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ESTIMATING WATER USAGE OF BAMBOO

(RIRDC Project UCQ-9A)

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There is tremendous requirement for information about water usage of bamboo in Australia. Commercial producers of bamboo for vegetable shoots and timber are seeking figures to estimate irrigation requirements in this semi-arid country. We have also been asked by governmental agencies, environmentalists and private households to estimate water consumption of bamboo for waste water dissipation.

After reviewing about 200 overseas scientific publications on bamboo agronomy with the greater part of them written in Chinese, we had to conclude that there is no specific information on water consumption of bamboo available. However, water usage of plants essentially depends on their total leaf area and some authors have estimated total leaf biomass and 'specific leaf area' (ie leaf area per unit leaf biomass) for bamboo which makes it possible to calculate total leaf area. If those figures are known, water usage of bamboo can be calculated as the product of

total leaf area and transpiration rate. We were unable to find estimates for transpiration of bamboo leaves in the literature and, therefore, measured this for a number of bamboo species currently grown in Australia.

Table 1 summarises estimates and measurements on which our calculation of bamboo water usage was based and from where these were derived.

The estimates for leaf area were made based on a measurement for a running bamboo species (*P. pubescens*) which had 3,900 culms ha⁻¹. Clumping bamboos may have 15 culms clump⁻¹ planted at a density of 250 clumps ha⁻¹ (= 40 m² clump⁻¹ = 6 x 7 m planting



Mature bamboo plant (*B. oldhamii*) on the Queensland coast

Table 1. Estimates and measurements for calculating water usage of mature bamboo

Parameter	Value	Unit	Source
Leaf biomass (dry)	5	[t] [ha] ⁻¹	overseas literature
Leaf dry/fresh weight	10	[%]	own measurements
Leaf biomass (fresh)	0.5	[t] [ha] ⁻¹	own calculation
Specific leaf area	150	[cm leaf area] ² [g dry leaf] ⁻¹	overseas literature
Specific leaf area	15	[cm leaf area] ² [g fresh leaf] ⁻¹	own calculation
Leaf area index	7.5	[m leaf area] ² [m soil surface] ⁻²	own calculation
Transpiration rate	2.3	[mmol water] [m leaf area] ² [s] ⁻¹	own measurements
Transpiration rate ^a	0.04	[ml water] [m leaf area] ² [s] ⁻¹	own calculation
Water usage ^b	13	[l water] [m soil surface] ² [day] ⁻¹	own calculation
Water usage ^c	9	[l water] [m soil surface] ² [day] ⁻¹	own estimation
Water usage	3,285	[mm water] ³	own calculation

^a Atomic weight of H₂O: 0.018 [g] [mmol]⁻¹

^b ie Water usage at maximum transpiration rate for 12 [h] [day]⁻¹

^c ie Water usage at estimated average yearly transpiration rate

distance). It follows that one mature clump may transpire (3,300 litre m⁻² x 40 m² =) 132,000 litre water year⁻¹.

Under field conditions we have recommended 2,000 mm water (precipitation + irrigation) per year (MIDMORE *et al.*, 1998) but actually only prior to and during the shooting season which barely extends to a period of 6 months. Water usage outside of the shooting season may be sizeable if plants are well-watered, therefore, 3,300 mm per year (last parameter in Table 1) seems to be a good estimate for the capacity of mature bamboo for transpiration under well-watered conditions. Current experiments are refining this estimation. This figure does not imply that for optimal shoot/timber yields such quantity should be available, rather it indicates the maximal water dissipation rate of bamboo.

Literature

MIDMORE, D, WALSH, K, KLEINHENZ, V, MILNE, J, LEONARDI, J, BLACKBURN, K, 1998: Culinary bamboo shoots in Australia. RIRDC Publication No 98/45. Rural Industries Research and Development Corporation, Barton. ISBN 0 642 54065 9.

SUGGESTED CHINESE CABBAGE CULTIVARS FOR AUTUMN PLANTINGS IN VICTORIA

Greg Hayes (Myrtleford) 03 5731 1205, Rob Dimsey (Bairnsdale) 03 5152 0600, Murat Top (Tatura) 03 5833 5222, Stephen Moore (Geelong) 03 5226 4667.

Chinese cabbage cultivar evaluation trials were conducted by Department of Natural Resources and Environment researchers at four regional sites across Victoria during the late Summer and Autumn planting period of 1997 and 1998. These complemented earlier trials in the East Gippsland region from 1994 to 1996.

Bolting in response to low temperatures is the major barrier to winter production of Chinese cabbages in Victoria. The objective of these trials was to identify cultivars that could extend the growing period into winter. Cultivars tested included currently grown ones, plus a number of newer releases. Quality after four weeks of

cool storage, to mimic sea transport, was also assessed. The effectiveness of heating during seedling growth, as a means of delaying vernalisation and bolting, was evaluated in May to June plantings.

The April/May planting recommendations in the list below are based on the results of these trials. Manoko was the most bolting-resistant cultivar of those tested in the April planting and produced good quality heads in all regions. In the Northern Irrigation region Manoko is the preferred cultivar of those listed for April. The other five can be grown but with reduced quality and marketable percentage compared to Manoko.

April appears to be the latest month that Chinese cabbage can be planted in most regions of Victoria. Planting is possible in May in East Gippsland with its milder winter climate, but only if 'heated' seedlings are used.

FARM CHEMICALS

Over the next few issues of the newsletter we will include some information from the DNRE leaflet 'Farm Chemicals – Answers to some common questions'.

Q: What is an 'ideal' pesticide?

A: The pesticide should control the pest or do the job that it is supposed to do. However, there is no point in using a pesticide unless it provides returns in terms of productivity or yield that outweigh the costs of applying it. Safety to the user, the consumer, the target crop and the environment is also vital.

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Chinese Cabbage								
Suggested Cultivars x Victorian Region								
For Autumn Planting								
Planting Time	North East (Myrtleford)		Northern Irrigation (Tatura, Swan Hill)		East Gippsland (Lindenow)		South West (Geelong)	
	Cultivar	Days to Harvest	Cultivar	Days to Harvest	Cultivar	Days to Harvest	Cultivar	Days to Harvest
April	Manoko	107-122	Manoko	98	Manoko Cream	98-112 90-104	Manoko	119
			Matilda	105				
			Harusakari	105				
			Spring Sun 50	109				
			1 Kilo SB	118				
			TSX 4112	118				
May	None Recommended		None Recommended		Manoko (Heated seedlings)	110	None Recommended	