommended increases the risk of exposure to low temperatures during MS and flowering, which can reduce grain yield.

V071$^{\phi}$ development does not slow during periods of low temperatures like Reiziq$^{\phi}$, which is beneficial in cool seasons.

Establishment vigour: experiments have shown V071$^{\phi}$ to have strong emergence and establishment vigour.

Table 13. Recommended sowing and first flush dates for V071⌽ and the subsequent panicle initiation (PI), microspore (MS) and flowering timing when sown in the recommended period for each district and sowing method. The hatched area shows the time of least risk of low temperatures.



MIA – Murrumbidgee Irrigation Area, CIA – Coleambally Irrigation Area, DPW – delayed permanent water.

Sowing rate: V071⌽ should be sown at 130 kg/ha for all sowing methods, aiming to establish between 100 plants/m² and 200 plants/m². Sowing rates can be reduced by 10–20% when drill sowing if the seed is placed at a consistent depth and in good establishment conditions.

Sow a compound fertiliser containing phosphorus and zinc with the seed when drill sowing.

Cold tolerance: V071⌽ has a higher tolerance to cold stress during the early pollen MS and flowering periods than Reiziq⌽. V071⌽ has a similar cold tolerance to Sherpa⌽.

Plant height: V071⌽ has a similar height to Reiziq⌽, which is, on average, 810 mm.

Lodging potential: V071⌽ has moderate resistance to lodging, which can be induced by applying excessive N pre-permanent water (PW).

Grain shattering: V071⌽ has improved grain shattering compared with Reiziq⌽. Ranked as moderate, V071⌽ is similar in grain shattering to Sherpa⌽ and Viand⌽.

Nitrogen management: apply between 200 kg/ha and 340 kg/ha urea to V071⌽ pre-PW (Figure 10). Fields with a history of legumes might require less pre-PW N, and some continuously cropped fields with heavy clay soils could require more pre-PW N.

V071⌽ is a durable variety with a long yield plateau before grain yield declines due to sterility or lodging becomes a problem from excess N application (Figure 10).

Any major field variability in N should be amended pre-PW. Red edge imagery of previous rice crops grown in the field is a good resource for identifying soil N variability.

Aim to apply 80–90% of the total required N before PW and then top up at PI if required. Adequate N must be applied pre-PW to achieve maximum grain yield as PI-applied N is limited in how much it can increase yield (Figure 11).

In warm seasons, maximum grain yield can be achieved by applying all the required N pre-PW. However, in seasons with low temperatures during MS or flowering, excess pre-PW N can increase sterility and reduce grain yield.

Panicle initiation nitrogen (PI N): for maximum grain yield with reduced lodging, use red edge imagery and the PI tissue test at PI to determine N top-dressing rates. Higher than required N rates applied at PI can increase lodging and reduce profitability.

Extra N applied at PI does not increase a rice crop's susceptibility to cold stress as much as applying higher than required rates of N before PW.

Harvest: V071⌽ leaves remain greener than Reiziq⌽ as it matures, which can provide some visual confusion when determining drainage timing. Use grain maturity (i.e. the number of milky grains) and grain moisture when making the drainage decision (Figure 12).

Be prepared to start harvesting as soon as the grain moisture drops to 22%. Delaying harvest after the crop matures increases the risk of grain shedding and lodging.

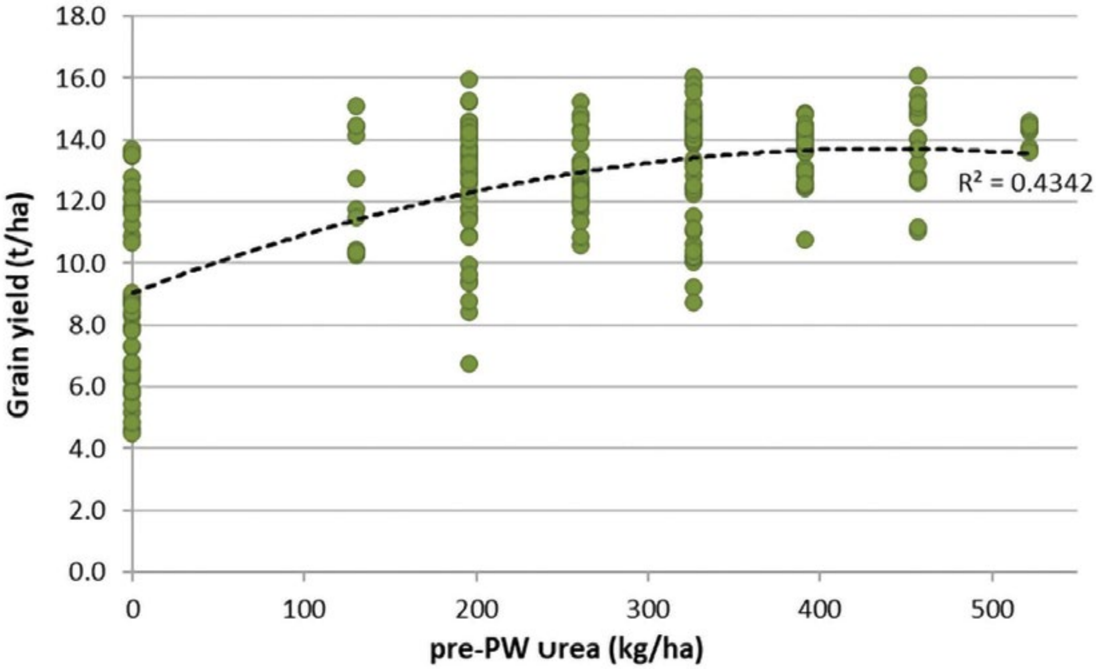


Figure 10. V071⊕ grain yield results for pre-permanent water (PW) nitrogen (N) rates (no panicle initiation (PI) applied N). Results are from 301 plots in 19 experiments conducted over 4 seasons with various soil types, fertility levels and sowing methods.

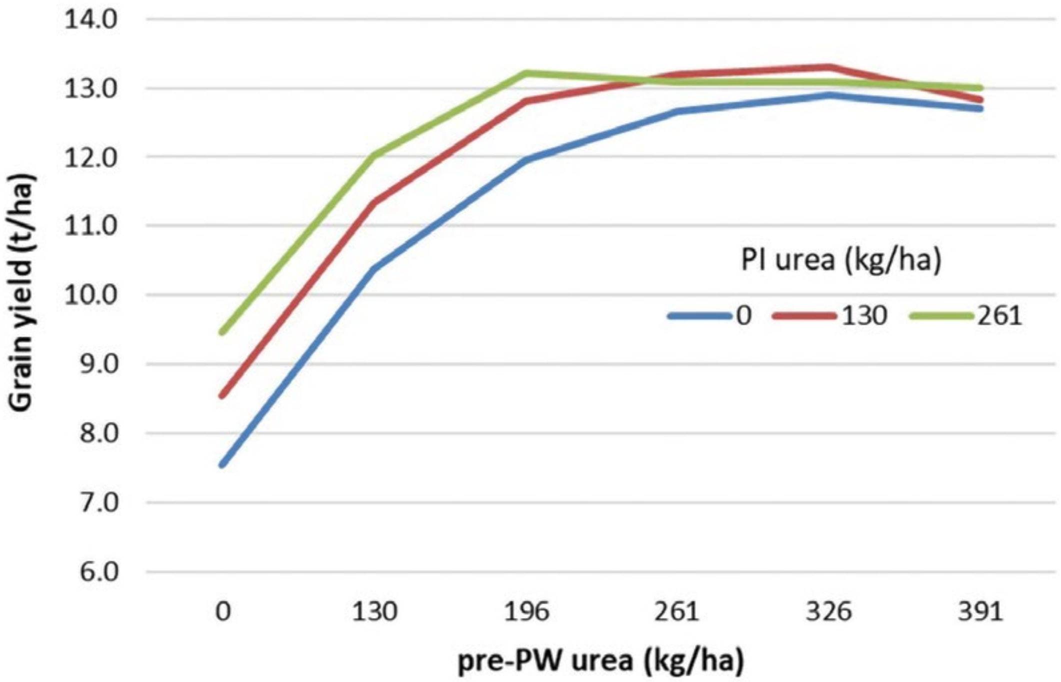


Figure 11. Grain yield of drill sown V071⊕ for a range of pre-permanent water (PW) and panicle initiation (PI) urea rates in 2022–23.

Figure 12. V071⦶ (left) has more green leaf than Reiziq⦶ (right) as it nears maturity with both varieties close to 26% grain moisture.

Acknowledgements

The research used in this publication is a collaboration between NSW Department of Primary Industries and AgriFutures.

DPI Primefact

Sherpa⦶ growing guide

June 2023, Primefact 1645, third edition

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Sherpa⦶ is a semi-dwarf medium grain variety with good cold stress tolerance.

Yield potential: the yield potential of Sherpa⦶ is an average of 9% higher than Reiziq⦶ (Table 14).

Table 14. Average grain yield of Sherpa⦶ and Reiziq⦶ from experiments and commercial fields over 5 seasons.

5 year average yield (t/ha)	Sherpa⦶	Reiziq⦶
Experiment average	13.1	12.0
Grower average	10.9	10.6

Establishment vigour: experiments have shown Sherpa⦶ to have moderate establishment vigour.

Sowing method and date: all sowing methods, i.e. aerial, dry broadcast, drill and delayed permanent water (DPW), are suitable for growing Sherpa⦶ and have the same grain yield potential when managed appropriately.

The recommended sowing and first flush windows for Sherpa⦶ are listed in Table 15.

Table 15. Target sowing and first flush dates for Sherpa⦶ using different sowing methods and regions.

MIA/CIA			Murray Valley		
Aerial/dry broadcast	Drill	Delayed permanent water	Aerial/dry broadcast	Drill	Delayed permanent water
25 October–10 November	20 October–5 November	10–25 October	20 October–5 November	15–31 October	5–20 October

MIA: Murrumbidgee Irrigation Area. CIA: Coleambally Irrigation Area.

Sowing date recommendations for Sherpa⦶ aim to ensure that the critical microspore (MS) and flowering periods align with the least risk of low temperatures (Table 16).

Sowing earlier or later than recommended increases the risk of exposure to low temperatures during MS and flowering, which can reduce grain yield.

Table 16. Recommended sowing and first flush dates for Sherpa$^{\phi}$ and the subsequent panicle initiation (PI), microspore (MS) and flowering timing when sown in the recommended period for each district and sowing method. The hatched area shows the time of least risk of low temperatures.

MIA – Murrumbidgee Irrigation Area, CIA – Coleambally Irrigation Area, DPW – delayed permanent water.

Sowing rate: Sherpa$^{\phi}$ should be sown at 130 kg/ha for all sowing methods, aiming to establish between 100 plants/m^2 and 200 plants/m^2. Sowing rates can be reduced by 10–20% when drill sowing if the seed is placed at a consistent depth and in good establishment conditions.

Sow a compound fertiliser containing phosphorus and zinc with the seed when drill sowing.

Cold tolerance: Sherpa$^{\phi}$ has a high tolerance to cold stress during the early pollen MS and flowering periods.

Plant height: Sherpa$^{\phi}$ is, on average, 840 mm tall, 30 mm taller than Reiziq$^{\phi}$.

Lodging potential: Sherpa$^{\phi}$ is moderately resistant to lodging, which can be induced by applying excessive nitrogen (N) pre-permanent water (PW). The effect of pre-PW N application rates on the lodging of Sherpa$^{\phi}$ is shown in Figure 13.

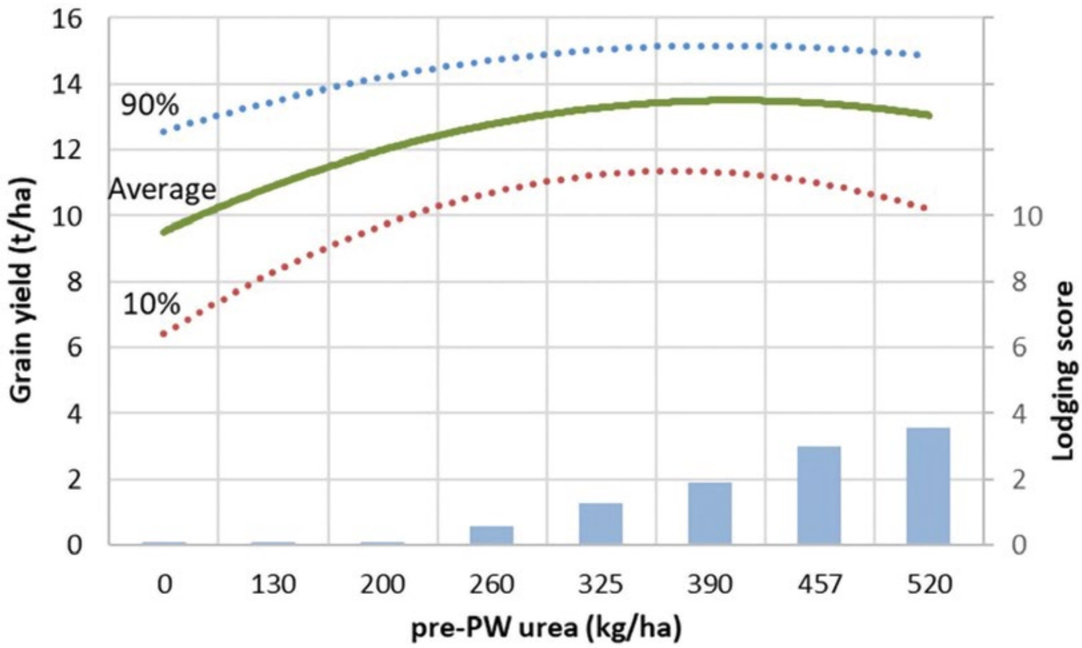

Figure 13. Sherpa$^{\phi}$ grain yield (average, 10 and 90 percentile) and average lodging score (0=standing, 10=flat) results for pre-permanent water (PW) nitrogen (N) rates (no panicle initiation (PI) applied nitrogen). Results are from 373 plots in 29 experiments conducted over 7 seasons with a range of soil types, fertility levels and sowing methods.

Grain shattering: Sherpa$^{\phi}$ has moderate susceptibility to shedding grain once the crop is mature. It does not shed grain as easily as Reiziq$^{\phi}$.

Nitrogen management: apply between 200 kg/ha urea and 340 kg/ha urea to Sherpa⁽ᵇ⁾ crops pre-PW (Figure 13). Fields with a history of legumes might require less pre-PW N; some continuously cropped fields with heavy clay soils could require more pre-PW N.

Sherpa⁽ᵇ⁾ is a durable variety with a long grain-yield plateau before yield declines due to sterility, or lodging becomes a problem from excess N application (Figure 14).

Any major field variability in N should be amended pre-PW. Red edge imagery of previous rice crops grown in the field is a good resource for identifying soil N variability.

Sherpa⁽ᵇ⁾ has similar N requirements to Reiziq⁽ᵇ⁾ to reach its maximum grain yield potential (Figure 14).

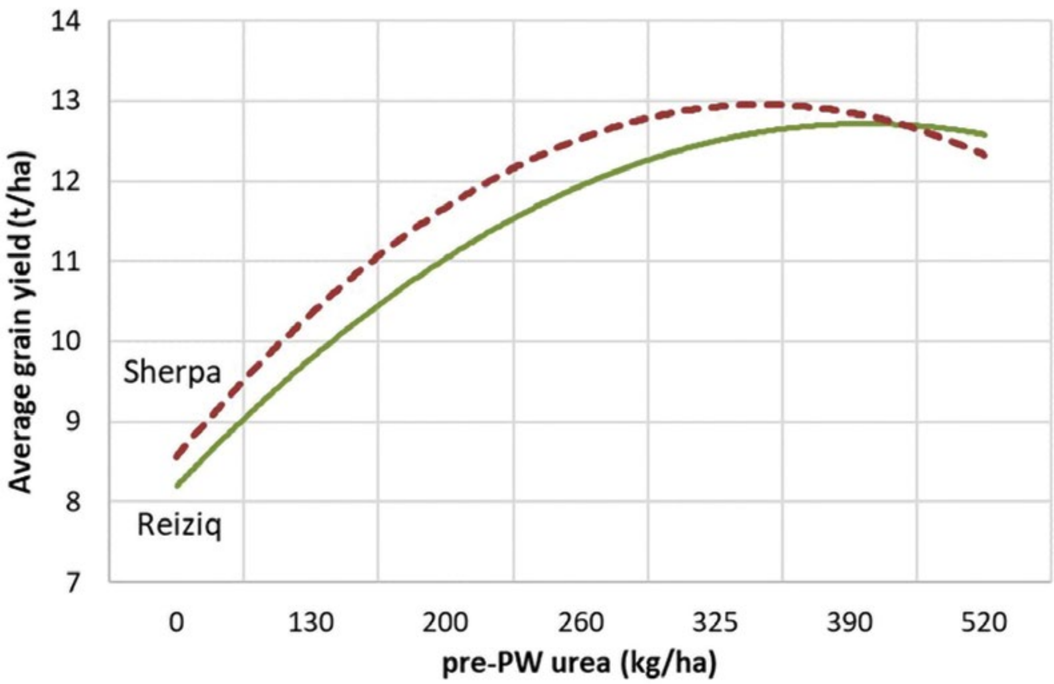

Figure 14. Average grain yield for Sherpa⁽ᵇ⁾ compared with Reiziq⁽ᵇ⁾ for a range of pre-permanent water (PW) nitrogen (N) application rates.

Adequate N must be applied pre-PW to achieve maximum grain yield as PI-applied N is limited in how much it can increase yield. Aim to apply 80–90% of the total required N before PW and then top up at PI if required.

In warm seasons, maximum grain yield can be achieved by applying all the required N pre-PW. However, in seasons with low temperatures during MS or flowering, excess pre-PW N can increase sterility and reduce grain yield.

Panicle initiation nitrogen (PI N): for maximum grain yield with reduced lodging, use red edge imagery and the PI tissue test to determine PI N top-dressing rates. Higher than required N rates applied at PI can increase lodging and reduce profitability.

Extra N applied at PI does not increase a rice crop's susceptibility to cold stress as much as applying higher than required rates of N before PW.

Harvest: be prepared to start harvesting Sherpa⁽ᵇ⁾ as soon as the grain moisture drops to 22%. Delaying harvest will increase the risk of lodging, which can cause difficult harvesting conditions and reduce grain quality.

Acknowledgements

The research used in this publication is a collaboration between NSW Department of Primary Industries and AgriFutures.

Department of Primary Industries
Department of Regional NSW

DPI Primefact

Viand$^{\phi}$ growing guide

June 2023, Primefact 1484, fifth edition

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Viand$^{\phi}$ is a semi-dwarf medium grain rice variety that is 10–14 days earlier to flower than all current commercial rice varieties.

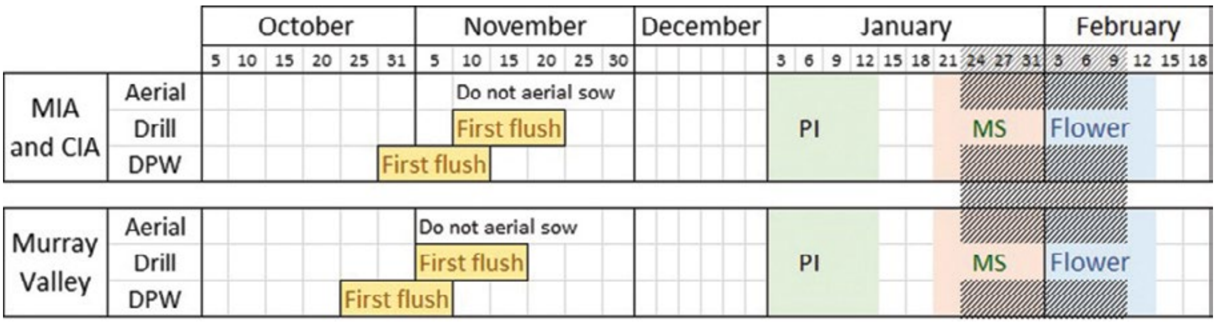
Yield potential: the yield potential of Viand$^{\phi}$ is similar to Reiziq$^{\phi}$ but 10–15% lower than V071$^{\phi}$ (Table 17). The lower grower average yield for Viand$^{\phi}$ is due to it often being grown later than recommended and in double crop and salvage situations.

Table 17. Grain yield of Viand$^{\phi}$, Reiziq$^{\phi}$ and V071$^{\phi}$ from experiments and commercial fields over the last 4 seasons.

4 year average yield (t/ha)	Viand$^{\phi}$	Reiziq$^{\phi}$	V071$^{\phi}$
Experiment average	11.4	11.3	12.5
Grower average	8.4	10.6	12.0

Sowing method and date: Viand$^{\phi}$ should only be drill sown as it is more prone to lodging when aerial sown. As Viand$^{\phi}$ is an early maturity variety, it is sown later than all other varieties, so microspore (MS) and flowering coincide with the highest probability of warm temperatures (Table 18).

Table 18. Recommended sowing and first flush dates for Viand$^{\phi}$ and the subsequent panicle initiation (PI), microspore (MS) and flowering timing when sown in the recommended period for each district and sowing method. The hatched area shows the time of least risk of low temperatures.



MIA – Murrumbidgee Irrigation Area, CIA – Coleambally Irrigation Area, DPW – delayed permanent water.

The recommended sowing and first flush dates for Viand$^{\phi}$ are shown in Table 19.

If Viand$^{\phi}$ receives its first flush later than the recommended time, do not delay permanent water (PW) application. Delayed permanent water (DPW) slows crop development, which can increase the risk of cold susceptibility and late harvest.

Left: at plant populations below 100 plants/m², even plant distribution become important.

Table 19. Target sowing and first flush dates for Viand^(h) for different sowing methods and regions.

MIA/CIA		Murray Valley	
Drill	Delayed permanent water	Drill	Delayed permanent water
15–31 October	5–20 October	10–25 October	1–15 October

MIA: Murrumbidgee Irrigation Area. CIA: Coleambally Irrigation Area.

Establishment vigour: Viand^(h) has strong establishment vigour. This is further improved by establishing it when temperatures are warmer, due to it being earlier to flower (Figure 15). It is therefore sown later than Reiziq^(h) and V071^(h).

Figure 15. The difference in maturity between Viand^(h) (left) and V071^(h) (right) at flowering.

Sowing rate: Viand^(h) should be sown at 130 kg/ha, aiming to establish between 100 and 200 plants/m². Sowing rates can be reduced by 10–20% if sowing at a consistent seed depth and good establishment conditions.

Dense plant populations increase lodging potential and should be avoided when growing Viand^(h).

Sow a compound fertiliser containing phosphorus and zinc with the seed when drill sowing.

Cold tolerance: Viand^(h) has a moderate tolerance to cold stress during the reproductive period. It is better than Reiziq^(h) but not as good as Sherpa^(h) and V071^(h). It should be sown at the correct time and deep water applied over the MS period to reduce cold risk.

Plant height: Viand^(h) is, on average, 850 mm tall, 40 mm taller than Reiziq^(h).

Lodging potential: Viand^(h) is moderately susceptible to lodging, which can be induced by applying excessive nitrogen (N) pre-permanent water (PW). Aerial sowing and dense plant stands also increase lodging potential.

Grain shattering: Viand⁽ᵇ has moderate susceptibility to shedding grain so should be harvested as soon as the crop is mature.

Nitrogen management: Viand⁽ᵇ N applications should be split **70:30 between pre-PW and PI** to reduce lodging and cold susceptibility risks.

It is recommended to apply between **180 and 260 kg/ha urea at pre-PW** to Viand⁽ᵇ. This should provide enough N for the crop to have sufficient growth by PI to reach maximum yield potential without greatly increasing lodging potential (Figure 16).

Fields with a history of legumes might require less N pre-PW and some continuously cropped fields with heavy clay soils might require more N.

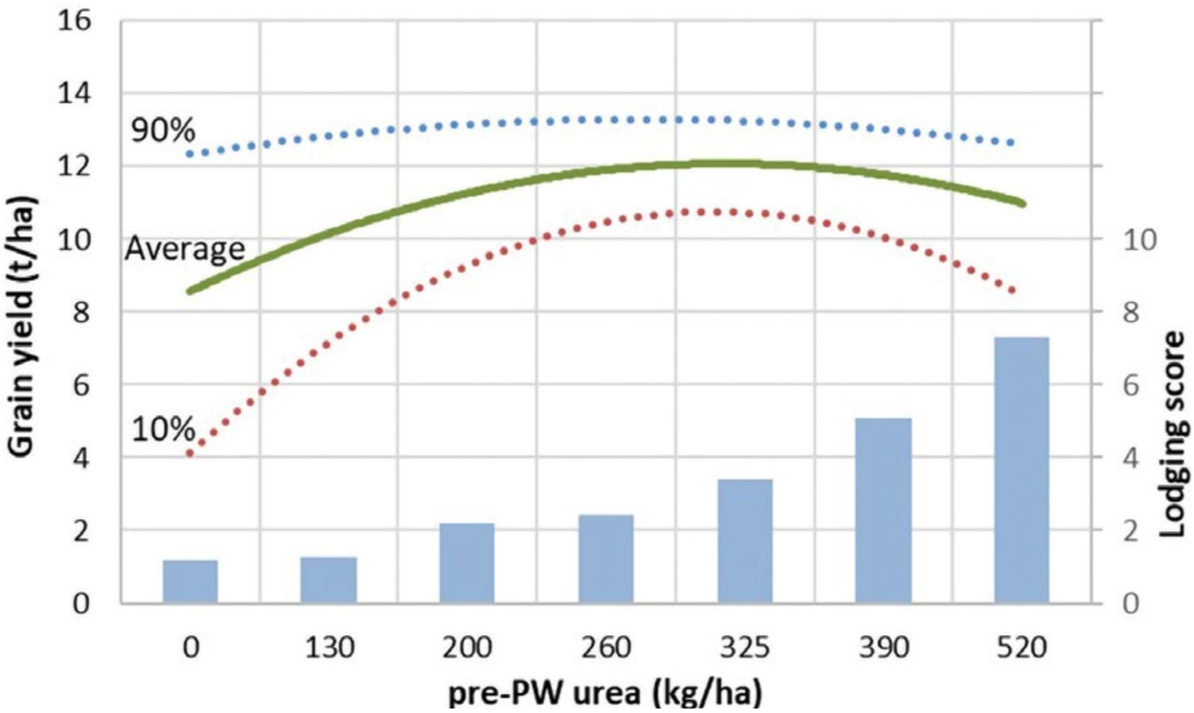


Figure 16. Viand⁽ᵇ grain yield (average, 10 and 90 percentile) and average lodging score (0=standing, 10=flat) results for pre-permanent water (PW) nitrogen (N) rates (no panicle initiation (PI) applied nitrogen). Results are from 208 plots in 20 experiments conducted over 7 seasons with a range of soil types, fertility levels and sowing methods.

Any major field variability in N should be amended pre-PW. Red edge imagery of previous rice crops grown in the field is a good resource for identifying soil N variability.

Panicle initiation nitrogen (PI N): Viand⁽ᵇ produces a high grain yield with less lodging and reduced cold susceptibility when N is split between pre-PW and PI.

A similar grain yield was produced, but with less lodging, when N was applied in split treatments or all at pre-PW in an experiment at Jerilderie (Figure 17).

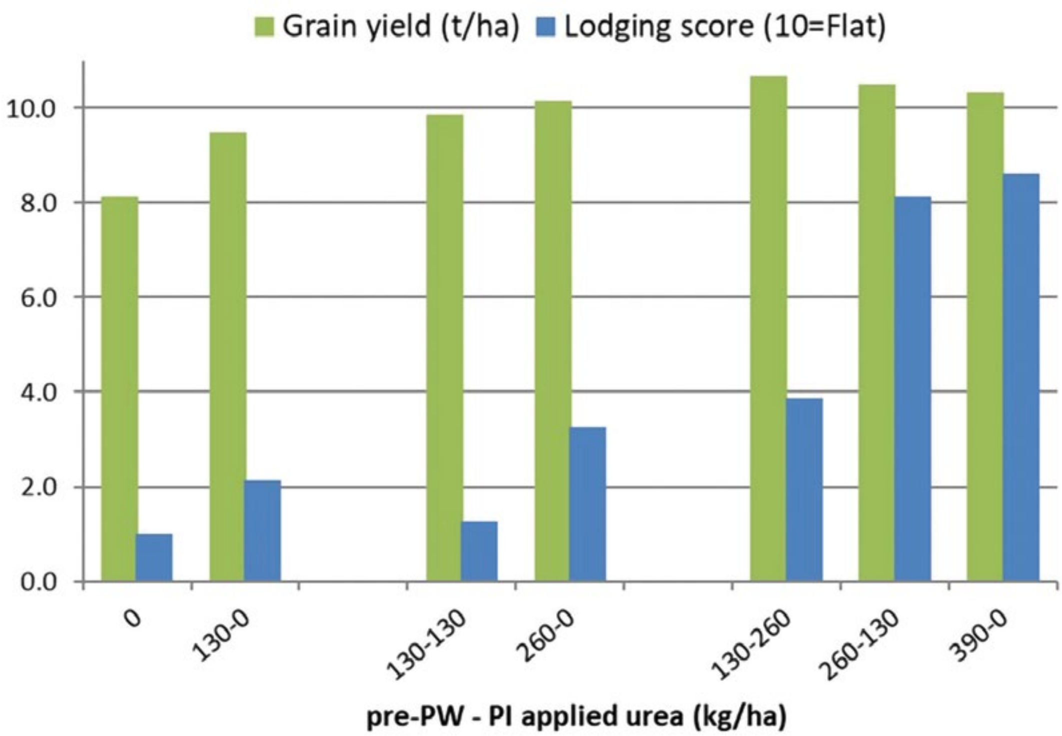


Figure 17. Grain yield and lodging score results from a Viand⁽ᵇ⁾ nitrogen (N) rate × timing experiment conducted at Jerilderie. The green bars are grain yield (t/ha @ 14%) and the blue bars are the lodging score (0=standing, 10=flat) for the range of nitrogen treatments applied pre-permanent water (PW) and at panicle initiation (PI).

For maximum grain yield with reduced lodging, use the PI tissue test to determine PI N top-dressing rates. Higher than required N rates applied at PI can increase lodging and reduce profitability.

Harvest: be prepared to start harvesting Viand⁽ᵇ⁾ as soon as the grain moisture drops to 22%. Delaying harvest after the crop is mature will increase the risk of grain shedding and lodging.

Acknowledgements

The research used in this publication is a collaboration between NSW Department of Primary Industries and AgriFutures.

Opus[PBR] growing guide

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Opus[PBR] is a semi-dwarf short grain sushi variety only grown in the Murray Valley.

Yield potential: the yield potential of Opus[PBR] is the same as Reiziq[PBR] (Table 20), but Opus[PBR] has better cold tolerance.

Table 20. Average grain yield of Opus[PBR] and Reiziq[PBR] from experiments and commercial fields over 5 seasons.

5 year average yield (t/ha)	Opus[PBR]	Reiziq[PBR]
Experiment average	12.1	12.2
Grower average	10.4	10.6

Establishment vigour: experiments have shown Opus[PBR] to have moderate establishment vigour.

Sowing method and date: all sowing methods, i.e. aerial, dry broadcast, drill and delayed permanent water (DPW), are suitable for growing Opus[PBR] and have the same grain yield potential when managed appropriately. However, care should be taken when drill sowing not to sow the small Opus[PBR] seed deeper than 30 mm.

The recommended sowing and first flush windows for Opus[PBR] are listed in Table 21.

Table 21. Target sowing and first flush dates for Opus[PBR] using different sowing methods.

Murray Valley		
Aerial/dry broadcast	Drill	Delayed permanent water
15–31 October	10–25 October	1–15 October

Sowing earlier or later than recommended will increase the risk of exposure to low temperatures during microspore (MS) and flowering, which can reduce grain yield.

Recommended sowing times for Opus[PBR] are aimed at ensuring the critical MS and flowering periods align with the period of least risk of low temperatures (Table 22).

Table 22. Recommended sowing and first flush dates for Opus⁽ᵈ⁾ and the subsequent panicle initiation (PI), microspore (MS) and flowering timing when sown in the recommended period for each district and sowing method. The hatched area shows the time of least risk of low temperatures.

District	Sowing method	October (5, 10, 15, 20, 25, 31)	November (5, 10)	December	January (3, 6, 9, 12, 15, 18, 21, 24, 27, 31)	February (3, 6, 9, 12, 15, 18)
Murray Valley	Aerial	Sowing			PI, MS	Flower
	Drill	First flush			PI, MS	Flower
	DPW	First flush			PI, MS	Flower

DPW – delayed permanent water.

Sowing rate: Opus⁽ᵈ⁾ should be sown at 110 kg/ha for all sowing methods, aiming to establish between 100 plants/m² and 200 plants/m². Sowing rates can be reduced by 10–20% when drill sowing if the seed is placed at a consistent depth and in good establishment conditions.

Sow a compound fertiliser containing phosphorus and zinc with the seed when drill sowing.

Cold tolerance: Opus⁽ᵈ⁾ has a moderately high tolerance to cold stress during the early pollen MS and flowering periods.

Plant height: Opus⁽ᵈ⁾ has a similar height to Reiziq⁽ᵈ⁾, which is, on average 810 mm.

Lodging potential: Opus⁽ᵈ⁾ is moderately resistant to lodging, which can be induced by applying excessive nitrogen (N) pre-permanent water (PW). The effects of pre-PW N application rates on lodging in Opus⁽ᵈ⁾ are shown in Figure 18.

Grain shattering: Opus⁽ᵈ⁾ is moderately resistant to shedding grain once the crop is mature.

Nitrogen management: Opus⁽ᵈ⁾ is a durable variety with a long plateau before grain yield declines or lodging becomes a problem from excess N application (Figure 18). However, as it is a variety used for making sushi, which requires a lower grain protein level to access high value markets, do not apply excessive N.

It is recommended to apply between **200 kg/ha and 300 kg/ha** of urea at pre-PW to Opus⁽ᵈ⁾ crops (Figure 18). Fields with a history of legumes might require less pre-PW N and some continuously cropped fields with heavy clay soils could require more pre-PW N.

To ensure grain protein is within the required levels, plan for a **70:30 split between PW and PI N** application.

Any major field variability in N should be amended pre-PW. Red edge imagery of previous rice crops grown in the field is a good resource for identifying soil N variability.

Results from a N rate × timing experiment show that maximum grain yield for Opus⁽ᵈ⁾ can be achieved with split N applications (Figure 19). The pre-PW and PI N split treatments produced equal or higher grain yield than when all urea was applied pre-PW; it also resulted in lower grain protein levels (Figure 19). There was no lodging in the experiment.

Panicle initiation nitrogen (PI N): for maximum grain yield with lower grain protein and reduced lodging, use red edge imagery and the PI tissue test to determine PI N top-dressing rates. Higher than required N rates applied at PI can also increase grain protein levels and lodging, and reduce profitability.

Grain protein: Opus⁽ᵈ⁾ is a short grain variety used to make sushi, which requires specific grain quality attributes. Protein levels of paddy grain below 6.9% are preferred, but high value markets require paddy protein levels below 6.4%.

Nitrogen management is crucial for achieving maximum grain yield without unnecessarily increasing grain protein levels. Low protein levels allow access to higher value markets.

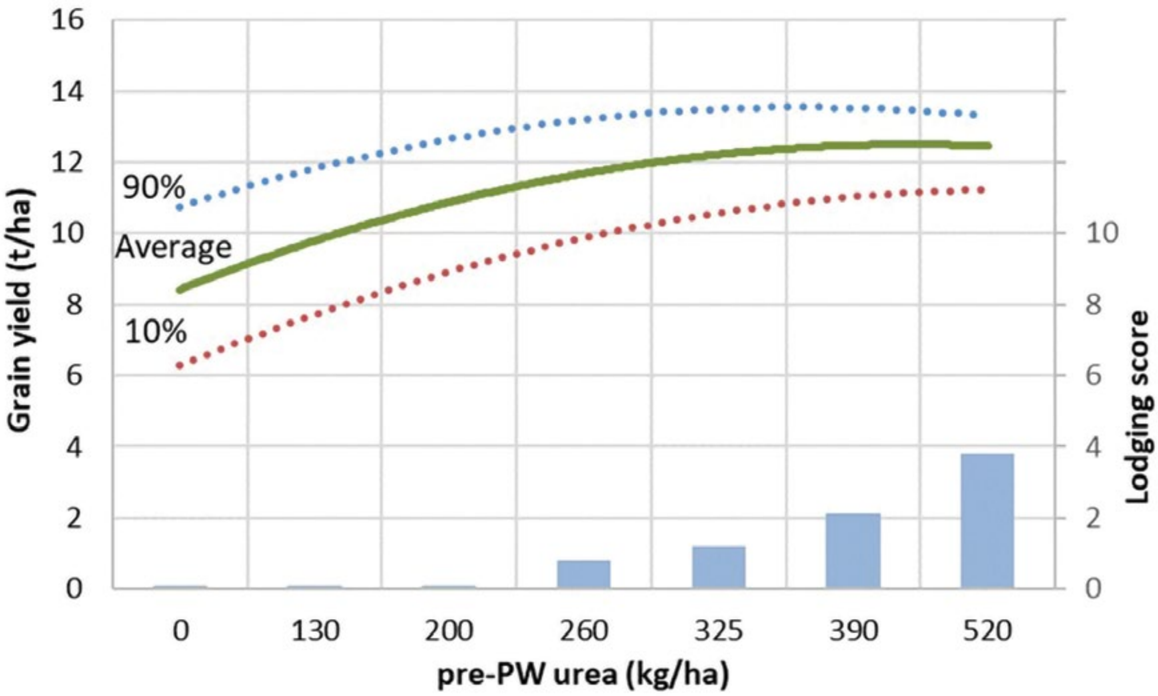

Figure 18. Opus[⏀] grain yield (average, 10 and 90 percentile) and average lodging score (0=standing, 10=flat) results for pre-permanent water (PW) nitrogen (N) rates (no panicle initiation (PI) applied nitrogen). Results are from 225 plots in 17 experiments conducted over 7 seasons with different soil types, fertility levels and sowing methods.

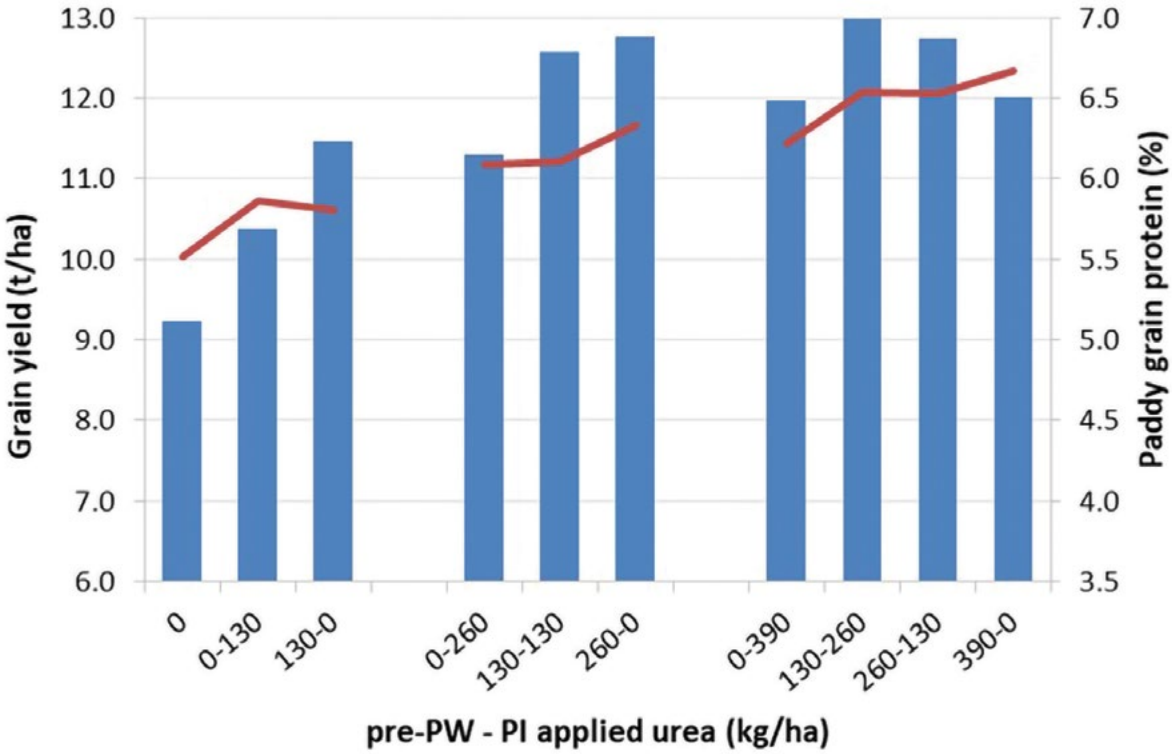

Figure 19. Grain yield results (blue bars) and grain protein levels (red lines) for Opus[⏀] from a nitrogen rate × timing experiment conducted at Jerilderie.

Harvest: be prepared to start harvesting Opus[(] as soon as the grain moisture drops to 22%. Delaying harvest will increase the risk of lodging, which can cause difficult harvesting conditions and reduce grain quality.

Further reading

Dunn B, Dunn T, Hodges C and Dawe C. 2019. Effect of sowing rate, nitrogen rate and application timing on grain yield and protein of short grain rice. In: *Southern NSW Research Results*. NSW Department of Primary Industries; 155–158. https://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/publications/southern-nsw-research-results

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NSW GOVERNMENT

DPI Primefact

Doongara growing guide

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Doongara is a semi-dwarf, long grain, hard cooking (high amylose) variety with a low glycaemic index (GI) and is resistant to lodging.

Yield potential: the yield potential of Doongara is similar to Reiziq⁽ᵇ⁾ (Table 23), although it is highly susceptible to low temperatures during the reproductive period.

Table 23. Average grain yield of Doongara and Reiziq⁽ᵇ⁾ from experiments and commercial fields over 5 seasons.

5 year average yield (t/ha)	Doongara	Reiziq⁽ᵇ⁾
Experiment average	12.2	12.1
Grower average	11.2	10.6

Establishment vigour: experiments have shown Doongara to have moderate establishment vigour.

Sowing method and date: all sowing methods, i.e. aerial, dry broadcast, drill and delayed permanent water (DPW), are suitable for growing Doongara and have the same grain yield potential when managed appropriately.

The recommended sowing and first flush windows for Doongara are listed in Table 24.

Table 24. Target sowing and first flush dates for Doongara using different sowing methods.

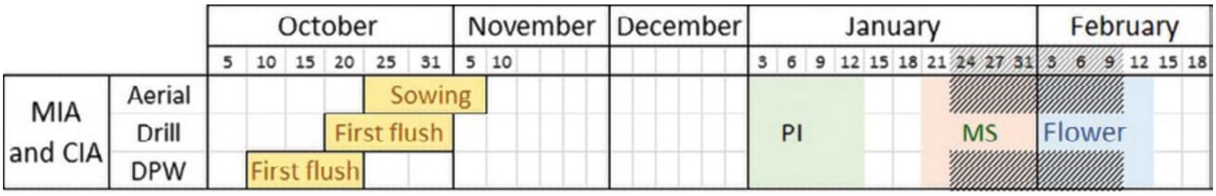
MIA/CIA		
Aerial/dry broadcast	Drill	Delayed permanent water
20 October–5 November	15–31 October	5–20 October

MIA=Murrumbidgee Irrigation Area. CIA=Coleambally Irrigation Area.

Sowing date recommendations for Doongara aim to ensure the critical microspore (MS) and flowering periods align with the period of least risk of low temperatures (Table 25).

Sowing earlier or later than recommended increases the risk of exposure to low temperatures during MS and flowering, which can reduce grain yield.

Table 25. Recommended sowing and first flush dates for Doongara and the subsequent panicle initiation (PI), microspore (MS) and flowering timing when sown in the recommended period for each district and sowing method. The hatched area shows the time of least risk of low temperatures.



MIA – Murrumbidgee Irrigation Area, CIA – Coleambally Irrigation Area, DPW – delayed permanent water.

Sowing rate: Doongara should be sown at 130 kg/ha for all sowing methods, aiming to establish between 100 plants/m² and 200 plants/m². Sowing rates can be reduced by 10–20% when drill sowing if the seed is placed at a consistent depth and in good establishment conditions.

Sow a compound fertiliser containing phosphorus and zinc with the seed when drill sowing.

Cold tolerance: Doongara **has a low tolerance to cold stress** during the reproductive periods. It must be sown in the recommended window with particular attention paid to water management.

Water levels should be kept low during tillering to encourage shorter plants and then increased to a depth of at least 250 mm after panicle initiation (PI) until mid-flowering.

Plant height: Doongara has a similar height to Reiziq$^{\phi}$, which is, on average, 810 mm.

Lodging potential: Doongara is resistant to lodging due to its short height and strong stem strength.

Grain shattering: Doongara has moderate susceptibility to shedding grain once the crop is mature.

Straighthead susceptibility: Doongara is susceptible to straighthead, which reduces grain yield. Symptoms present as floret sterility, particularly in low nitrogen (N) areas. Severe straighthead has the characteristic parrot-beaking symptoms and missing florets. See Primefact 1346: Straighthead in Australian rice crops.

Nitrogen management: Doongara N applications should be split 70:30 between pre-PW (permanent water) and PI to reduce cold susceptibility risks.

It is recommended to apply between 180 kg/ha and 260 kg/ha urea at pre-PW to Doongara (Figure 20). Fields with a history of legumes could require less N pre-PW, and some continuously cropped fields with heavy clay soils might require more N.

Applying higher than required rates of N pre-PW increases a rice crop's susceptibility to cold stress more than extra N applied at PI.

Any major field variability in N should be amended pre-PW. Red edge imagery of previous rice crops grown in the field is a good resource for identifying soil N variability.

Doongara has similar N requirements to Reiziq$^{\phi}$ to reach its maximum yield potential (Figure 21). However, the N input timing differs due to its high susceptibility to low-temperature-induced sterility.

Panicle initiation nitrogen (PI N): Doongara produces a consistently high grain yield with lower susceptibility to cold when N is split between pre-PW and PI.

For maximum grain yield with reduced lodging, use red edge imagery and the PI tissue test to determine PI N top-dressing rates. Higher than required N rates applied at PI can reduce profitability.

Harvest: be prepared to start harvesting Doongara as soon as the grain moisture drops to 22%. Delaying harvest after the crop matures will increase the risk of grain shedding and lodging, reducing grain quality.

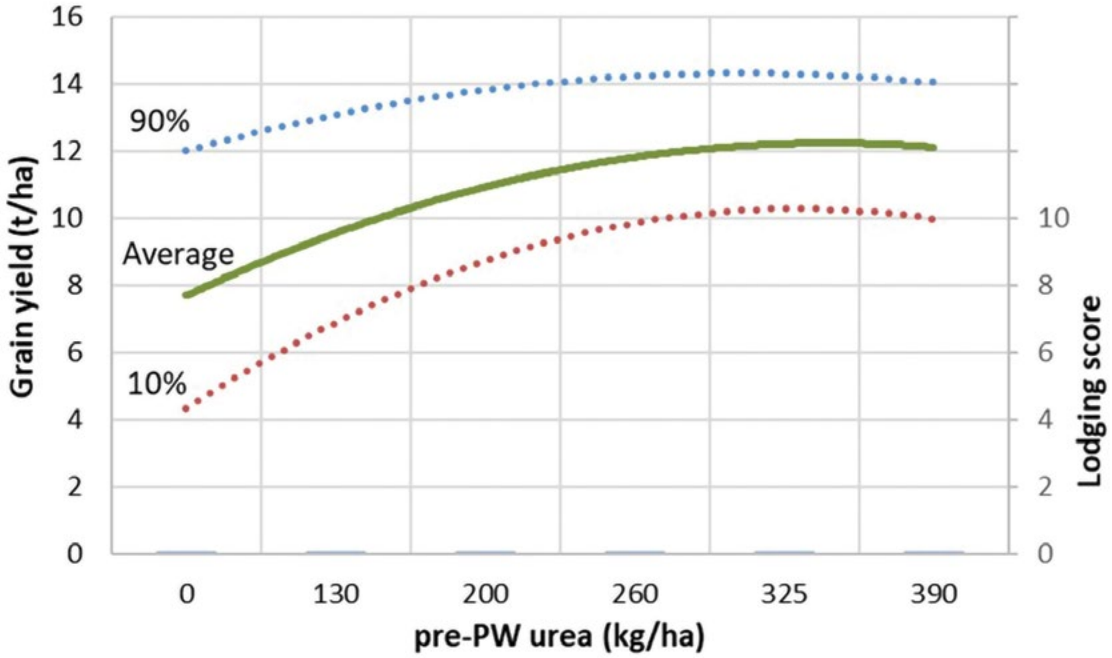


Figure 20. Doongara grain yield (average, 10 and 90 percentile) and average lodging score (0=standing, 10=flat) results for pre-permanent water (PW) nitrogen (N) rates (no panicle initiation (PI) applied nitrogen). Results are from 99 plots in 11 experiments conducted over 7 seasons with a range of soil types, fertility levels and sowing methods.

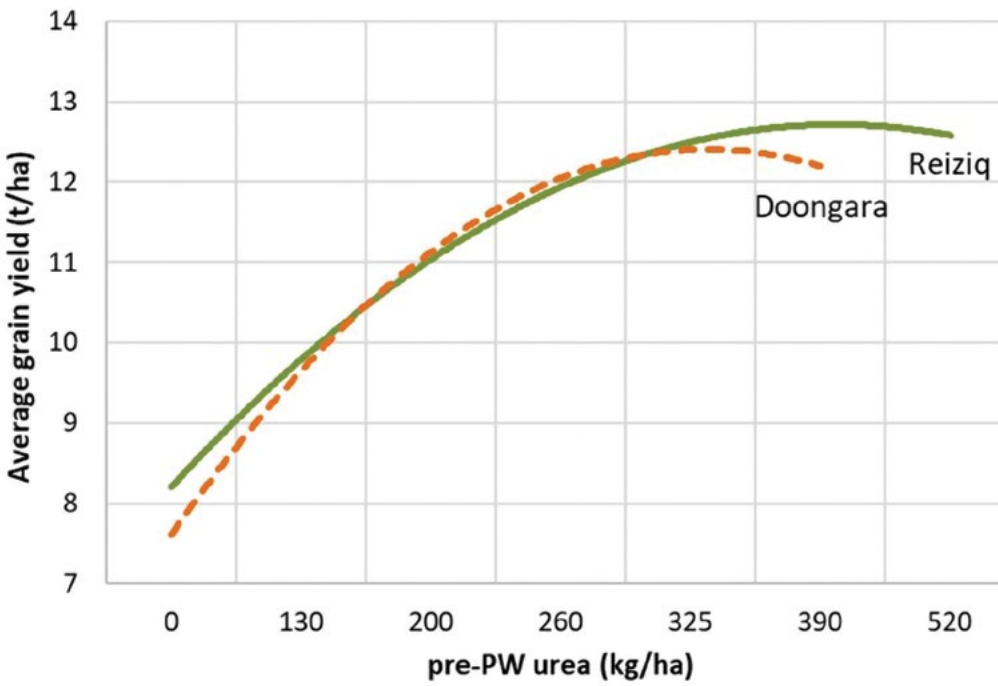


Figure 21. Average grain yields for Doongara compared with Reiziq[(l)] for a range of pre-permanent (PW) water nitrogen (N) applications.

Acknowledgements

The research used in this publication is a collaboration between NSW Department of Primary Industries and AgriFutures.


Sherpa
Poongara
Reiziq

Langi growing guide

June 2023, Primefact 1647, third edition

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Langi is a semi-dwarf, long grain variety with soft cooking (low amylose) properties. It is grown in the Murrumbidgee Irrigation Area (MIA) and the Coleambally Irrigation Area (CIA) and is susceptible to shedding grain when mature.

Yield potential: the yield potential of Langi is 94% of Reiziq[PBR] (Table 26), with similar cold stress tolerance.

Table 26. Average grain yield of Langi and Reiziq[PBR] from experiments and commercial fields over 5 seasons.

5 year average yield (t/ha)	Langi	Reiziq[PBR]
Experiment average	11.5	12.3
Grower average	9.4	10.6

Establishment vigour: experiments have shown Langi to have moderate establishment vigour.

Sowing method and date: all sowing methods, i.e. aerial, dry broadcast, drill and delayed permanent water (DPW), are suitable for growing Langi and have the same grain yield potential when managed appropriately.

The recommended sowing and first flush windows for Langi are listed in Table 27.

Table 27. Target sowing and first flush dates for Langi using different sowing methods.

MIA/CIA			Murray Valley		
Aerial/dry broadcast	Drill	Delayed permanent water	Aerial/dry broadcast	Drill	Delayed permanent water
25 October–10 November	20 October–5 November	10–25 October	20 October–5 November	15–31 October	5–20 October

MIA=Murrumbidgee Irrigation Area. CIA=Coleambally Irrigation Area.

Sowing date recommendations for Langi aim to ensure the critical microspore (MS) and flowering periods align with the period of least risk of low temperatures (Table 28).

Sowing earlier or later than recommended increases the risk of exposure to low temperatures during MS and flowering, which can reduce grain yield.

Left: a method was developed to determine differences in shattering tolerance between varieties.

Table 28. Recommended sowing and first flush dates for Langi and the subsequent panicle initiation (PI), microspore (MS) and flowering timing when sown in the recommended period for each district and sowing method. The hatched area shows the time of least risk of low temperatures.

MIA – Murrumbidgee Irrigation Area, CIA – Coleambally Irrigation Area, DPW – delayed permanent water.

Sowing rate: Langi should be sown at 130 kg/ha for all sowing methods, aiming to establish between 100 plants/m² and 200 plants/m². Sowing rates can be reduced by 10–20% when drill sowing if the seed is placed at a consistent depth and in good establishment conditions.

Sow a compound fertiliser containing phosphorus and zinc with the seed when drill sowing.

Cold tolerance: Langi has a moderate tolerance to cold stress during the early pollen MS and flowering periods, similar to Reiziq⁽ᴾ⁾.

Plant height: Langi is, on average, 870 mm tall, 60 mm taller than Reiziq⁽ᴾ⁾.

Lodging potential: Langi has intermediate resistance to lodging, which can be induced by applying excessive nitrogen (N) pre-permanent water (PW). The effects of pre-PW N application on lodging in Langi are shown in Figure 22.

Langi will also lodge if left in the field once mature for an extended period before harvest.

Grain shattering: Langi is the second-most prone of all current commercial varieties for shattering. Early harvest is recommended as Langi is susceptible to shedding grain once the crop is mature.

Nitrogen management: Langi N applications should be **split 70:30 between pre-PW and PI** to reduce lodging and cold susceptibility risks.

It is recommended to apply between **180 kg/ha and 260 kg/ha urea** at pre-PW to Langi (Figure 22). Fields with a history of legumes might require less N pre-PW, and some continuously cropped fields with heavy clay soils could require more N.

Any major field variability in N should be amended pre-PW. Red edge imagery of previous rice crops grown in the field is a good resource for identifying soil N variability.

Langi has similar N requirements to Reiziq⁽ᴾ⁾ to reach its maximum yield potential (Figure 23), however, it requires different timing for the N inputs. Applying higher than required rates of N pre-PW increases a rice crop's susceptibility to cold stress more than extra N applied at PI.

Panicle initiation nitrogen (PI N): Langi produces a high grain yield with less lodging and reduced cold susceptibility when N is split between pre-PW and PI.

For maximum grain yield with reduced lodging, use red edge imagery and the PI tissue test to determine PI N top-dressing rates. Higher than required N rates applied at PI can increase lodging and reduce profitability.

Harvest: be prepared to start harvesting Langi as soon as the grain moisture drops to 22%. Delaying harvest after the crop is mature will increase the risk of grain shedding and lodging and reduce grain quality.

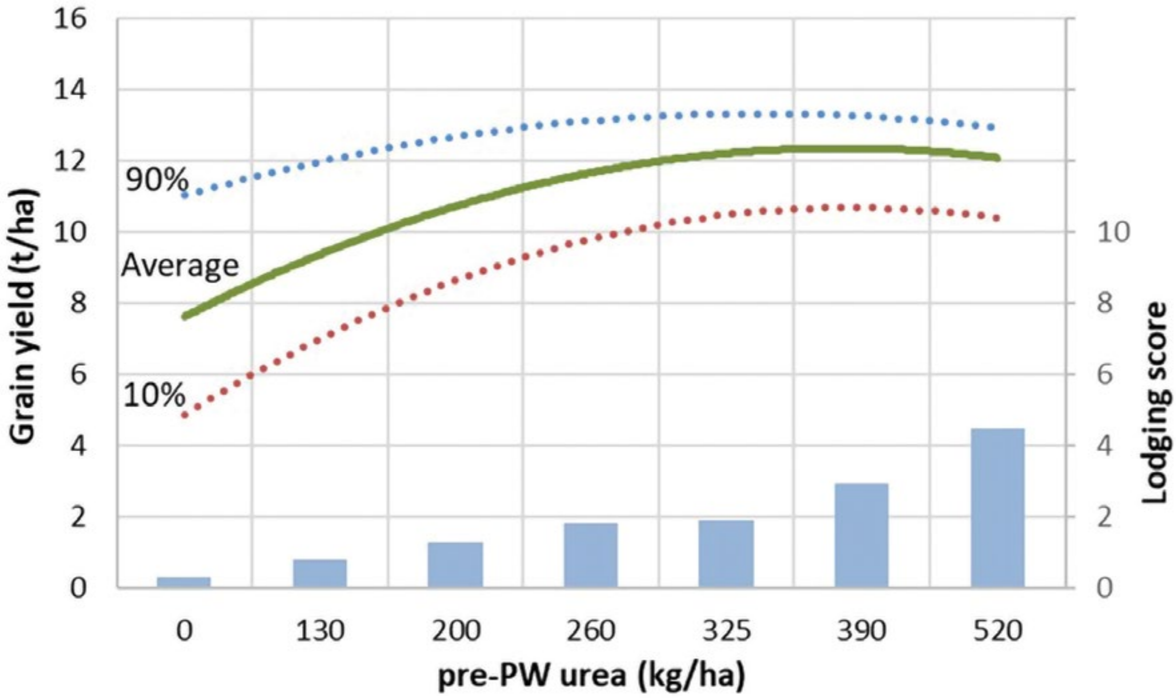

Figure 22. Langi grain yield (average, 10 and 90 percentile) and average lodging score (0=standing, 10=flat) results for pre-PW N application rates (no PI-applied nitrogen). Results are from 207 plots in 16 experiments conducted over 7 seasons with various soil types, fertility levels and sowing methods.

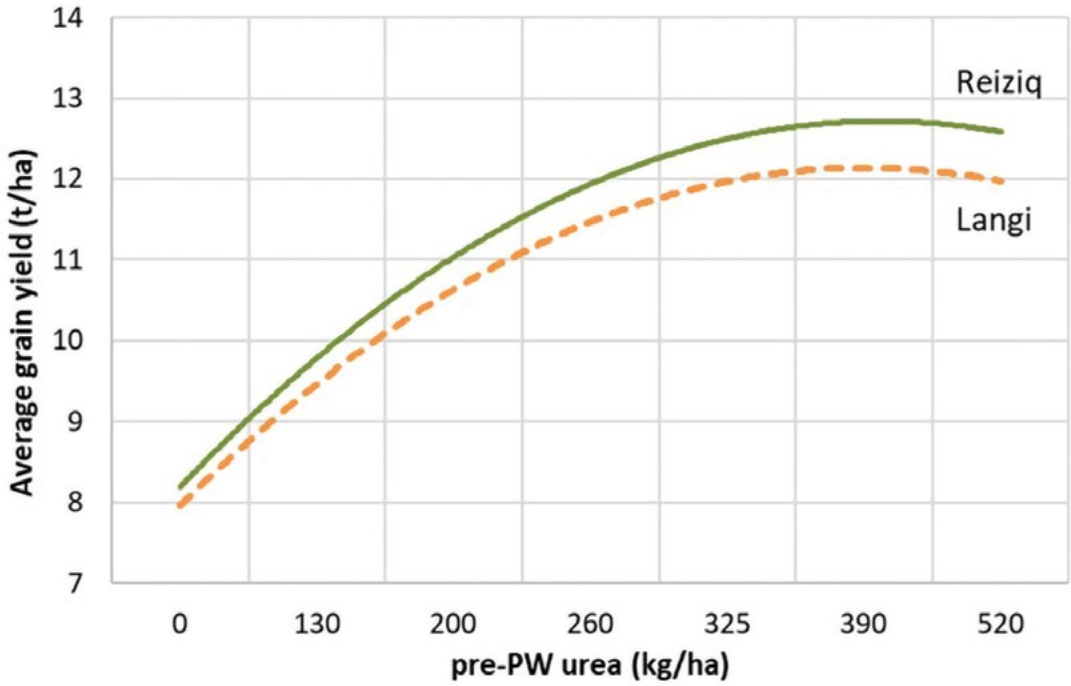

Figure 23. Average grain yields for Langi compared with Reiziq⦷ for a range of pre-permanent water (PW) nitrogen (N) applications.

Acknowledgements

The research used in this publication is a collaboration between NSW Department of Primary Industries and AgriFutures.

Department of Primary Industries
Department of Regional NSW

DPI Primefact

Topaz growing guide

June 2023, Primefact 1483, fourth edition

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Topaz is a semi-dwarf, fragrant, long grain variety only grown in the Murrumbidgee Irrigation Area (MIA) and the Coleambally Irrigation Area (CIA).

Yield potential: the yield potential of Topaz is 88% of Reiziq (Table 29), and it is highly susceptible to low temperatures during the reproductive period.

Table 29. Average grain yield of Topaz and Reiziq from experiments and commercial fields over 5 seasons.

5 year average yield (t/ha)	Topaz	Reiziq
Experiment average	10.3	11.8
Grower average	8.9	10.6

Establishment vigour: experiments have shown Topaz has the poorest establishment vigour of all commercial varieties. Care must be taken with seed depth to ensure adequate establishment.

Sowing method and date: all sowing methods, i.e. aerial, dry broadcast, drill and delayed permanent water (DPW), are suitable for growing Topaz and have the same grain yield potential when managed appropriately.

The recommended sowing and first flush windows for Topaz are listed in Table 30.

Table 30. Target sowing and first flush dates for Topaz using different sowing methods and regions.

MIA/CIA		
Aerial/dry broadcast	Drill	Delayed permanent water
20 October–5 November	15–31 October	5–20 October

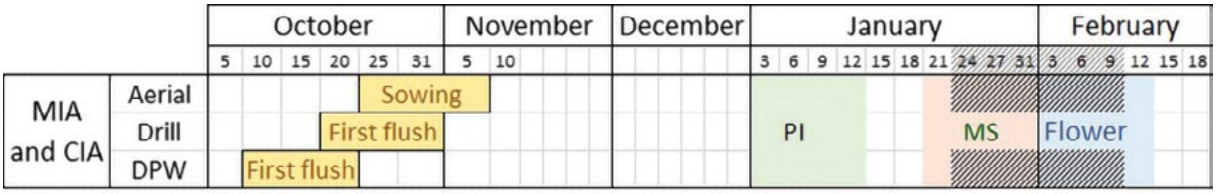
MIA=Murrumbidgee Irrigation Area. CIA=Coleambally Irrigation Area.

Sowing date recommendations for Topaz aim to ensure the critical microspore (MS) and flowering periods align with the period of least risk of low temperatures (Table 31).

Sowing earlier or later than recommended increases the risk of exposure to low temperatures during MS and flowering, which can reduce grain yield.

Left: pre-germinated rice seed that has been soaked for 24 hours, then drained for 24 hours before being aerially sown.

Table 31. Recommended sowing and first flush dates for Topaz$^{\phi}$ and the subsequent panicle initiation (PI), microspore (MS) and flowering timing when sown in the recommended period for each district and sowing method. The hatched area shows the time of least risk of low temperatures.



MIA – Murrumbidgee Irrigation Area, CIA – Coleambally Irrigation Area, DPW – delayed permanent water.

Sowing rate: Topaz$^{\phi}$ should be sown at 140 kg/ha for all sowing methods, aiming to establish between 100 plants/m² and 200 plants/m².

Although Topaz$^{\phi}$ has a small grain size and more seeds per kilogram than Reiziq$^{\phi}$, the same sowing rate is required to account for the variety's poor establishment vigour.

Sow a compound fertiliser containing phosphorus and zinc with the seed when drill sowing.

Cold tolerance: Topaz$^{\phi}$ has a low tolerance to cold stress during the early pollen MS and flowering periods. It must be sown in the recommended window with particular attention paid to water management.

Water levels should be kept low during tillering to encourage shorter plants and then increased to a depth of at least 250 mm after PI through until mid-flowering.

Plant height: Topaz$^{\phi}$ has a similar height to Reiziq$^{\phi}$, which is, on average, 810 mm.

Lodging potential: Topaz$^{\phi}$ is resistant to lodging, which can be induced by applying excessive nitrogen (N) pre-permanent water (PW) and delaying harvest until well past maturity.

Grain shattering: Topaz$^{\phi}$ is moderately resistant to shedding grain once the crop is mature.

Nitrogen management: Topaz$^{\phi}$ N applications should be **split 70:30 between pre-PW and PI** to reduce cold susceptibility risks.

It is recommended to apply between **180 kg/ha and 260 kg/ha urea** at pre-PW to Topaz$^{\phi}$ (Figure 24). Fields with a history of legumes might need less N pre-PW, and some continuously cropped fields with heavy clay soils could need more N.

Applying higher than required rates of N pre-PW increases a rice crop's susceptibility to cold stress more than extra N applied at PI.

Any major field variability in N should be amended pre-PW. Red edge imagery of previous rice crops grown in the field is a good resource for identifying soil N variability.

Topaz$^{\phi}$ has similar N requirements to Reiziq$^{\phi}$ to reach its maximum yield potential (Figure 25), however, it requires different N input timing due to its high susceptibility to low-temperature-induced sterility.

Panicle initiation nitrogen (PI N): Topaz$^{\phi}$ produces a high grain yield with lower susceptibility to cold when N is split between pre-PW and PI.

For maximum grain yield with reduced lodging, use red edge imagery and the PI tissue test to determine PI N top-dressing rates. Higher than required N rates applied at PI can increase lodging and reduce profitability.

Harvest: be prepared to start harvesting Topaz$^{\phi}$ as soon as the grain moisture drops to 22%. Delaying harvest will increase the risk of lodging, which can cause difficult harvesting conditions and reduce grain quality.

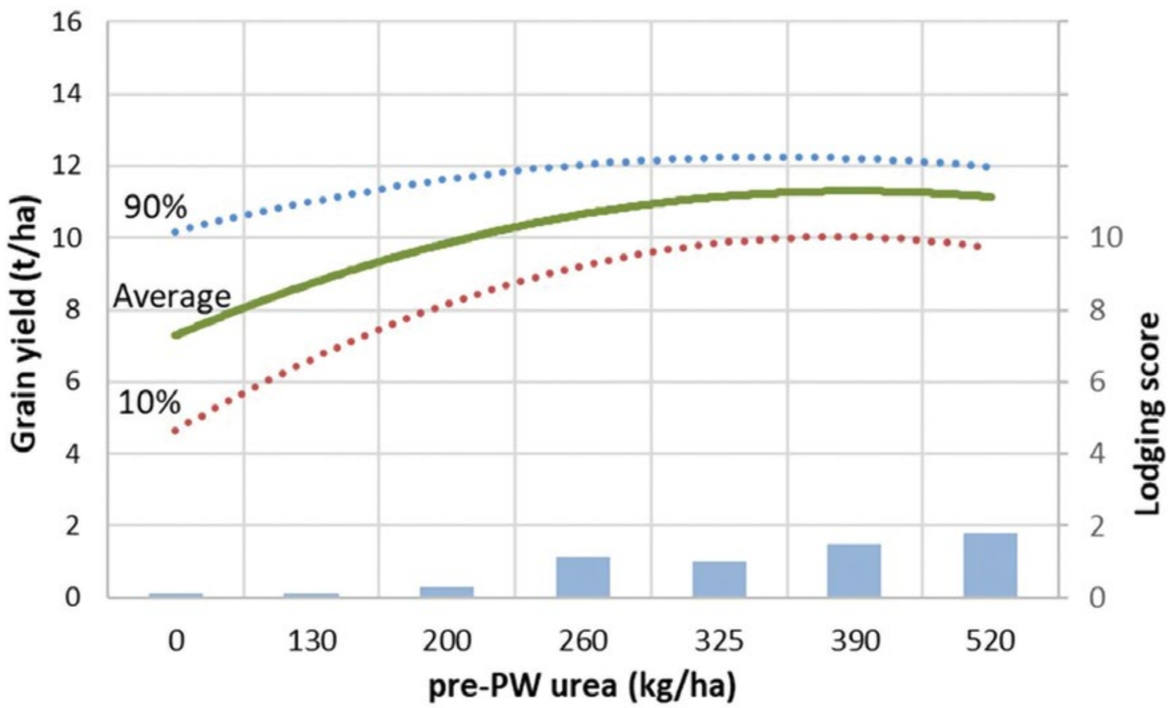


Figure 24. Topaz[⌽] grain yield (average, 10 and 90 percentile) and average lodging score (0=standing, 10=flat) results for pre-permanent water (PW) nitrogen (N) rates (no panicle initiation (PI) applied nitrogen). Results are from 115 plots in 12 experiments conducted over 5 seasons with a range of soil types, fertility levels and sowing methods.

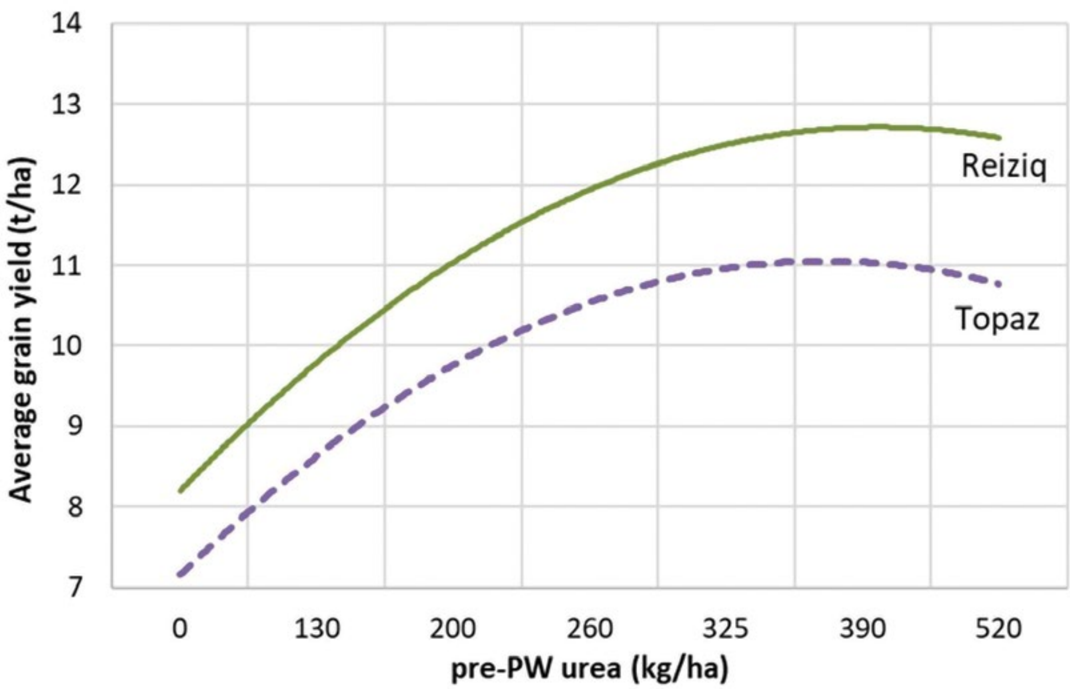


Figure 25. Average grain yields for Topaz⌽ compared with Reiziq⌽ for a range of pre-permanent water (PW) nitrogen (N) application rates.

Acknowledgements

The research used in this publication is a collaboration between NSW Department of Primary Industries and AgriFutures.

Koshihikari growing guide

June 2023, Primefact 1486, fourth edition

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Koshihikari is a short grain Japanese variety that demands a high premium. It is a tall variety that is susceptible to lodging and should not be aerial sown.

Yield potential: the yield potential of Koshihikari is 90% of Reiziq⦷ (Table 32), but it is extremely susceptible to lodging at high yields.

Table 32. Average grain yield of Koshihikari and Reiziq⦷ from experiments and commercial fields over 5 seasons.

5 year average yield (t/ha)	Koshihikari	Reiziq⦷
Experiment average	9.9	11.5
Grower average	7.8	10.6

Establishment vigour: experiments have shown Koshihikari to have moderate establishment vigour.

Sowing method and date: Koshihikari should only be drill sown as it is prone to lodging when aerial sown. Drill-sown crops have better root anchorage and resistance to stem bending, which reduces their lodging susceptibility.

The recommended sowing and first flush windows for Koshihikari are listed in Table 33.

Table 33. Target sowing and first flush dates for Koshihikari using different sowing methods.

Murray Valley		
Aerial/dry broadcast	Drill	Delayed permanent water
Do not aerial sow	10–25 October	1–15 October

Sowing date recommendations aim to ensure the critical microspore (MS) and flowering periods align with the period of least risk of low temperatures (Table 34).

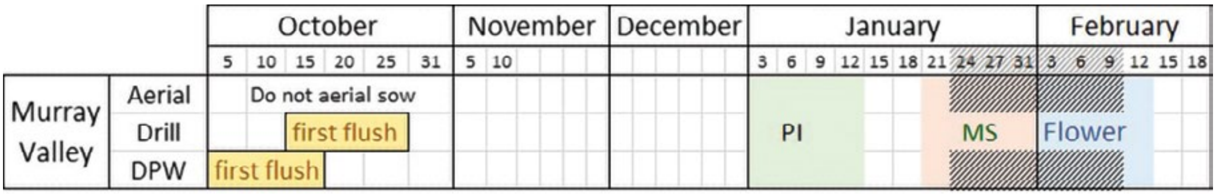
Sowing earlier or later than recommended increases the risk of exposure to low temperatures during MS and flowering, which can reduce grain yield.

Sowing rate: Koshihikari should be sown at 100 kg/ha for all sowing methods, aiming to establish between 100 plants/m² and 150 plants/m². Sowing rates can be reduced by 10–20% when the seed is placed at a consistent depth and in good establishment conditions. Lower plant densities reduce lodging potential.

Left: a plot of Koshihikari among other varieties shows its high lodging potential.

Sow a compound fertiliser containing phosphorus and zinc with the seed when drill sowing.

Table 34. Recommended sowing and first flush dates for Koshihikari and the subsequent panicle initiation (PI), microspore (MS) and flowering timing when sown in the recommended period for each district and sowing method. The hatched area shows the time of least risk of low temperatures.



DPW – delayed permanent water.

Cold tolerance: Koshihikari has a moderately high tolerance to cold stress during the early pollen MS and flowering periods.

Plant height: Koshihikari is, on average, 940 mm tall, 130 mm taller than Reiziq(b).

Lodging potential: Koshihikari is highly susceptible to lodging, which is made worse by applying excessive nitrogen (N) pre-permanent water (PW), aerial sowing or sowing in high plant densities.

Grain shattering: Koshihikari is resistant to shedding grain after maturity.

Straighthead susceptibility: Koshihikari is susceptible to straighthead, which reduces grain yield. Symptoms present as floret sterility, particularly in low N areas. Severe straighthead shows the characteristic parrot-beaking symptoms and missing florets. See Primefact 1346: Straighthead in Australian rice crops.

Nitrogen management: Koshihikari N management presents a trade-off between grain yield and lodging. To maximise grain yield, reduce lodging and ensure grain protein is within required levels, plan for a **50:50 split between pre-PW and PI-applied N**. As Koshihikari is a variety used for making sushi, lower grain protein levels are required to access high value markets.

It is recommended to only apply between **100 kg/ha and 150 kg/ha urea** to Koshihikari pre-PW and top-dress at PI (Figure 26). Fields with a history of legumes might require less N pre-PW, and some continuously cropped fields with heavy clay soils could require more pre-PW N.

Any major field variability in N should be amended pre-PW. Red edge imagery of previous rice crops grown in the field are a good resource for identifying soil N variability.

Koshihikari produces a high grain yield with reduced susceptibility to lodging and lower grain protein levels when N is split between pre-PW and PI. Results from a N rate × timing experiment conducted at Jerilderie show that high grain yields with reduced lodging and lower grain protein levels can be achieved for Koshihikari by using split N applications (Figure 27).

Panicle initiation nitrogen (PI N): for maximum grain yield with reduced lodging and lower grain protein, use red edge imagery and the PI tissue test to determine PI N top-dressing rates.

Higher than required N rates applied at PI can significantly increase lodging and grain protein levels and reduce profitability.

Grain protein: Koshihikari is used to make sushi, which requires specific grain quality attributes. Grain protein levels of paddy grain below 6.9% are preferred, but high value markets require paddy protein levels below 6.4%.

Nitrogen management is vital for achieving maximum grain yield without unnecessarily increasing grain protein levels to access high value markets.

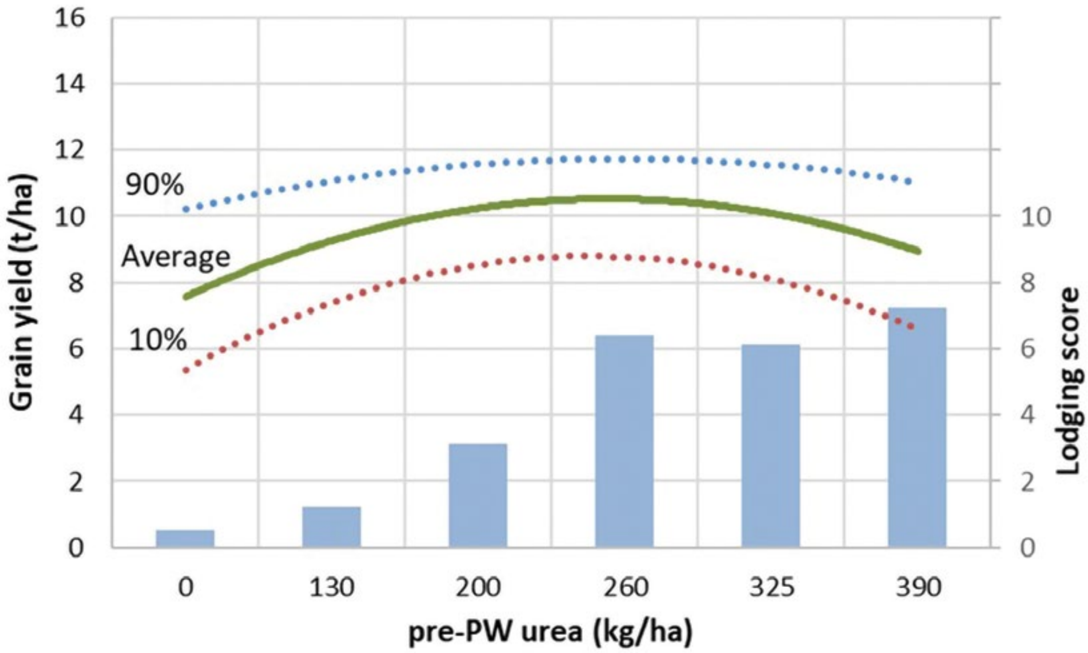


Figure 26. Koshihikari grain yield (average, 10 and 90 percentile) and average lodging score (0=standing, 10=flat) results for pre-permanent water (PW) nitrogen (N) rates (no panicle initiation (PI) applied nitrogen). Results are from 84 plots in 9 experiments conducted over 5 seasons with a range of soil types, fertility levels and sowing methods.

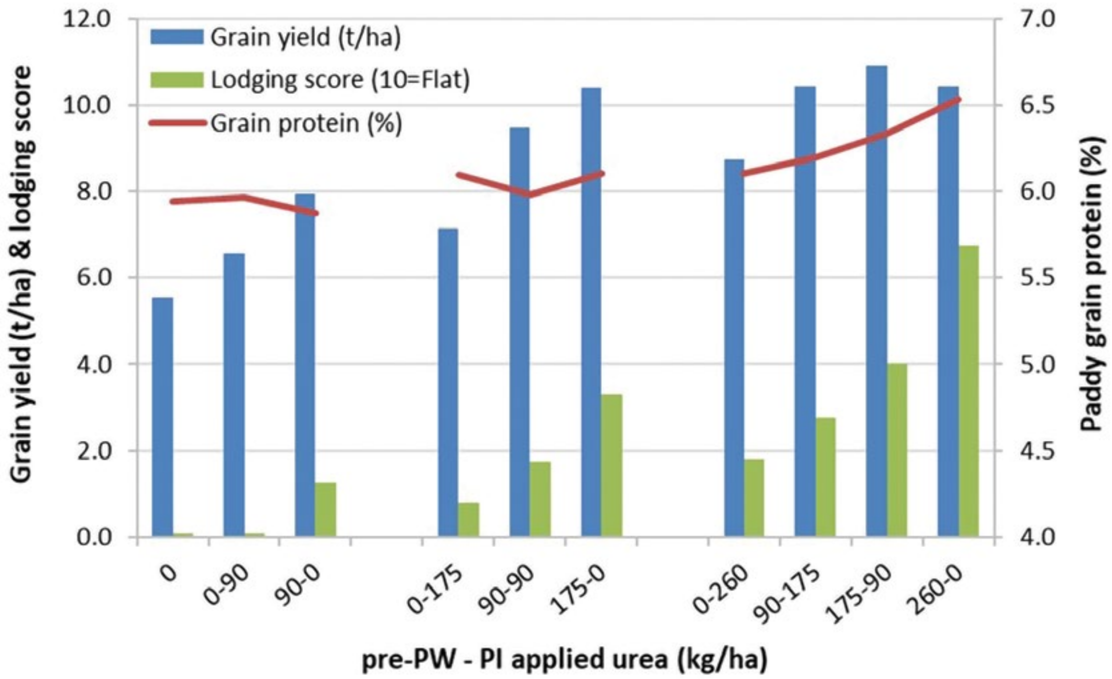


Figure 27. Grain yield results (blue bars), lodging scores (green bars, 10=flat) and grain protein levels (red lines) for Koshihikari from a nitrogen rate × timing experiment conducted at Jerilderie.

Harvest: be prepared to start harvesting Koshihikari as soon as the grain moisture drops to 22%. Delaying harvest will increase the risk of lodging, which can cause difficult harvesting conditions and reduce grain quality.

Acknowledgements

The research used in this publication is a collaboration between NSW Department of Primary Industries and AgriFutures.

Department of Primary Industries

Department of Regional NSW