

Activity # 1- Assessing Horticultural Crop Suitability for the Queensland Murray Darling Basin Study Area

Specific Biophysical Crop Information - Garlic

(1 August 2014 to 30 June 2016)

Activity 1 — Project Team

David Carey¹, Senior Horticulturist, Activity Leader 2015 -16

Peter Deuter², Senior Principal Horticulturist, (Crop Specialist)

Dr Andrew Zull³, Resource Economist

Heather Taylor⁴, Senior Project Officer (GIS)

Dr Neil White⁵ Principal Scientist, (QMDB Climate Data Analysis)

1. Department of Agriculture and Fisheries, 41 Boggo Road, Dutton Park GPO Box 267, Brisbane Qld 4001

2. Formerly Department of Agriculture and Fisheries LMB7, MS 437, Gatton, QLD, 4343

3. Department of Agriculture and Fisheries 203 Tor Street, Toowoomba QLD 4350

4. Formerly Department of Agriculture and Fisheries Primary Industries Building, 80 Ann Street, Brisbane QLD 4000

5. Department of Agriculture and Fisheries 203 Tor Street, Toowoomba QLD 4350

Citation: Carey, D., Deuter, P., Zull, A., Taylor, H., White, N (2017) High Value Horticulture Value Chains for the Queensland Murray-Darling Basin Project: Activity 1 – Assessing Horticulture Crop Suitability for the Queensland Murray Darling Basin Study Area report. Queensland Government Department of Agriculture and Fisheries.

This publication has been compiled by David Carey of Agri-Science, Department of Agriculture and Fisheries.

© State of Queensland, 2015

The Queensland Government supports and encourages the dissemination and exchange of its information. The copyright in this publication is licensed under a Creative Commons Attribution 3.0 Australia (CC BY) licence.

Under this licence you are free, without having to seek our permission, to use this publication in accordance with the licence terms.



You must keep intact the copyright notice and attribute the State of Queensland as the source of the publication.

Note: Some content in this publication may have different licence terms as indicated.

For more information on this licence, visit <http://creativecommons.org/licenses/by/3.0/au/deed.en>

The information contained herein is subject to change without notice. The Queensland Government shall not be liable for technical or other errors or omissions contained herein. The reader/user accepts all risks and responsibility for losses, damages, costs and other consequences resulting directly or indirectly from using this information.

Table of contents

Crop Matrix:-	4
Biophysical Requirements and Limiting Factors (climate)	5
Soils	5
Rainfall	5
Irrigation	5
Day length	5
Temperature.....	5
Crop Lifecycle	5
Planting Time	5
Planting Material	6
Garlic Varieties	6
Garlic Varieties - Descriptions.....	6
Comparison Region(s)	7
Average Yields	7
Allium Crop Overview	8
References	8

Garlic

Based on the biophysical requirements and limiting factors, Garlic is a potential crop for the Balonne-Border Rivers Region of the QMDB.

Crop Matrix:-

	Annual Crop	Other Alliums			
		Garlic	Leek	Shallot (true shallot)	Spring onion
Currently Grown (Y/N)	Qld	Y	Y	Y	Y
	QMDB	Y	Y	?	?
	NSW	Y	Y	Y	Y
	Vic	Y	Y	Y	Y
Frost Sensitivity (N or Deg C)	Seedling	N	N	N	N
	Growth	N	N	N	N
	Reproductive	N/A	N/A	N/A	N/A
Low Temp Sensitivity (Y/N or Deg C)	Seedling	N	N	N	N
	Growth	N	N	N	N
	Reproductive	N/A	N/A	N/A	N/A
High Temp Sensitivity	Seedling	Y	Y	Y	Y
	Growth	N	27oC	Y	Y
	Reproductive	N/A	N/A	N/A	N/A
Rainfall Sensitivity	Y/N	Y	Y	Y	Y
	Growth Phase	Harvest	Harvest	Harvest	Harvest
Special Soil Requirements	Y/N	N	N	N	N
	Requirement				
Chilling Req.	Y/N	N	N	N	N
	Amount (hrs)				
Water Quality	Sensitivity (dS/m)	1.2	1.2	1.2	1.2
First Planting Date	(Month)	March	May	May	May
Last Planting Date	(Month)	April	June	June	June
Consecutive Plantings	(Y/N)	N	N	Y	Y
First Harvest	(Month)	Sept	Oct	July	July
Last Harvest	(Month)	Oct	Nov	Aug	Aug
Length of harvest	(weeks)	8	8	8	8
QMDB	Y/N	Y	Y	Y	Y

Garlic (*Allium sativum*) is primarily grown for its bulbs, which are used in cooking and for medicinal purposes. **Garlic is a close relative of onions, leeks and chives.** In plant structure and growth habit, garlic resembles the onion, though mature bulbs tend to be slightly smaller. **Garlic requires a high level of management** to achieve optimum yields, with **weed and disease control** being **crucial** to obtaining good yields.

Biophysical Requirements and Limiting Factors (climate)

The optimum monthly average temperature range for growing garlic is from 13°C to 24°C.

Autumn (March/April) is the main planting time throughout Southern Queensland and New South Wales. This allows the garlic plant to have a fairly long vegetative period before the higher temperatures and longer days in late spring cause leaf growth to cease and bulbing to commence.

Dry weather before and after maturity is best for harvesting and curing. The climate should be cool and dry.

Soils

Garlic can be **grown in a range of soils**, but prefers sandy to clay loams that are rich in organic matter and reasonably well-drained. As with onions, soil pH should be in the range 5.5 to 7.0. There are problems with a soil pH of over 8.0.

Rainfall

Excessive rainfall at **crop maturity** may delay harvest in heavier soil types resulting in **bulb rots**, skin damage and reduced yield. Once mature rain can discolour bulbs and make the bulb scales rot.

Irrigation

Garlic plants have a relatively shallow fibrous root system similar to onions. In the early plant growth stages, frequent light irrigations of about 15 to 20 mm are needed. Less-frequent and heavier irrigations can be applied for later growth - **approximately 25 mm per week**. It is important to avoid stressing the crop, particularly during bulb development. Cease irrigation when the first signs of maturity are evident (tops yellowing or necks softening). Continued irrigation or rain on a mature crop may discolour bulbs and make the bulb scales rot.

Day length

Potential yield of the plant depends on the amount of vegetative growth made before bulbing commences in the crop. Leaf initiation ceases once bulbing begins. The maturation of the bulb is hastened by high temperatures and long days.

Temperature

The optimum temperature range for growing garlic is between 13°C to 24°C. Autumn (**March/April**) is the main **planting time** throughout **southern Queensland** and New South Wales. This allows the young plant to establish, begin bulb formation in cool weather and then have time to maximise bulb fill and size going into late spring.

Crop Lifecycle

Bulb formation starts in the cold weather with bulb fill driven by response to warming temperatures and lengthening days. Maturity time varies with location, see comparison regions below. High yields can be obtained only if the plant has had sufficient time and favourable conditions before the onset of bulbing. The general rule is the longer the vegetative period, the larger the bulbs and the higher the yield.

Planting Time

Planting normally commences from **mid-March to late April in southern Queensland** as well as inland New South Wales (Griffith, Hay, Balranald), as garlic requires a cool growing season. Later plantings result in a reduction in bulb size. The separated and sized cloves are planted by manually

dropping them through a tube behind a behind a cultivator, or by specially developed planting machines. The recommended plant density is 15 to 20 plants per square metre.

Planting Material

Garlic is **vegetatively propagated using cloves**, which are the small bulbs or sections broken out of a complete garlic bulb. Larger bulbs and larger cloves provide the best planting material, maximising crop uniformity. Discard the small centre cloves or separate them out and plant separately. Do not plant bulbs obtained from soils infected with the disease white rot.

Garlic should be planted in rows 45 cm to 60 cm apart, with 15 cm to 20 cm between plants, and no deeper than 5 cm. Depending on planting density 400 kg/ha to 600 kg of planting material is needed to plant one hectare.

Garlic Varieties

Glenlarge and Southern Glen are the dominant varieties grown in Queensland. They are the **highest yielding** and may exhibit a light purpling of the outer skin. Southern Glen matures approximately one to two weeks before Glenlarge. The old medium and small purple varieties (probably of Taiwanese origin) are now rarely grown commercially because of their small clove size. Apart from South African White, which tends to produce a high percentage of small cloves, most other imported and southern strains have failed to produce bulbs. Giant Russian garlic, which is really a member of the leek family, is grown but the market potential appears to be limited.

Garlic Varieties - Descriptions

Variety	Type	Comments
Australian White	mid season	Californian type, large white bulb and cloves, selected in South Australia.
California Early	mid	Popular for temperate climates until recently. White bulbs, flat base allows easy cleaning. A number of selections available.
California Late	late	Late variety for southern areas, very good storage ability, large bulbs, many small cloves with dark pink skin, less popular than previously.
Creole	early	Rarely grown after the 1980s.
Cristo	late	A later variety, white and large bulbs.
Glenlarge	early	Queensland selection of local garlic with large well-formed white bulbs, 6-12 cloves. Similar to Southern Glen.
Italian White	mid	Older popular variety for temperate climates. Many selections. Good storage ability.
Moulinor	mid	Likely to be second to Printanor in Australia. Large white bulbs of a fairly symmetrical nature
New Zealand Purple	mid	Small bulbs with few cloves, cloves are high quality larger- sized and with purple tips. Rarely grown today.
Printanor	mid	French origin and proving to be most popular in Australia and New Zealand. 95% of all New Zealand now grows this variety and the percentage is increasing in Australia.
Southern Glen	early	Queensland selection with large white bulbs, 12-15 cloves, some purpling of clove tips.
Taiwanese strains	early	Suitable for warmer climates (Queensland), has been replaced by Glenlarge and Southern Glen, little-grown nowadays.

Comparison Region(s)

Garlic is produced in a range of locations throughout southern Queensland, in Victoria along the Murray and Sunraysia, and in south-east South Australia. The New South Wales crop is grown mainly around Griffith, Hay, Balranald and other localities in the south-west of the state. There are also a large number of small garlic production enterprises on the north coast around Coffs Harbour, and the NSW tablelands around Tenterfield.

Garlic can be grown in any district provided water for irrigation is available during dry periods. Relatively dry weather at harvest time is desirable so that the bulbs can dry and mature properly

Harvest Season for Garlic in Australia*

State	Month
Queensland	September
New South Wales	Early to Mid November
Victoria	Early December / January
South Australia	Early December / January
NE South Australia Mildura	Mid / Late November
Tasmania	Late December / Late January
Gippsland	Late December / Late January

*Source - Australian Garlic Industry Association.

Average Yields

Garlic yields range from 4 t/ha to 8 t/ha. Around a five- to ten-fold return on planting material weight can be expected under good crop-management conditions

Allium Crop Overview

There are seven classifications of allium crops reported by the Australian Bureau of Statistics (ABS) and major produce markets in Australia. Below is a list and description of the alliums crops reported on by the ABS and major produce markets.

Bulb onions (*Allium cepa*). There are three main types of bulb onions including brown, red and white onions which are grown for their bulbs only.

Garlic (*Allium sativum*). These are grown for their bulbs only.

Leeks (*Allium ampeloprasum var. porrum*). These are grown for their leaves and thickened stem.

Spring onions (*Allium fistulosum*). This term means different things to different people. True spring onions are harvested with about 40cm of green leaves and a slightly enlarged bulb. Spring onions marketed in NSW are markedly different as they are generally a white bulbing variety that is harvested when the bulb is immature and the leaves are intact. They are commonly sold in bunches of 4 or 5 plants with about 2 bunches/kg.

Shallots (*Allium cepa, aggregatum*). This term also means different things to different people. True shallots are grown for their bulbs only. Shallots marketed in NSW are similar to true spring onion and are harvested with about 40cm of green leaves and a slightly enlarged bulb. They are marketed in bunches of about 10-12 plants with 3 bunches/kg. Shallots grown and marketed this way are also known as Eschallots (*Allium ascalonicum*).

Chives (*Allium schoenoprasum*). These are the smallest species in the allium family but are not mentioned in either the ABS or Sydney Market reporting service. It is suspected that any production of chives is recorded under spring onions or shallots.

References

- Brewster, J.L.(2008) Onions And Other Alliums 2nd edition .Warwick HRI.Wellsbourne, Warwick CV35 9EF,UK
- Department of Primary Industries (2015). Commercial Garlic Production. Retrieved from; [DAF commercial-production-of-garlic](#)
- Ealing, D and S Sterling. (2000) A cholesterol-lowering extract from Garlic. A report for the Rural Industries Research and Development Corporation RIRDC Publication No 00/63.RIRDC Project No. DAV-124A
- Hickey, M. (2012). Growing garlic in NSW second edition. Primefact 259.New South Wales Department of Primary Industries, Yanco. Retrieved from [DPI NSW factsheets](#)
- Lovatt, J, .Jackson, K, .Schrodter, G, .Henderson, C, and O'Brien, R. (1997) Onion Information Kit, from the Agrilink series: your growing guide to better farming. Manual Agrilink Series QAL9703. Department of Primary Industries, Queensland Horticulture Institute. Brisbane, Queensland. Onions Australia (2015) [Onions Australia - allium-crops](#)

Disclaimer: The candidate crop information presented in this QMDB study area report (Activity 1) are based on the analysis of the published biophysical needs of the crops (e.g. temperature, frost sensitivity, chill requirement, water quality, etc.) and current climate records for the QMDB study area. The candidate crops are deemed suited to the study area where the biophysical needs are met either year round or for portion of the year and will allow crop production.
