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Have I enough water to finish my rice crop?

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Monthly water budgets to compare crop water requirements and available allocations are very important. If crop needs are likely to exceed supply then decisions about buying extra water or reducing the area of rice by draining must be made. The information below can help rice growers calculate their water needs and compare this with available supplies.

Rice crop water use is determined by:

1. The amount of water stored in the soil profile or already ponded on bays.
2. Evapo-transpiration demand as affected by weather conditions (wind, humidity, rainfall, temperature, solar radiation).
3. The duration of crop growth as affected by variety and crop growth stage.
4. Soil type and permeability.

Calculating rice crop water needs

Crop water requirements are calculated by estimating the **duration of crop growth** from the calculation date to drainage, then totalling the **estimated rice water use** for that period. Water ponded on the field, i.e. **already supplied**, but not yet used by the crop must be deducted. Full step-by-step instructions are provided to calculate your crop water needs *(see page 2).*

Duration of crop growing season

It is important to estimate the period of crop growth for which water must be supplied (see Table 1). This will largely depend upon variety and temperatures. The hotter the weather, the faster the crop will progress through each of the stages of growth to maturity. Table 1 shows the estimated duration of growth in days from Panicle Initiation (P.I.) through to Physiological Maturity (P.M.) for a number of rice varieties.

Table 1 Duration of growth - panicle initiation (P.I.) to physiological maturity (P.M.)

Varieties	P.I. to flowering	Flowering to P.M.	P.I. to P.M.
Medium grain – Amaroo, etc.	30 to 35 days	40 to 45 days	70 to 80 days
Long grain – Langi, etc.	30 to 35 days	35 to 40 days	65 to 75 days
Short season Jarrah, etc.	25 to 30 days	35 to 40 days	60 to 70 days

Estimated rice water use

Rice water use starts right from the beginning of the season, when rice fields are first filled up. The amount of water used at fill up will depend on the soil type, paddock history and seasonal conditions.

The main component of water use in rice is evapo-transpiration, the combination of water transpired through the leaves and water evaporated from the surface of the bays. This is varied by many factors such as the prevailing weather conditions (temperatures, solar radiation, wind, relative humidity of the air, and rainfall) and by the growth of the crop itself. Consequently it varies greatly within and between seasons.

*Deep percolation (*the water passing below the root zone) and *drainage losses* are usually minor components, depending upon the rice field permeability and rice grower management. NSW DPI uses 10-day evapo-transpiration averages plus 1 mm/day for deep percolation and channel loss when estimating rice crop water use. Additional water will be required to fill the profile on top of this. Table 2 provides an estimate of rice crop water use throughout the growing season.

Table 2. Rice water use – evapo-transpiration, plus 1 mm/day for deep percolation and channel losses.

Rice Water Use ML/ha					
E Oct 1/10–10/10	M Oct 11/10-20/10	L Oct 21/10-31/10	E Nov 1/11-10/11	M Nov 11/11-20/11	L Nov 21/11-30/11
0.59	0.64	0.72	0.76	0.85	0.94
E Dec 1/12–10/12	M Dec 11/12-20/12	L Dec 21/12-1/1	E Jan 1/1-10/1	M Jan 11/1-20/1	L Jan 21/1-31/1
0.94	0.97	1.00	0.99	1.00	0.98
E Feb 1/2–10/2	M Feb 11/2-20/2	L Feb 21/2-28/2	E Mar 1/3-10/3	M Mar 11/3-20/3	L Mar 21/3-31/3
0.96	0.91	0.83	0.80	0.71	0.62

E: Early, M: Mid, L: Late

N.B. These figures are based on the average evapo-transpiration rates plus 1 mm a day allowance for deep percolation and drainage losses. These figures will vary depending on variety, sowing date, season and soil type. They represent average figures and do not take into account any rainfall. Actual figures may differ.

Use as a guide only. Crop coefficients have not been included in this calculation as they are generally around 1.0 for rice.

In calculating your crop water requirements water already on the field needs to be considered as it is used by the crop. Table 3 below provides an indication of the amount of water available in the field at any given time, not yet used by the rice crop. It is calculated by using the depth of the water on the high side of the bay.

Table 3. Quantity of available water on field at calculation date i.e. water already supplied but not used

Depth of Water on High Sides of Bays							
cm	2.5	5	7.5	10	15	20	25
ML/ha	0.25	0.5	0.75	1	1.5	2	2.5

Remember! It is important to make your decisions early. A 40 megalitre deficit on the 1st January may mean that around 7 hectares needs to be drained – it can be made into rice hay. Delaying this decision until the 1st February can more than double the area (15 ha) that must be drained. If you wait until the end of the season then the crop could run out of water 10 days too early – experimental data suggests that this could mean a 33% or more loss in yield and a severe drop in grain quality.

Conversion factors:
10 cm depth of water on 1 hectare = 1 megalitre
100 mm depth of water on 1 hectare = 1 megalitre
1 hectare = 2.47 acres

Calculating your rice crop needs at date_____
Step 1: Estimating crop water requirements to P.M. – megalitres per hectare

	Estimate of duration of growth from date of calculation to P.M. from table 1.	Estimate of rice crop water use - ML/ha from table 2.	Minus estimate of water already existing on high side of bays at calculation Date - ML/ha from table 3.	Equals estimated crop water requirements for the remainder of the the season
Example at 1 Jan	e.g. Amaroo, PI on 1/1 70 days	e.g. Total E. Jan to E. Mar 6.47 ML/ha	e.g. 10 cm depth* 1.0 ML/ha	= 5.47 ML/ha
Your crop				= ML/ha **

***Use the conversion factors above.*
***1. Above average seasonal conditions could increase water use by up to 10% or more over the figure calculated. 2. Local farm experience may indicate that the water requirement should be varied.*

Step 2: Total crop water requirement – megalitres (ML)

	Estimated crop water requirements ML/ha from step 1	Multiplied by number of hectares	Equals total crop water requirement
Example	5.47	5.47 x 30 ha	= 164.1 ML
Your crop		x ha	= ML

Step 3: Your situation – a surplus or a deficit?

	Allocation available at date of calculation - ML from Irrigation authority	Minus estimated total crop water requirements ML from step 2	Equals surplus or deficit?
Example	85 ML	- 164.1 ML	= -79.1 ML
Your crop		- ML	= + OR - ML

Step 4: Managing a water deficit – can extra water be obtained or purchased? OR how much rice to drain - i.e. "cut off" the water?

	Amount of water deficit - ML from step 3	Divided by estimated water required to finish crop - ML/ha from step 1	Equals area required to be drained at date of calculation
Example	-79.1 ML	÷ 5.47 ML	= -14.5 Hectares
Your crop		÷	= Hectares

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