

# **MUNGBEAN**

## **THE \$70M DIVERSIFICATION OPPORTUNITY IN NORTH WEST QUEENSLAND**

*FINAL REPORT; v1.03; December 2018*

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# MUNGBEAN

*The \$70m diversification opportunity in North West Queensland*

FINAL REPORT

December 2018

V1.02

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# This research on agricultural diversification opportunities emerged from the Strategic Blueprint for North West Queensland



The image shows the cover of the report 'A Strategic Blueprint for Queensland's North West Minerals Province'. The cover features the title in orange and black text, the Queensland Government logo, and a map of the North West Queensland region. A callout box highlights 'Strategic priority 2: Diversifying the regional economy and creating employment opportunities'.

**Strategic priority 2:  
Diversifying the regional economy and creating employment opportunities**

The Province has a strong regional economy built predominantly on mining and minerals processing. The Queensland Government is committed to maximising commercially viable economic development and job creation opportunities for the Province by adopting a whole-of-government diversification approach, with additional funding of almost \$5.5 million over four years for initiatives within this strategic blueprint priority.

Key actions to be delivered in developing the strategy include:

- **Scope opportunities for increasing agricultural production**

The state's North West presents unique prospects for further agricultural development. In recognising these opportunities across the Province, the Queensland Government will be developing an integrated North West Queensland agriculture plan. The plan will focus on continuing to grow a sustainable and diversified agricultural sector, and will be developed in collaboration with key stakeholders across the supply chain and linked with the broader regional economic diversification strategy.

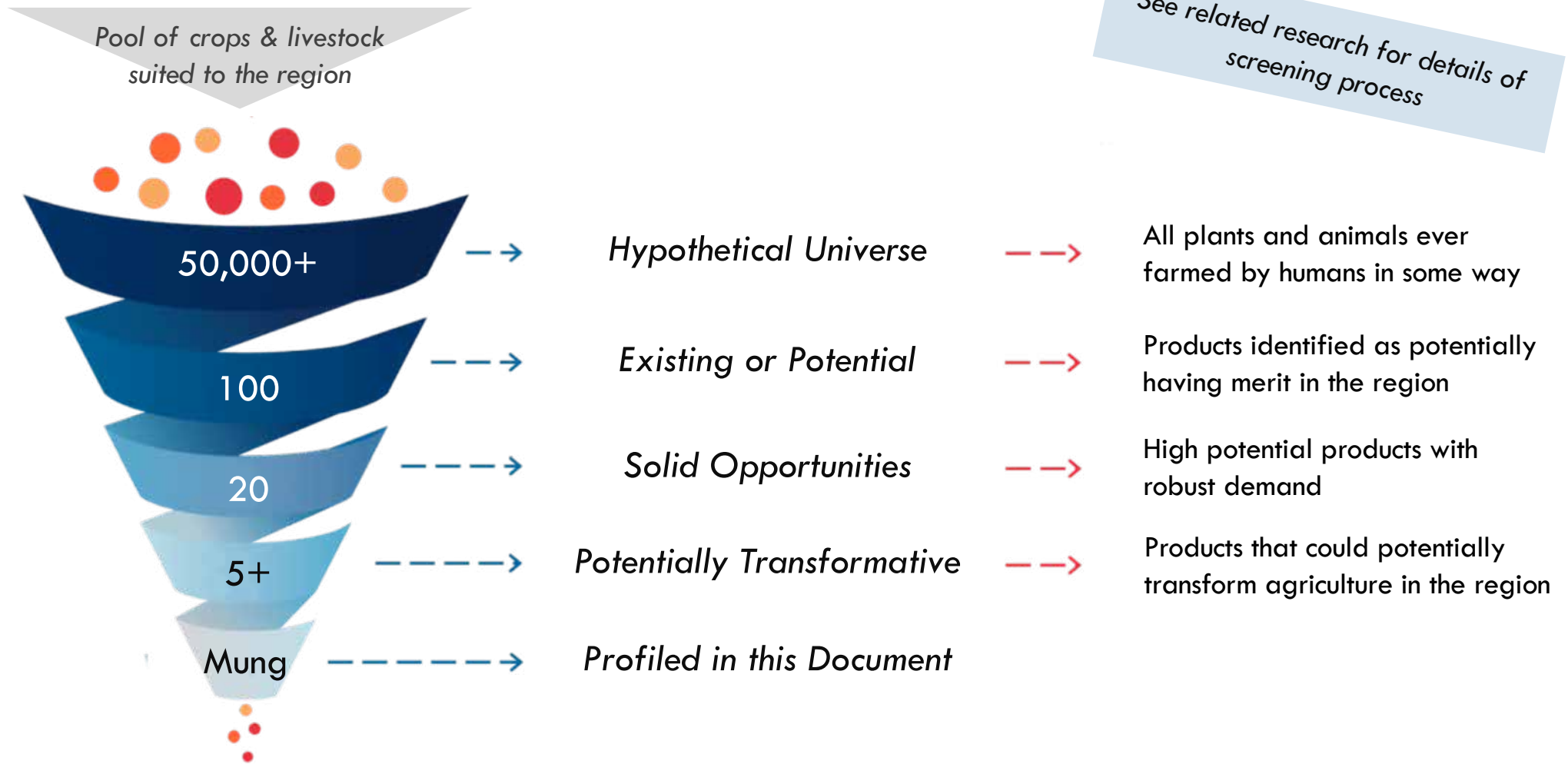
*Mung is one of 20 identified high potential products that both fit regional conditions and have large & attractive global markets*



FOCUS OF THIS PROJECT



# Mungbeans emerged from a multi-stage screening process as a star product with high growth potential



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# Executive Summary

## THE NORTH WEST QUEENSLAND OPPORTUNITY

North West Queensland is a massive region with huge untapped potential for agricultural growth. It is the size of Japan or Germany, with the population of the City State of Monaco. African climatic peers currently produce 10 times as much food per hectare.

This report forms part of a wider body of research designed to identify opportunities for increasing and diversifying agricultural production in the North West Queensland region. The research identifies high potential products that both fit regional conditions and have large and attractive global markets. Mungbeans emerged from a multi-stage screening process as a star product with high growth potential.

## LARGE & GROWING MARKET

Global demand for mungbean is large (US\$2.4b), growing long term (20y CAGR 6%) and pays reasonable prices (US\$994/t). Mungbeans growth is on the back of growing demand from global markets. Macro drivers are pushing growth in global mungbean trade volume and value. Demand is growing faster than supply increasing value. Mungbean sprouts, noodles and flour are used extensively in Asia. Mungbean protein is also being used by the food industry in increasingly innovative ways.

## MUNGBEAN IN AUSTRALIA

Mungbeans are currently planted over approximately 120,000 hectares in Australia, producing around 90,000t and yielding around 0.8-0.9t/ha. Queensland is the major producer of mungbeans in Australia and achieves higher

yields on average. Ninety-five percent of Australian mungbeans are exported, with most growers supply processing and manufacturing grades.

Australia is succeeding as a supplier in the global cross-border market for mungbeans, with exports growing very strongly since 2007. Australia's growing mungbean exports are going to India and SE Asia, with a clear shift underway to SE Asia. Australia receives above the average global landed price for mungbean, achieving \$1,025/t in 2017.

## THE \$70m MUNGBEAN OPPORTUNITY IN NORTH WEST QUEENSLAND

North West Queensland is ideally positioned to supply Asia's growing demand for mungbean. The region is "the right place to grow", as it is close to key markets in Asia and a safe and trusted supplier of food to the global market. Only NW Queensland can deliver a region that combines a modern, developed economy with African climatic conditions.

Mungbean has the potential to be a A\$70m industry for North West Queensland. This new volume (+90kt) from NW Queensland would increase Australian mungbean exports by +80-90%.

Realising the NW Queensland mungbean opportunity will require investment across four broad development themes: (1) developing mungbean requires land and water ("best location"), (2) the best available genetics ("proven genetics"), (3) systems optimised to local conditions ("efficient systems"), and (4) selling the product to key markets ("targeted market").



# LARGE & GROWING MARKET

---

# 01

- + Strong demand
- + Large global trade
- + New uses in foods

---

## *There is strong global demand for mungbean*

- Mungbeans are a US\$2.4b global market, growing at 6% per year, on the back of growing demand from global markets
- Macro drivers are pushing growth in global mungbean trade volume and value
- Mungbeans predominantly go into the food chain with some cosmetic use in Asian markets
- Australian supermarkets and health stores carry a wide range of mung based products
- Mungbean sprouts, noodles and flour are used extensively in Asia
  - Mungbean starch noodles are one of the most popular types of noodles in Asian cuisines
- There is a wide range of customers for whole mungbeans, starch and protein products
- Mungbean protein is also being used by the food industry in increasingly innovative ways

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*Mungbeans are a US\$2.4b global market, growing at 6% per year, on the back of growing demand from global markets*



**83m hectares**

Of pulses harvested globally in 2016



**81m tonnes**

Of pulses produced globally in 2016



**Africa & India**

Currently supply much of world trade



**6% year**

Global demand growth (20y CAGR)



**US\$2.4b**

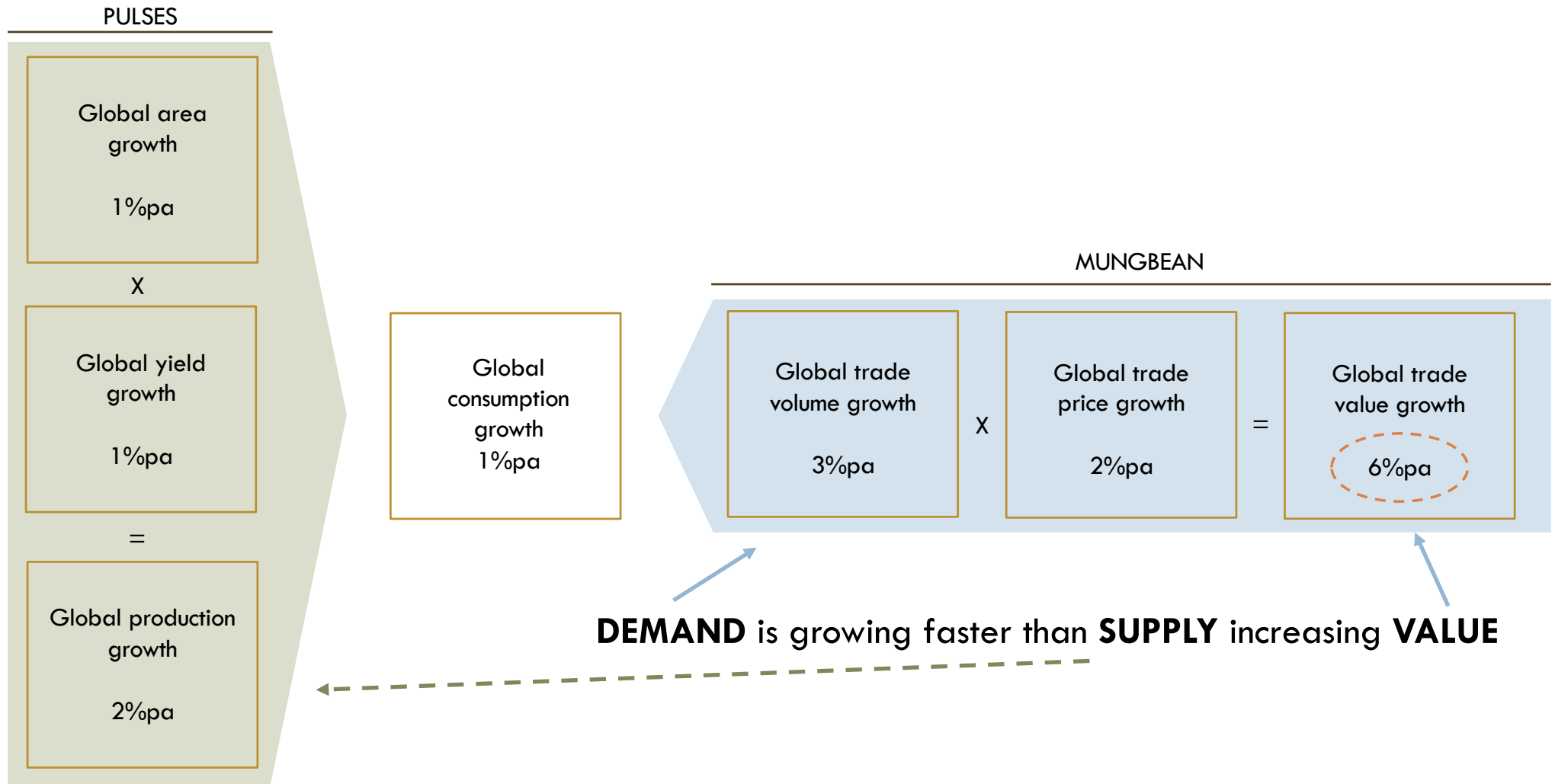
Global trade value in 2017



**417,380 tonnes**

Imported by E/SE Asia in 2016

# Macro drivers are pushing growth in global mungbean trade volume and value



Note: supply side uses "total pulses" due to lack of high quality mungbean specific data; Source: Coriolis analysis and estimates



# Mungbeans predominantly go into the food chain with some cosmetic use in Asian markets



**BEAN**

*Used across many cultures globally*

- Whole & split in soups, stews, curries, porridge
- Sprouted
- Paste & spreads
- Tempeh
- Fried snack
- Soybean and chickpea substitute



**STARCH**

*Unique and versatile*

- Jelly
- Ice cream and desserts
- Baked goods
- Cellophane noodles
- Pasta
- Vegan cheese
- Egg substitute
- Plant protein



**PHARMACEUTICAL & COSMETIC**

*Health giving and beauty enhancing*

- Face masks
- Skincare
- Soap
- Nutraceutical extracts



**ANIMAL FEED**

*Good source of protein (11-23% protein)*

- Bran
- Hulls
- Meal
- Straw
- Forage

# Australian supermarkets and health stores carry a wide range of mungbean based products

## EXAMPLE PRODUCTS CONTAINING MUNGBEAN IN AUSTRALIA

Selected; late 2018

Major supermarkets range

Health food stores range



# Mungbean sprouts, noodles and flour are used extensively in Asia

## EXAMPLE: SELECT MUNGBEAN PRODUCTS IN SINGAPORE

Late 2018





# Mungbean starch noodles are one of the most popular types of noodles in Asian cuisines

## EXAMPLE: SELECT MUNGBEAN NOODLE PRODUCTS IN HONG KONG

Late 2018





# There is a wide range of customers for whole mungbeans, starch and protein products

## EXAMPLES: GLOBAL CUSTOMERS FOR MUNGBEAN 2018

### Munbean product manufacturers



### Noodle manufacturers



### Other starch & protein products



# Mungbean protein is also being used by the food industry in increasingly innovative ways

## Mungbean pasta

- Gluten free
- High in protein and fibre
- Low carb
- Vegan



## Mungbean meat analogues

- Vegan meat substitutes
- Non soy, non GMO



## Mungbean protein

- Used as plant sourced protein in supplements, etc.
- Used by food industry in increasingly innovative ways



## Mungbean "egg"

- Vegan egg substitute
- Non soy, non GMO

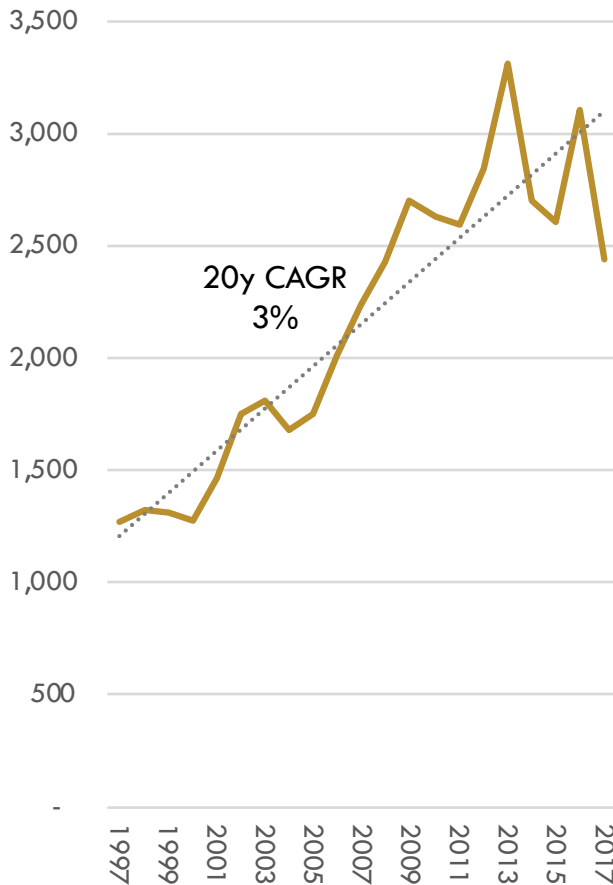
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## *Global demand for mungbean is large (US\$2.4b), growing long term (20y CAGR 6%) and pays reasonable prices (US\$994/t)*

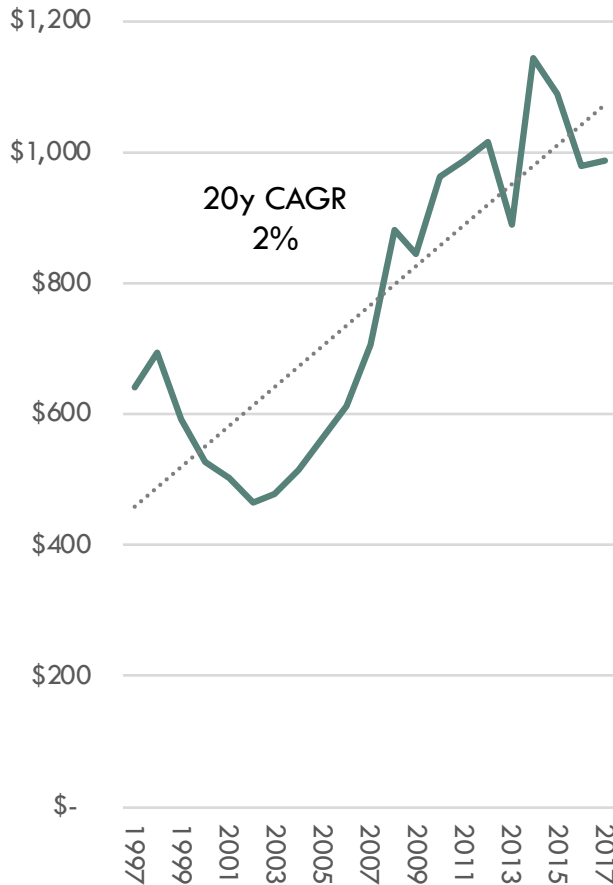
- Global cross-border spending on mungbean is growing (20y CAGR 6%) through greater volumes (3%) across limited price increases (2%)
- US\$2.4b of mungbeans are imported globally, with Europe (\$657m), India (\$456m) and Japan (\$136m) the key markets
  - Growing global mungbean imports go to a wide range of countries; India impacts volumes when it enters and exits
- Europe, Japan, and North America stand out as large market that pay high prices; India is a large market, but at lower prices
- India, other parts of South Asia, SE Asia and Japan have driven mungbean import value growth over the past decade

# Global cross-border spending on mungbean is growing (20y CAGR 6%) through greater volumes (3%) across limited price increases

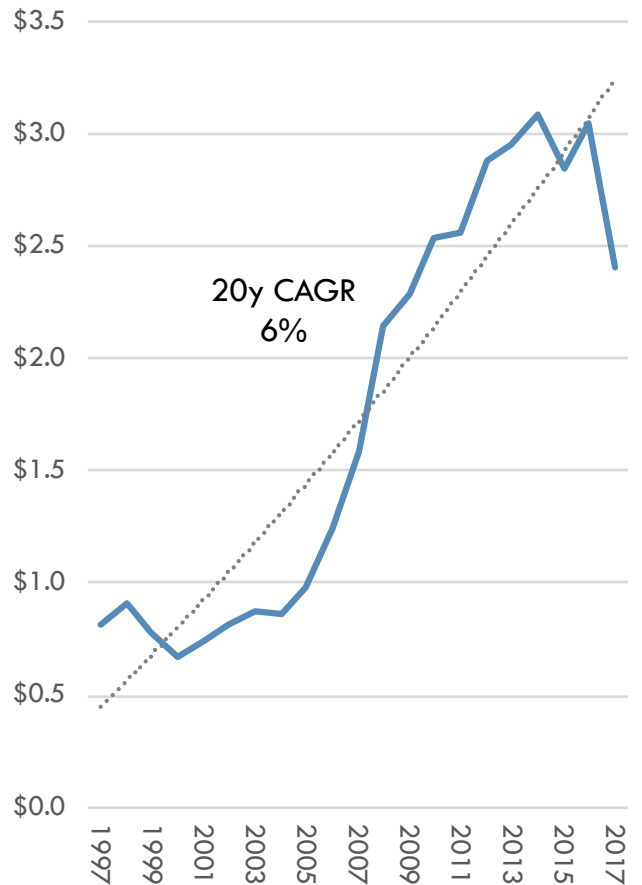
**GLOBAL IMPORT VOLUME**  
Tonnes; 000; 1997-2017



**AVERAGE CIF PRICE**  
US\$/t; landed CIF; 1997-2017



**GLOBAL IMPORT VALUE**  
US\$; b; landed CIF; 1997-2017

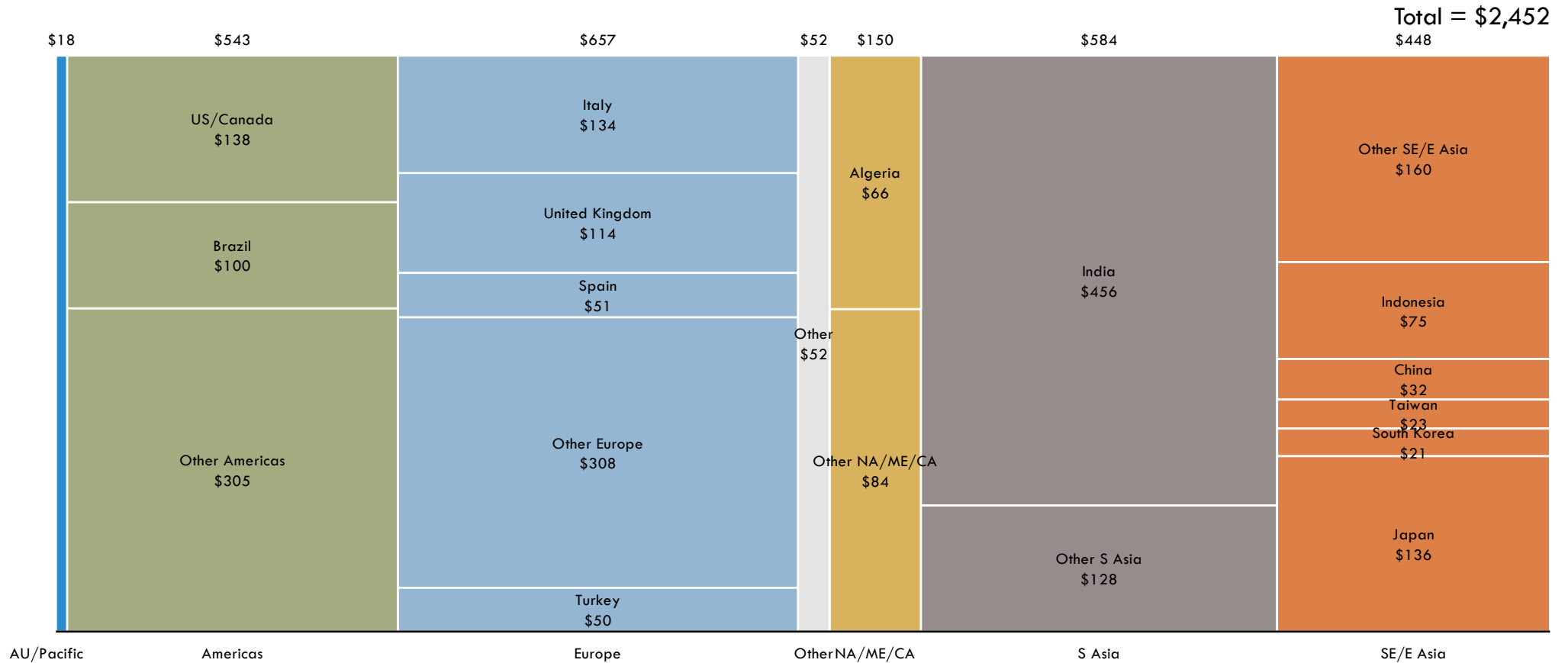




*US\$2.4b of mungbeans are imported globally, with Europe (\$657m), India (\$456m) and Japan (\$136m) the key markets*

**TOTAL GLOBAL MUNGBEAN IMPORT VALUE BY COUNTRY/REGION**

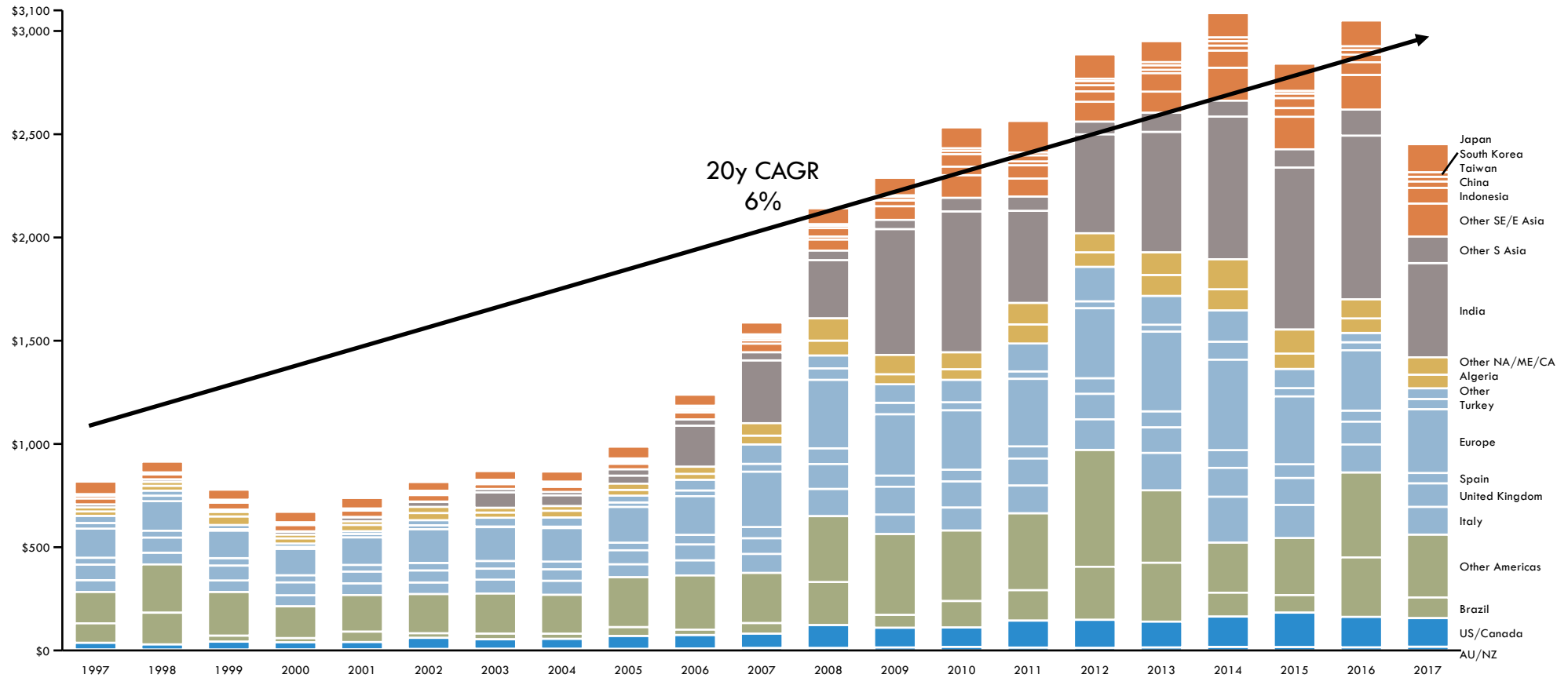
US\$; m; 2017



# Growing global mungbean imports go to a wide range of countries; India impacts volumes when it enters and exits

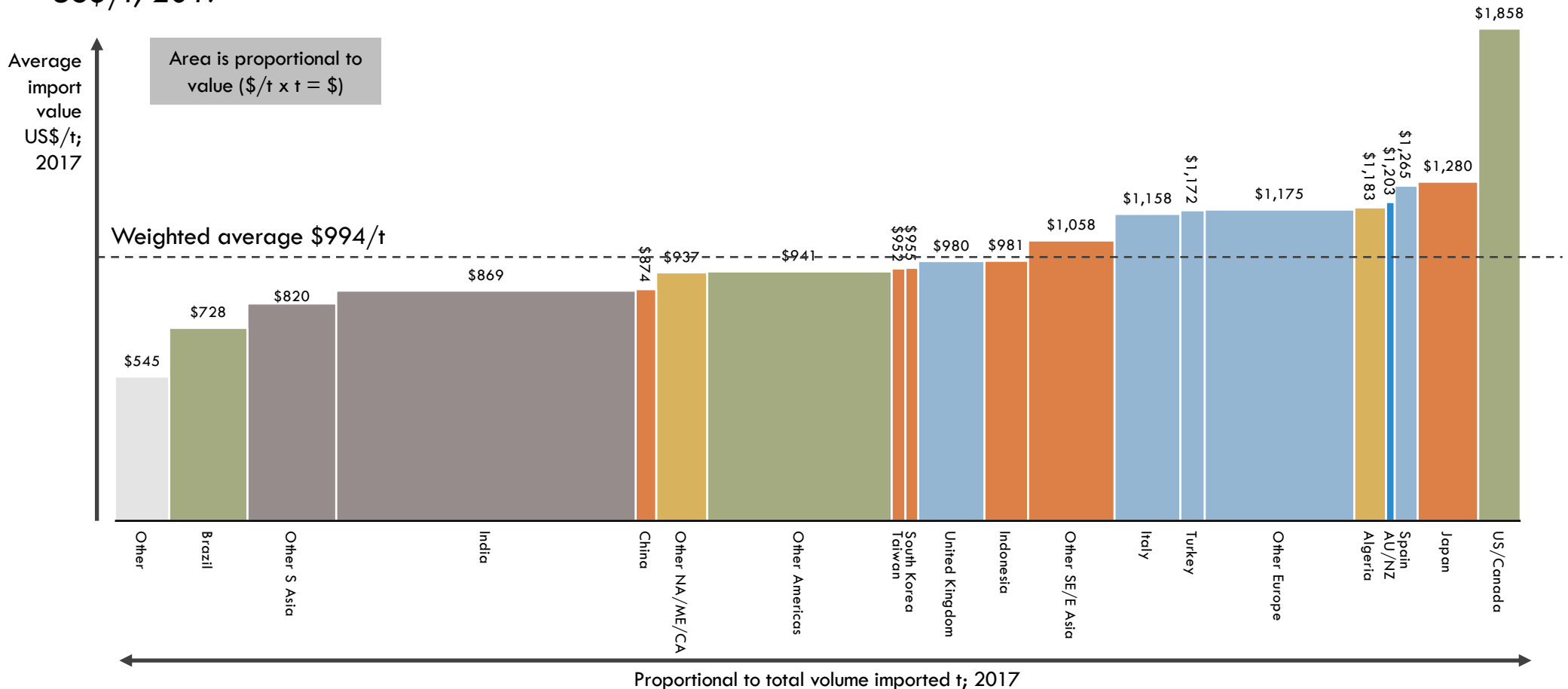
## TOTAL GLOBAL MUNGBEAN IMPORT VALUE BY COUNTRY/REGION

US\$, m; 1997-2017



*Europe, Japan, and North America stand out as large markets that pay high prices; India is a large market, but at lower prices*

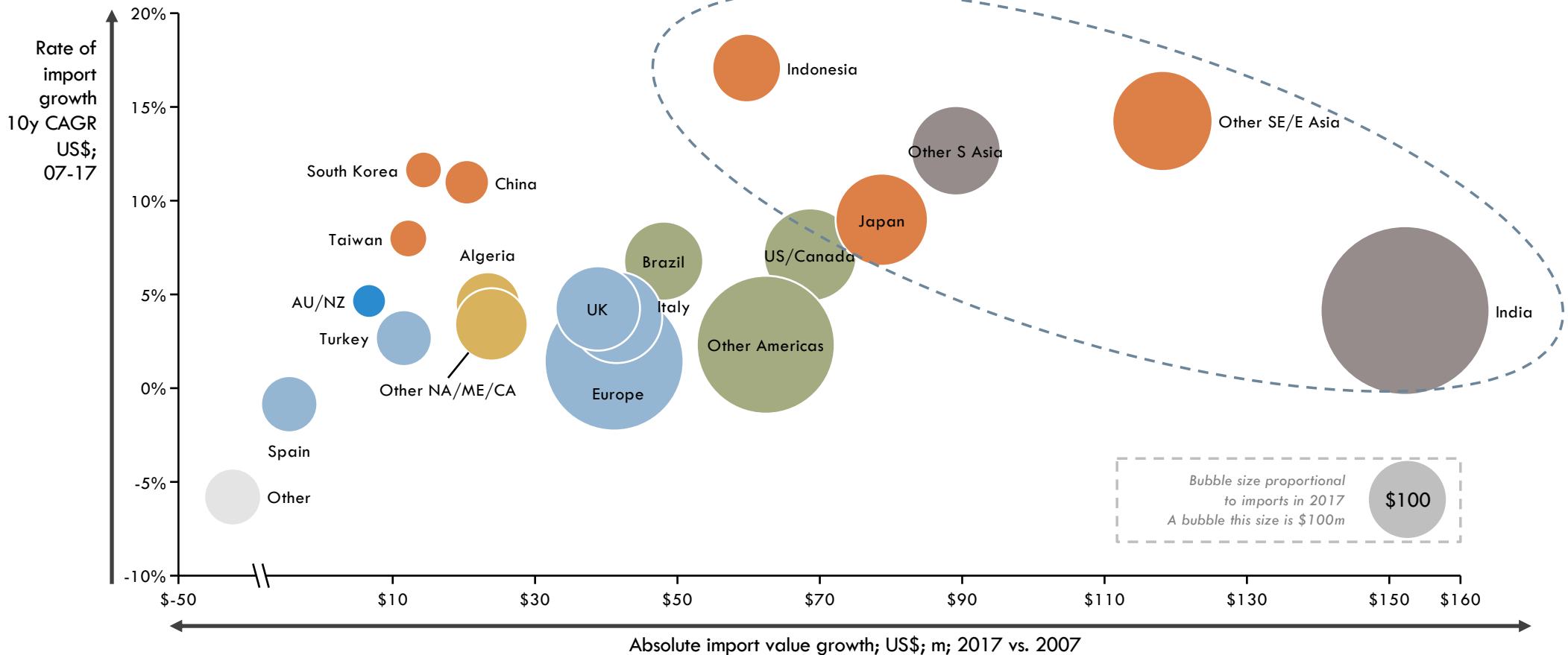
**MARKET VALUE BUILDUP: IMPORT VOLUME VS. PRICE PER TONNE**  
*US\$/t; 2017*



# India, other parts of South Asia, SE Asia and Japan have driven mungbean import value growth over the past decade

## GROWTH MATRIX: ABSOLUTE VALUE GROWTH VS. RATE OF GROWTH

US\$; m; 2007 vs. 2017





# MUNG IN AUSTRALIA

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# 02

- + Growing mungbean production
- + Succeeding in markets

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## *Australia is achieving long term success in mungbeans*

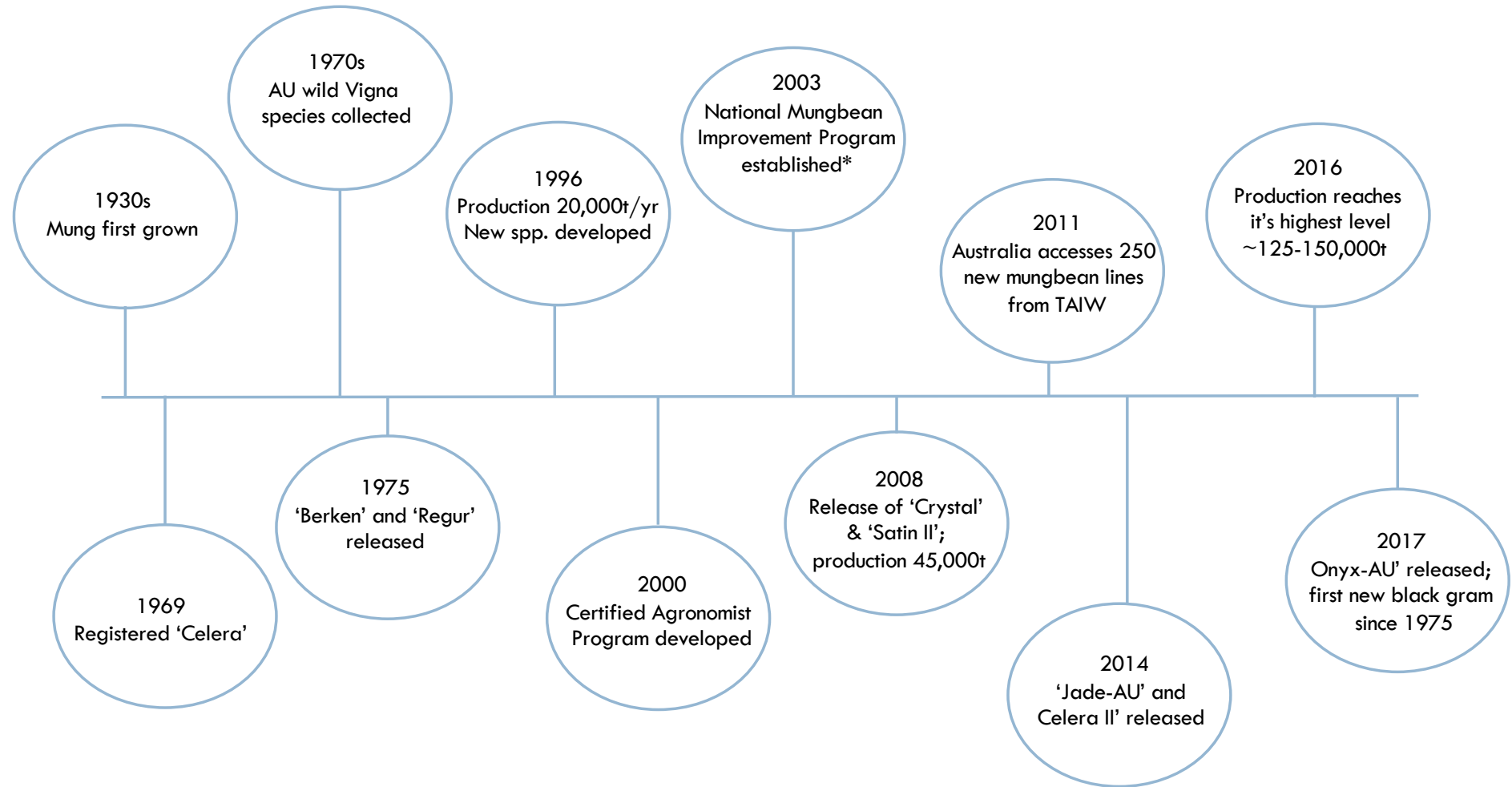
- Mungbean is a drought tolerant crop that originated in India
- Mungbeans were first grown commercially in Australia in the 1930s; investment in R&D and new varieties continues
- The mungbean supply chain in Australia is focused on exports; currently little further processing occurs
  - The Australian mungbean supply chain is robust and well organised
  - The Australian mungbean industry is well supported with a range of industry bodies and organisations
- Australian mungbean production is in long term growth
- Mungbeans are currently planted over approximately 120,000 hectares, producing around 90,000t and yielding an average of 0.9t/ha
- Queensland is the major producer of mungbeans in Australia and achieves higher yields on average
- 95% of mungbeans are exported; most growers supply processing and manufacturing grades

# Mungbean is a drought tolerant crop originating from India



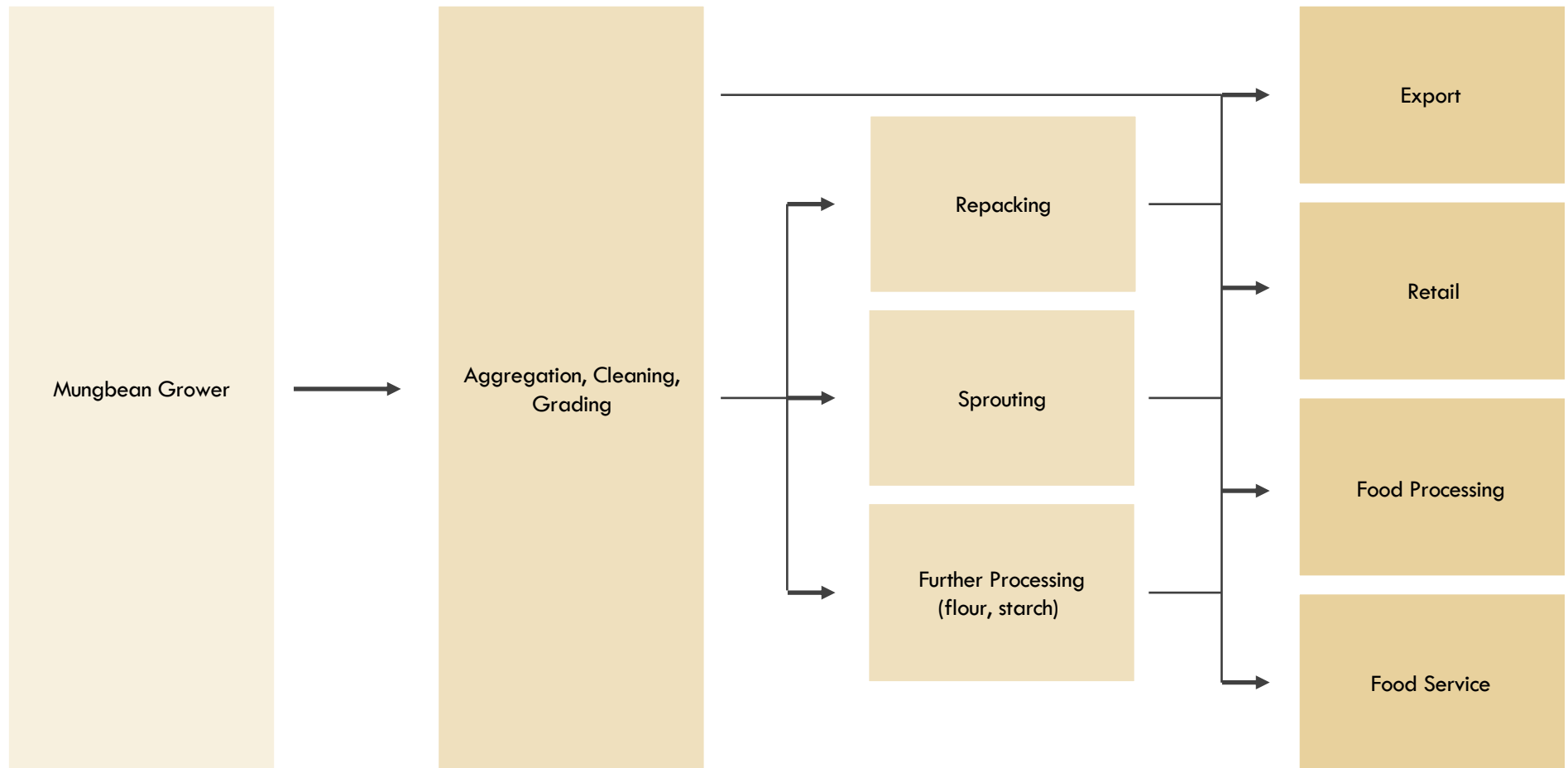
Common names	Green gram, moong bean, golden gram
Scientific name	<i>Vigna radiata</i>
Type of plant	Annual flowering legume herb
Cultivation cycle	Maturity in 90-110 days
Suited climate	Subtropical climate
Uses	Dried whole or hulled; used in soups, stews, curries, porridge Sprouted Flour & starch Fermented Paste & Spreads Desserts, baked goods, ice cream Cellophane noodles
Origin	India
Established in AU	1930s

# Mungbeans were first grown commercially in Australia in the 1930s; investment in R&D and new varieties continues



\* QDAF and GRDC. Source: Australian Mungbean Association; various published articles; Coriolis analysis

*The mungbean supply chain in Australia is focused on exports; currently little further processing occurs*





# The Australian mungbean supply chain is robust and well organised

## AUSTRALIAN MUNGBEAN ASSOCIATION MEMBERS 2018

SUPPORT	SUPPLIERS	EXPORT PROCESSORS <sup>1</sup>		EXPORTERS	
     	     	  <p>Allenden Seeds</p>  	  <p>Australian Grains and Pulses</p> <p>Champion Seeds</p> 	     	 <p>Freedom Exports &amp; Trade</p> <p>HORIZON COMMODITIES</p>  

<sup>1</sup>.via Australian Quarantine Inspection Services (AQIS) Accredited. Source: Australian Mungbean Association; Coriolis analysis

# The Australian mungbean industry is well supported with a range of industry bodies and organisations



[www.mungbean.org.au/](http://www.mungbean.org.au/)  
Mungbean industry body



[www.aegic.org.au](http://www.aegic.org.au)  
Export Innovation Centre



[www.pulseaus.com.au/](http://www.pulseaus.com.au/)  
Pulse industry body



[www.gln.org.au](http://www.gln.org.au)  
Health and Promotion



[www.graintrade.org.au](http://www.graintrade.org.au)  
Trade Association



[www.graingrowers.com.au](http://www.graingrowers.com.au)  
Grower representatives



<https://grdc.com.au>  
RD&E Investment



<https://grdc.com.au/research/trials,-programs-and-initiatives/pba>  
Breeding



<http://www.giwa.org.au>  
State – Industry Organisations

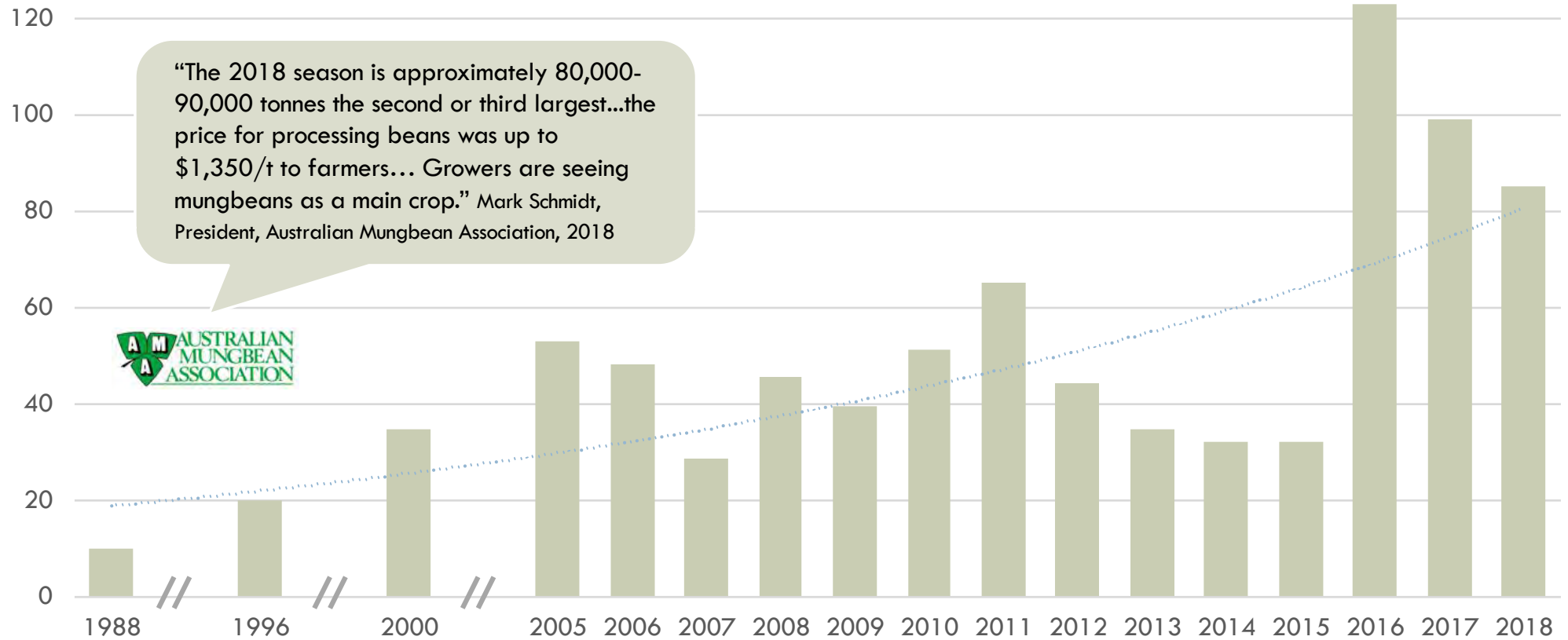


[www.agrifutures.com.au/farm-diversity/mungbeans/](http://www.agrifutures.com.au/farm-diversity/mungbeans/)  
Rural R&D

# Australian mungbean production is in long term growth

## PRODUCTION OF MUNGBEANS IN AUSTRALIA

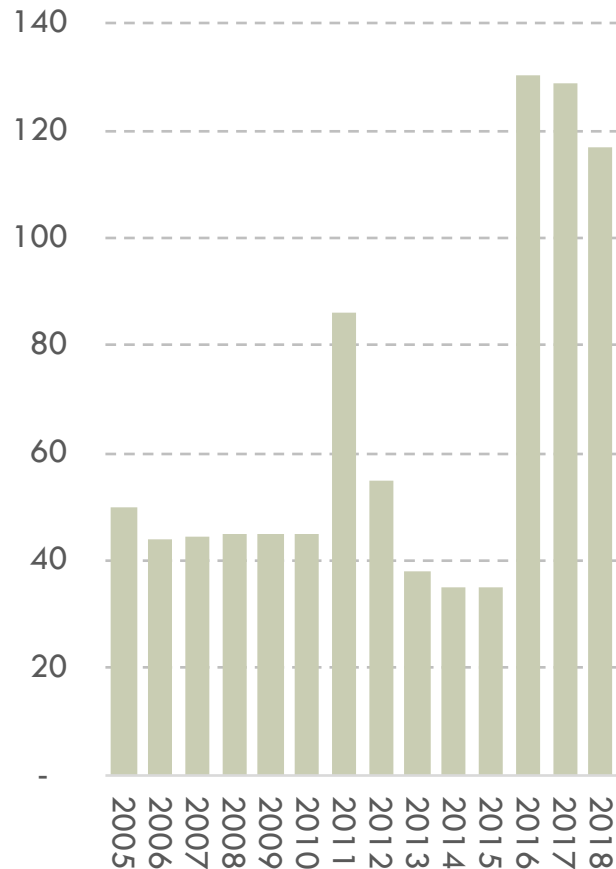
Tonnes; 000; 1988-2018



*Mungbeans are planted over approximately 120,000 hectares, producing around 85,000t and yielding 0.8-0.9t/ha*

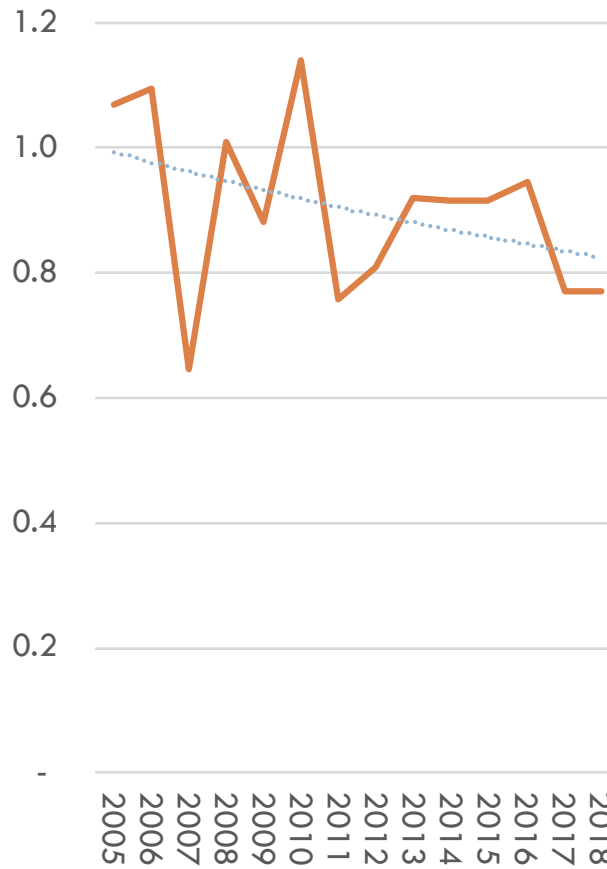
### AREA

Hectares; 000; 2005-18



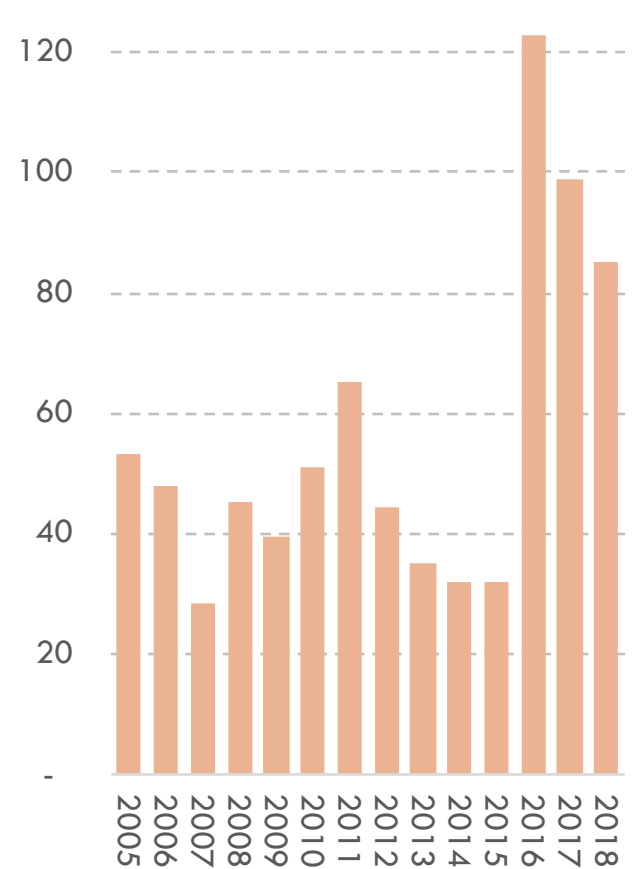
### YIELD

T/ha; 2005-18

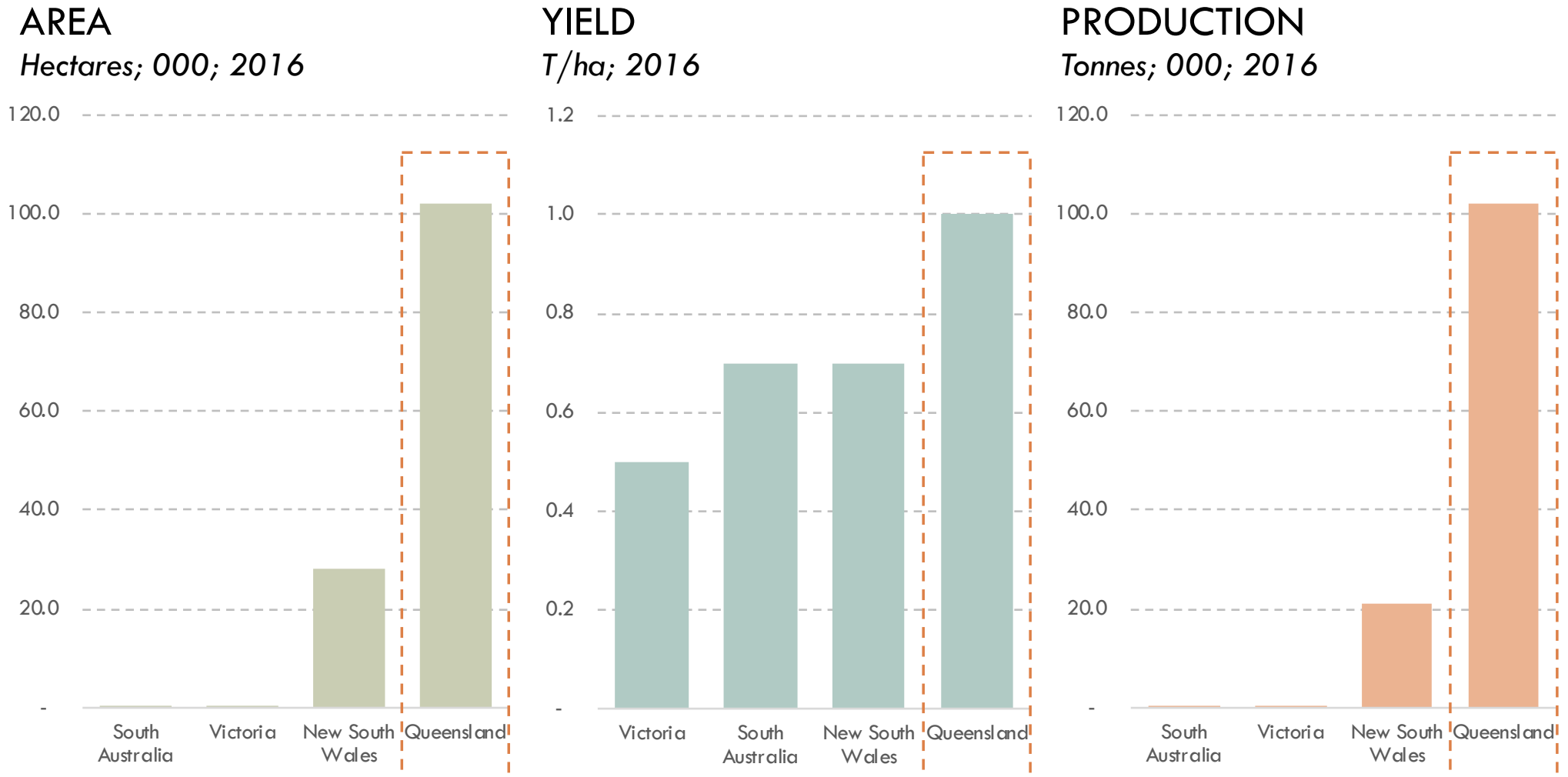


### PRODUCTION

Tonnes; 000; 2005-18



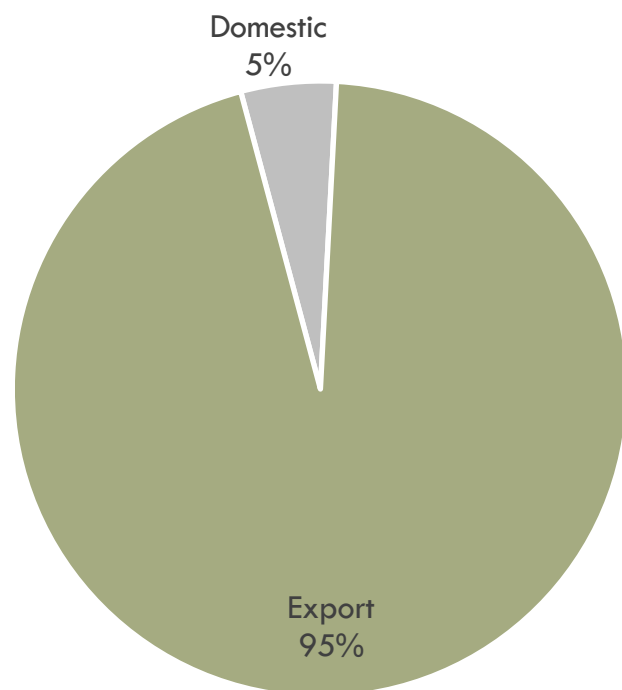
# Queensland is the major producer of mungbeans in Australia and achieves higher yields on average



Source: ABARES; Coriolis analysis

# 95% of mungbeans are exported; most growers supply processing and manufacturing grades

**AU MUNGBEAN BY MARKET**  
%; volume; 2017



**MUNGBEAN EXPORT STANDARDS\***  
Machine dressed; 2017

	SROUTING	No.1	PROCESSING	MANUFACTURING
Variety	Berken, CrystalA, Satin IIA, Onyx-AU, Regur, Jade-AU	Berken, Crystal, Jade-AU, Satin II, Onyx-AU, Green Diamond, Celera II-AU, Regur	Berken, Crystal, Jade-AU, Satin IIA, Onyx-AU, Green Diamond, Celera II-AU, Regur	Berken, Crystal, Jade-AU Other varieties sale by sample.
Appearance	In conjunction with the photographic charts and parameters	In conjunction with the photographic charts and parameters	In conjunction with the photographic charts and parameters	Equal to or better than the appearance of the standard sample.
Purity	99%	99%	99%	98%
Moisture	12%	12%	12%	12%
Size range 2mm	98% (75% in 0.8mm range)	98% (75% in 0.8mm range)	N/A	N/A
Defect type				
Podscale	3%	3%	12%	N/A
Seed coat	1%	1%	2%	N/A
Stained	1%	1%	2%	N/A
Wrinkled	4%	4%	12%	N/A
PRICE GUIDE	\$870	\$770	\$700	\$600



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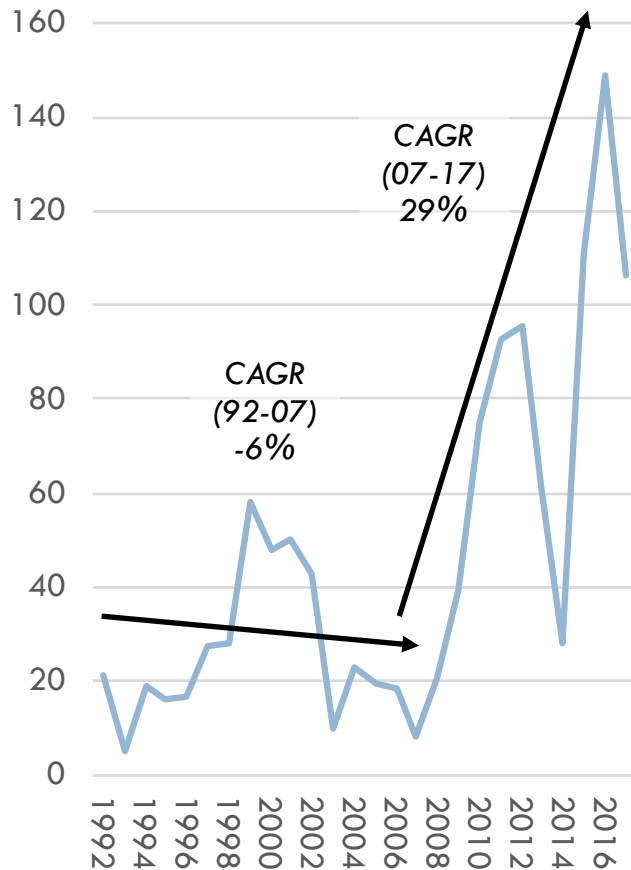
## *Australia is succeeding as a supplier in the global cross-border market for mungbeans*

- Australian mungbean exports have been growing very strongly (10y CAGR 31%) since 2007
- Australia's growing mungbean exports are going to India and SE Asia; clear shift underway to SE Asia
- Australia is the seventh largest global exporter of mungbeans
- Australia & Mozambique stand out for rate of value growth over the last decade and Myanmar & the US for absolute value growth
- Australia receives above the average global landed price for mungbean, achieving \$1,025/t in 2017

# Australian mungbean exports have been growing very strongly (10y CAGR 31%) since 2007

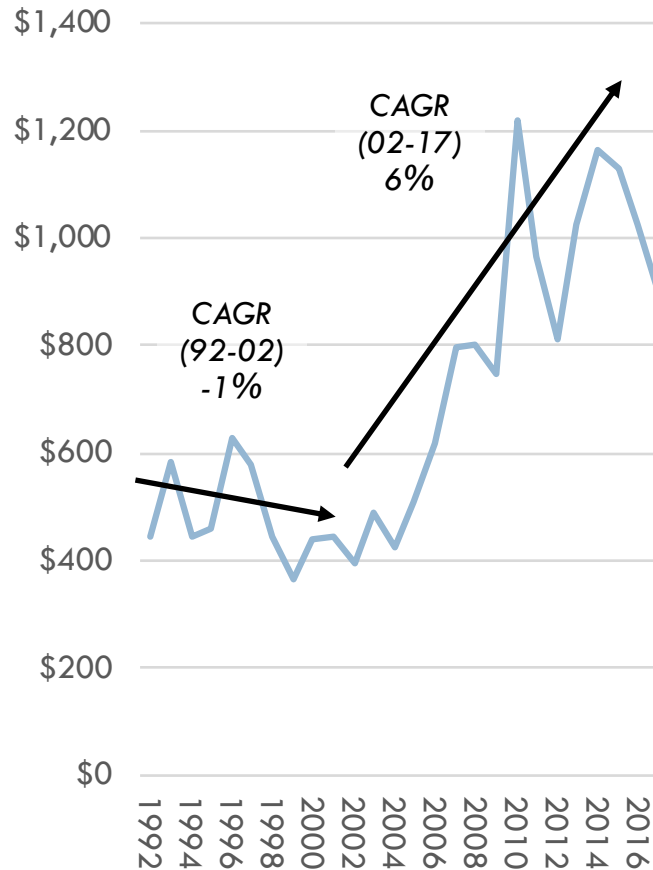
## AU EXPORT VOLUME

Tonnes; 000; 1992-17



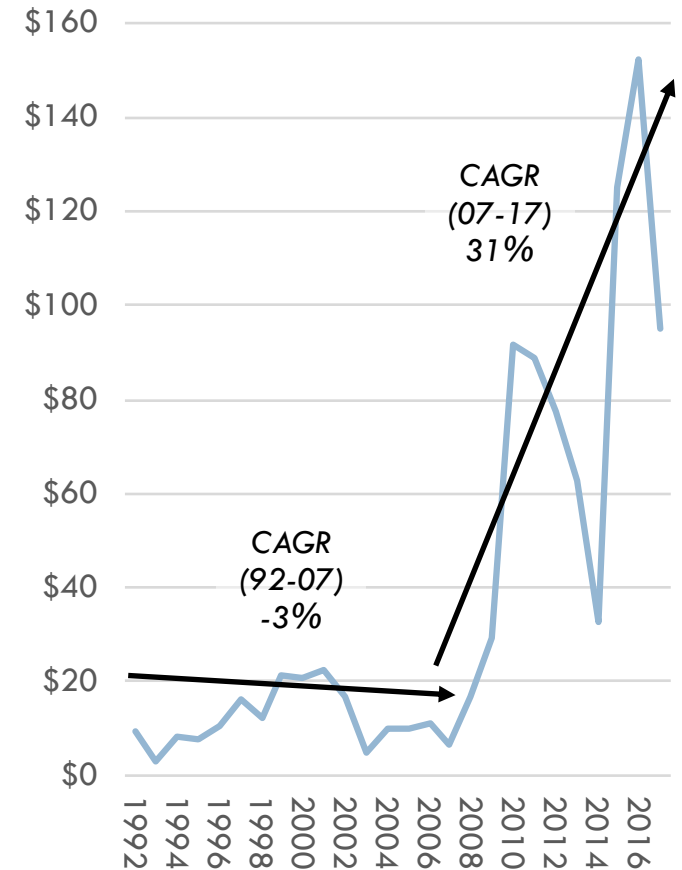
## AVERAGE AU EXPORT PRICE

US\$/t; 1992-17



## AU EXPORT VALUE

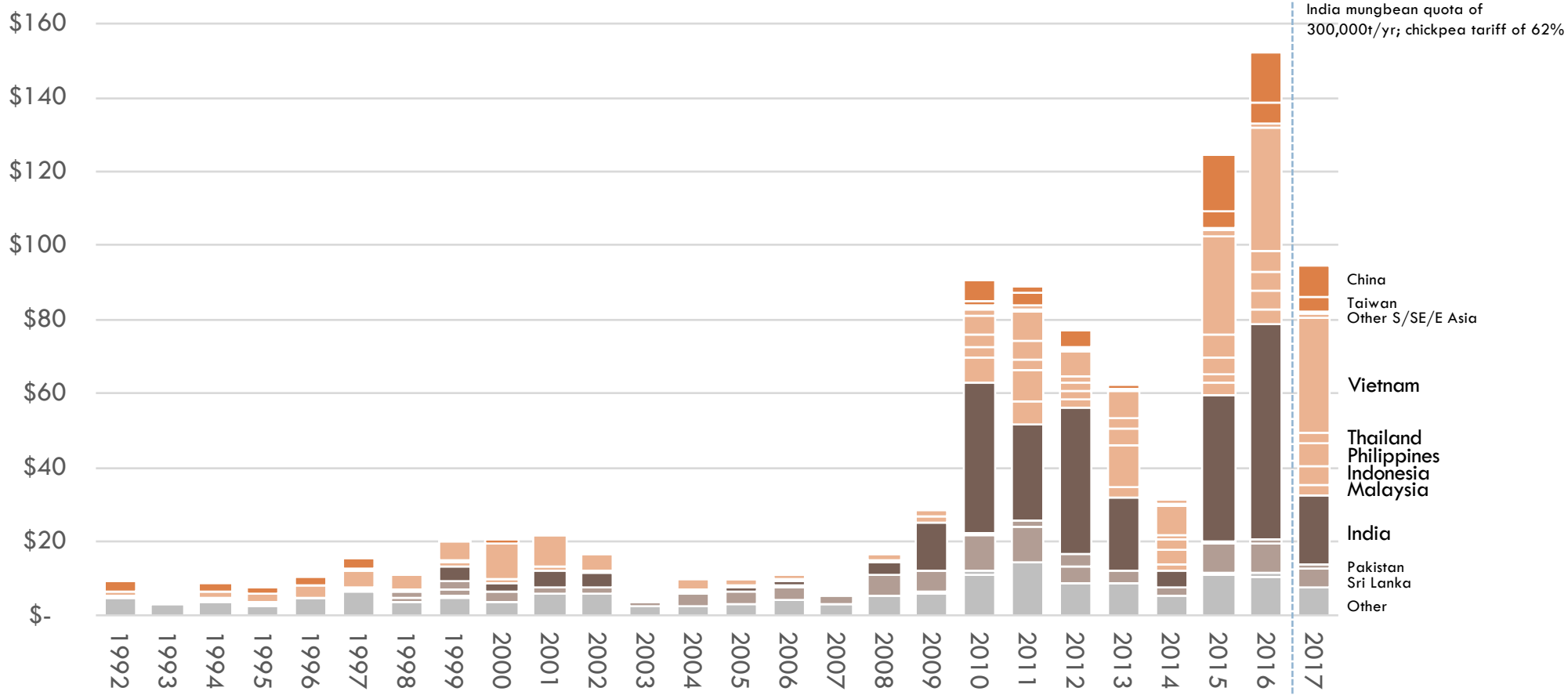
US\$, m; 1992-17



# Australia's growing mungbean exports are going to India and SE Asia

## TOTAL AU PULSE EXPORT VALUE BY MARKET

US\$, m; 1992-17

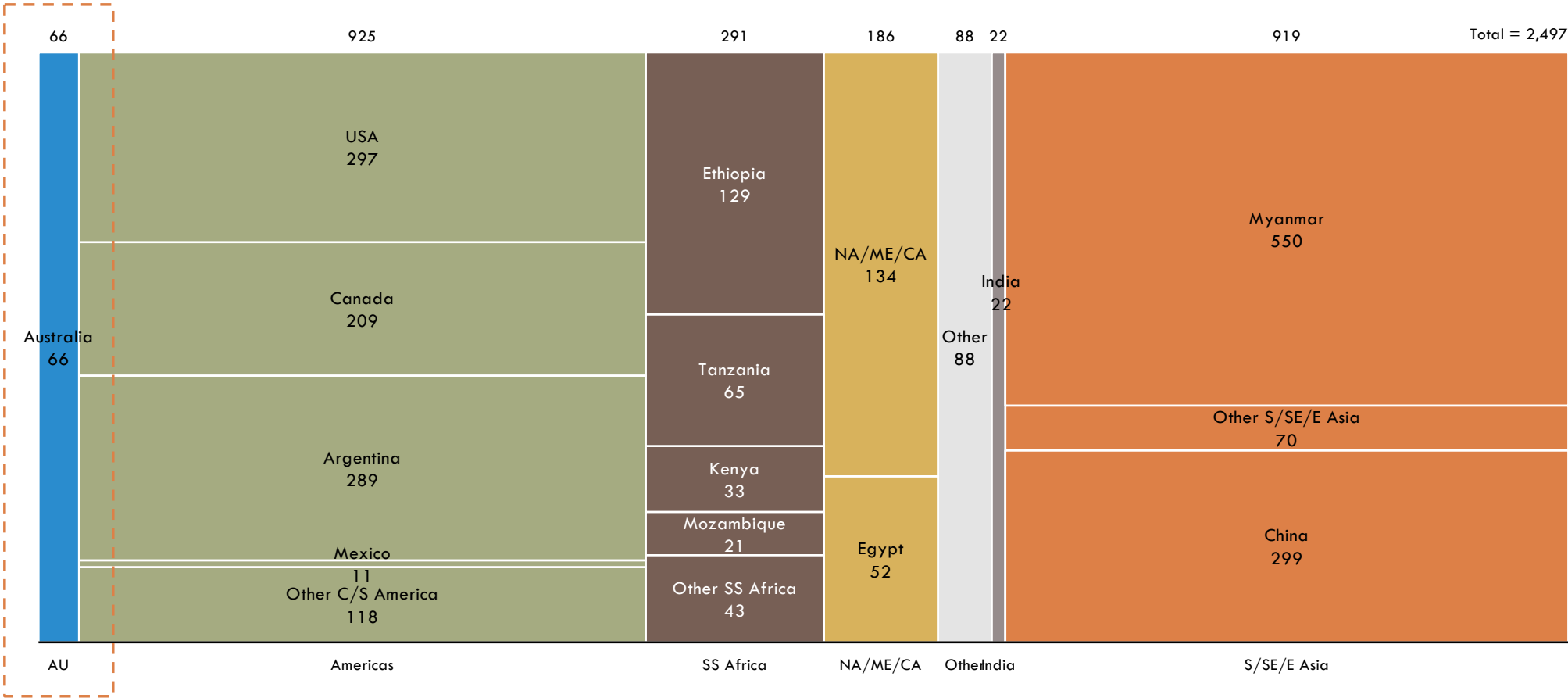


Source: UN Comtrade; Coriolis analysis

# Australia is the seventh largest global exporter of mungbeans

## TOTAL GLOBAL MUNGBEAN EXPORT VOLUME BY COUNTRY/REGION

Tonnes; 000; 2017

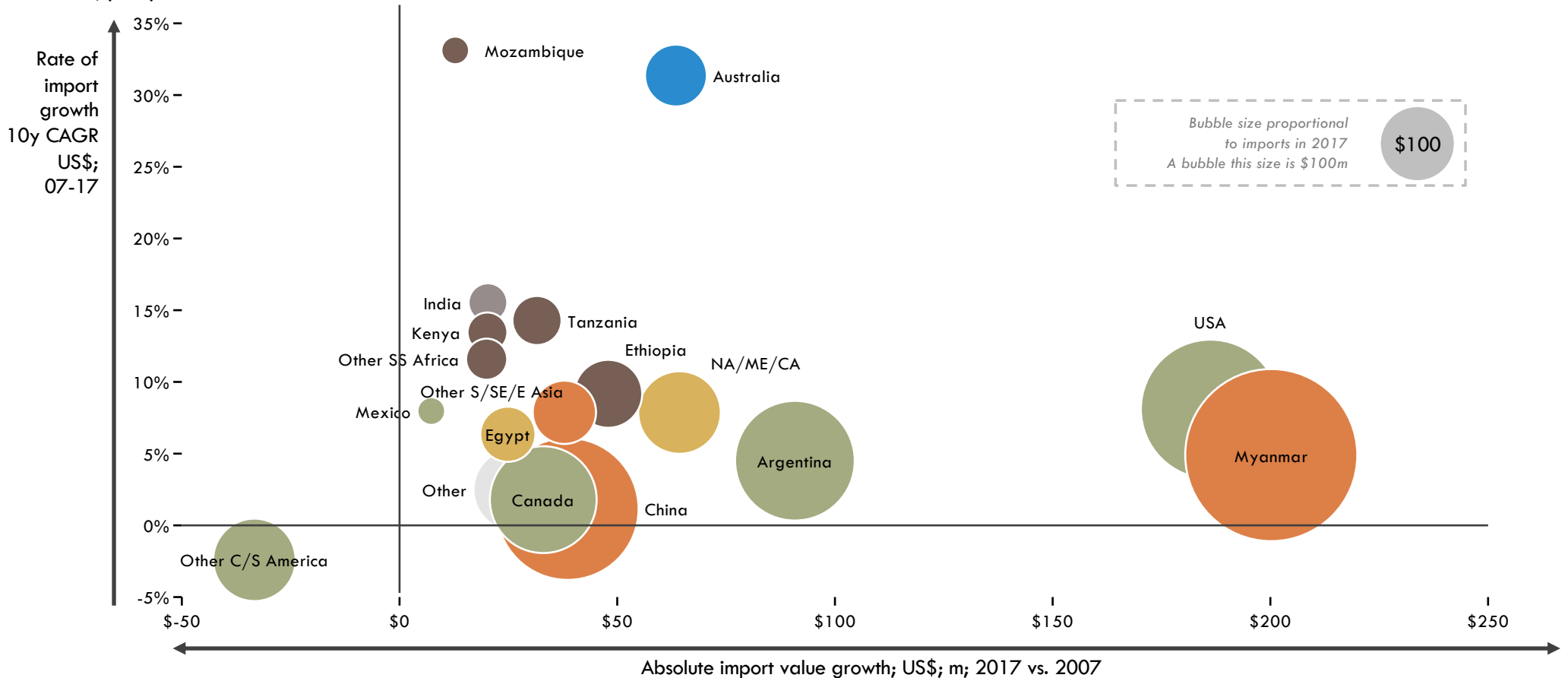


Source: UN Comtrade; Coriolis classifications and analysis

# Australia & Mozambique stand out for rate of value growth over the last decade and Myanmar & the US for absolute value growth

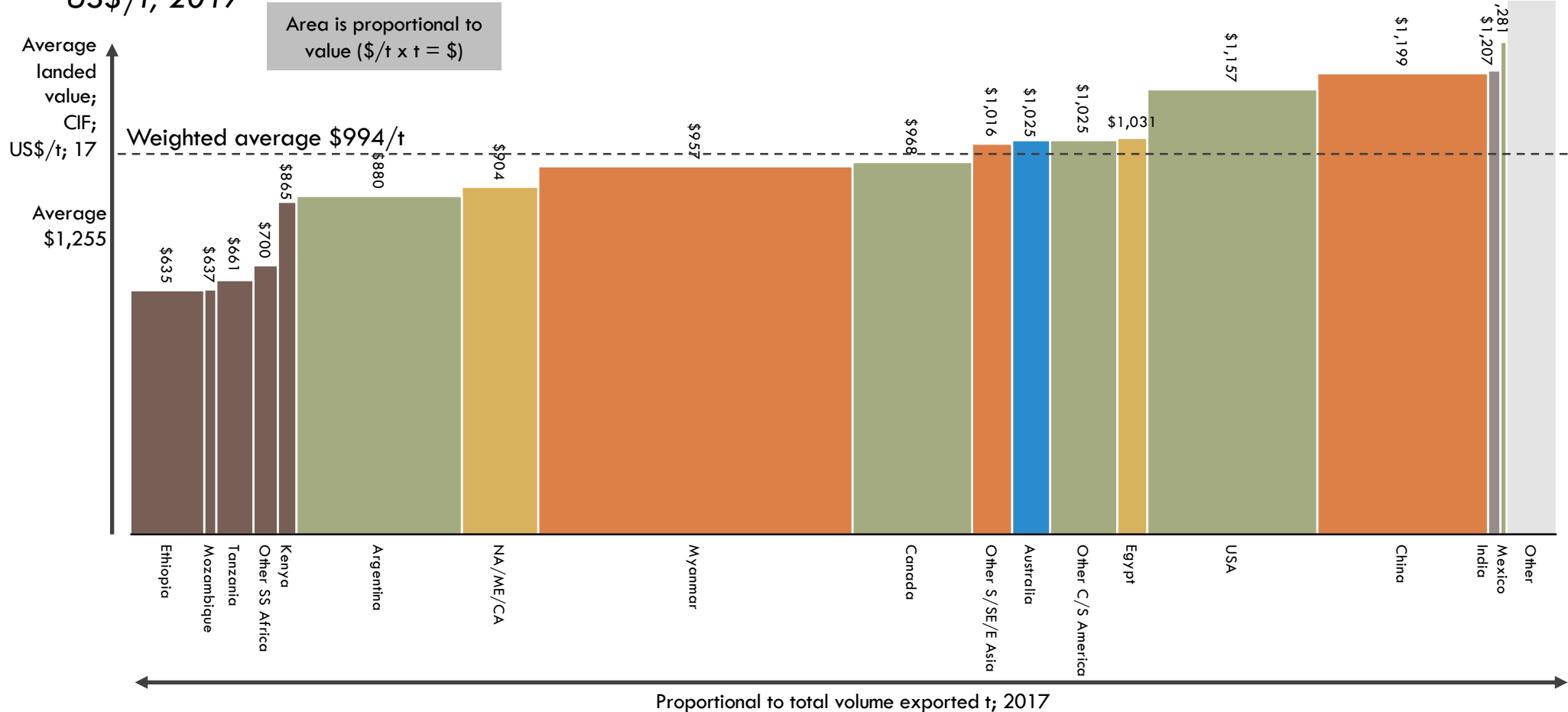
## GROWTH MATRIX: ABSOLUTE VALUE GROWTH VS. RATE OF GROWTH

US\$; m; 2007 vs. 2017



# Australia receives above the average global landed price for mungbean, achieving \$1,025/t in 2017

## MARKET VALUE BUILDUP: EXPORT VOLUME VS. PRICE PER TONNE\* US\$/t; 2017



\* landed price as reported receiver. Source: UN Comtrade; Coriolis classifications and analysis



# THE \$70M OPPORTUNITY

---

# 03

- + Mungbean is suited to North West Queensland
- + Peers demonstrate what is possible
- + Potential for further processing

# Mungbean has the potential to be a A\$70m (US\$50m) industry for North West Queensland

## POTENTIAL NW QUEENSLAND MUNGBEAN PRODUCTION

Model

Assumed price  
US\$600/t

NW QUEENSLAND COULD ACHIEVE WHAT YIELD PER HECTARE? (t/ha)

HOW MUCH <b>AREA</b> WOULD NW QUEENSLAND BRING INTO PRODUCTION? (ha)		0.5 (Burkina Faso)		0.7		0.9		1.1 (Mali)	
		Volume (kt)	Value (US\$m)	Volume (kt)	Value (US\$m)	Volume (kt)	Value (US\$m)	Volume (kt)	Value (US\$m)
20,000		10	\$ 6	14	\$ 8	18	\$ 11	22	\$ 13
40,000		20	\$ 12	30	\$ 20	35	\$ 20	45	\$ 30
60,000		30	\$ 20	40	\$ 30	55	\$ 30	65	\$ 40
100,000		50	\$ 30	70	\$ 40	90	\$ 50	110	\$ 70

NOTE: Highly simplified "toy" model for illustration; includes significant assumptions

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# *North West Queensland has a major opportunity in mungbeans*

Mungbeans are suited to the region

- Mungbeans are highly drought tolerant and succeed in low rainfall regions
- Mungbeans are well suited to the climatic zones of North West Queensland
- Strong climatic peer countries for NW Queensland produce massive amounts of pulses, supporting significant upside
- Dry pulse production is growing over time across the African climatic peer region

Export volumes can increase

- Proposed new volume (+90kt) from NW Queensland would increase Australian mungbean exports by +80-90%
- Even at these new volumes, Australia would still be a relatively small mungbean exporter relative to Myanmar
- The technology is available to add value to mungbeans in Queensland, creating new and innovative food products

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## Mungbeans are highly drought tolerant and succeed in low rainfall regions

“Replacing maize with **drought-tolerant** crops such as sorghum, millets, pigeonpea, cowpea and green gram (mungbean) is helping farmers overcome the failure of rains and its damaging impact on maize in Busia county in western Kenya.” *ICRISAT, Kenya*

“Mungbean does not require a large amount of water (600–1000 mm/year rainfall) and is also capable of **tolerating drought** stress as it has a well-developed root system including taproot and deep lateral roots for the absorption of water when limited in availability... Some of the experimental studies believe that drought stress has no effect on mungbean as it is a **drought tolerant** crop.” *King Saud University, Saudi Arabia*

“Mungbean is a valuable summer crop as it is **relatively drought tolerant**, quick maturing and requires minimal fertiliser input.” *Australian Mungbean Association*

“Although profits from mung bean are not dramatically different from those of soya bean, their **drought tolerance** and the fact that they are a food crop rather than a feed crop can aid in buffering some of the farmer’s economic risk because of the variability in weather and commodity crop prices...Mung bean is considered to be heat and drought tolerant.” *Department of Agriculture, South Africa*

“Overall, mungbeans can be looked at as another crop to diversify the crop base on a farm. Although their profit is not dramatically different from soybeans, their **drought tolerance**, and the fact they are a food crop rather than a feed crop, can help buffer a farmer’s economic risk from variability in weather or commodity crop prices.” *Iowa State University, USA*

“Mung bean is a traditional food in China and is widely grown in monoculture in **dry and semi-dry regions**, as well as being used as an intercrop throughout much of the country because of its drought tolerance and nitrogen-fixing soil fertilization.” *The Crop Journal*

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## *Mungbeans are well suited to the climatic zones of North West Queensland*

“Climatic analysis shows that the dry tropics [of Australia] provide ideal growing conditions for mungbeans, with an abundance of sunlight and plenty of rain and irrigation water available over a long period. The key is to look for a time of the year when it is least likely to rain at harvest, and work backwards to choose a good time to sow. Mungbean plants need to ripen in fine weather and can be weathered if as little as 30 mm of rain falls on the ripening pods.”

*Stephen Yeates, CSIRO, 2018*

“Mungbean is very water efficient, requiring 3 ML/ha. Yield is generated in the last 30 days, so the timing of management decisions is critical. Warm temperatures and low humidity allows the pods to ripen in just 10 days and so the timing of the last irrigation is very important.” *Stephen Yeates, CSIRO, 2018*

“Mungbeans are mostly all dryland. If you get your timing right you can get great results. They have grown in the NW and come down from Darwin.” *Pulse Australia, 2018*

“There is a huge opportunity for the new breeds in the dryland tropical regions of the North. The drier areas have less issues with pathogens. It makes for a cleaner product.” *Brett Williams, QUT, Nov 2018*

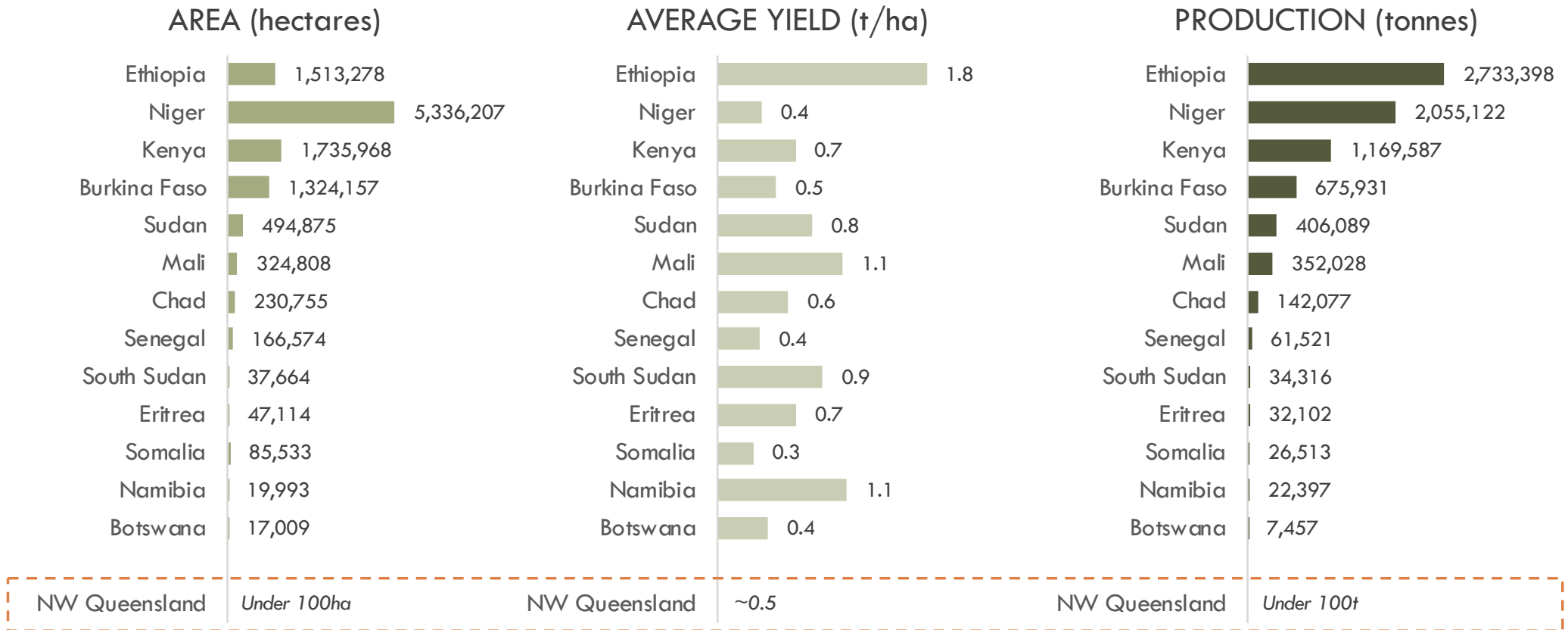
“The new varieties are coming on well. We have had success out of the North, and they are coming down from Darwin. It all about getting the agronomy right.” *Paul McIntosh, Pulse Australia, Nov 2018*



# Strong climatic peer countries for NW Queensland produce massive amounts of pulses, supporting significant upside

## PULSE PRODUCTION METRICS: NW QUEENSLAND VS. STRONG CLIMATIC PEERS

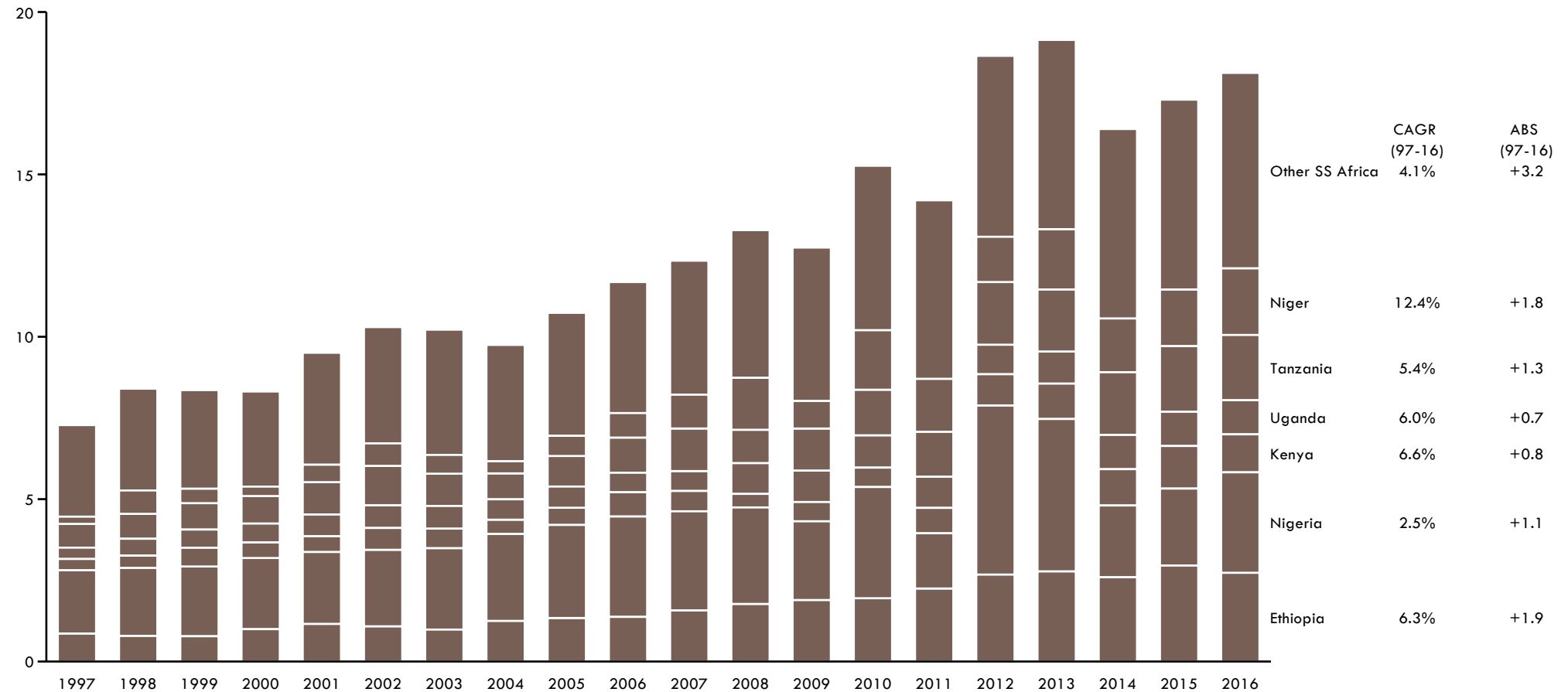
Hectares, t/ha, tonnes, 2016 (or as available)



# Dry pulse production is growing over time across the African climatic peer region

## PULSE PRODUCTION BY DEFINED PEER GROUP COUNTRIES

Tonnes; 000; 2016

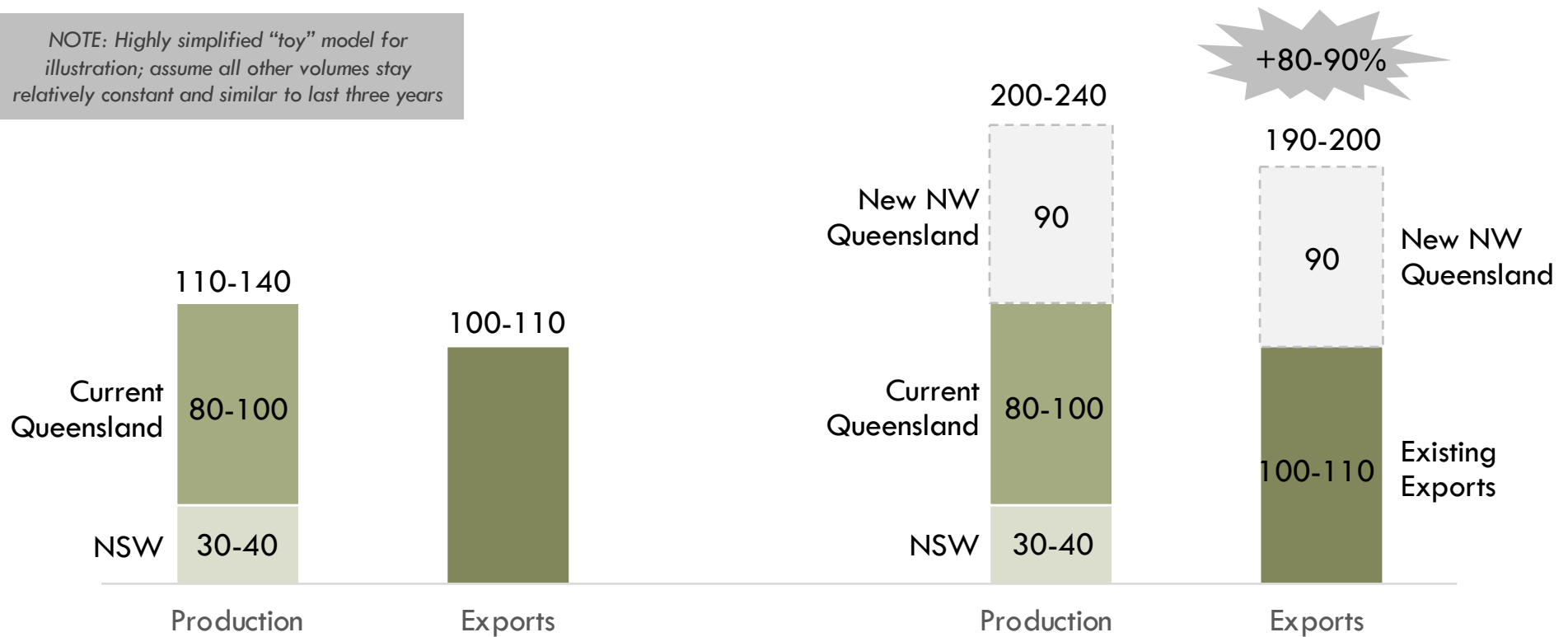


# Proposed new volume (+90kt) from NW Queensland would increase Australian mungbean exports by +80-90%

## POTENTIAL AUSTRALIAN MUNGBEAN PRODUCTION & EXPORTS WITH NEW VOLUMES

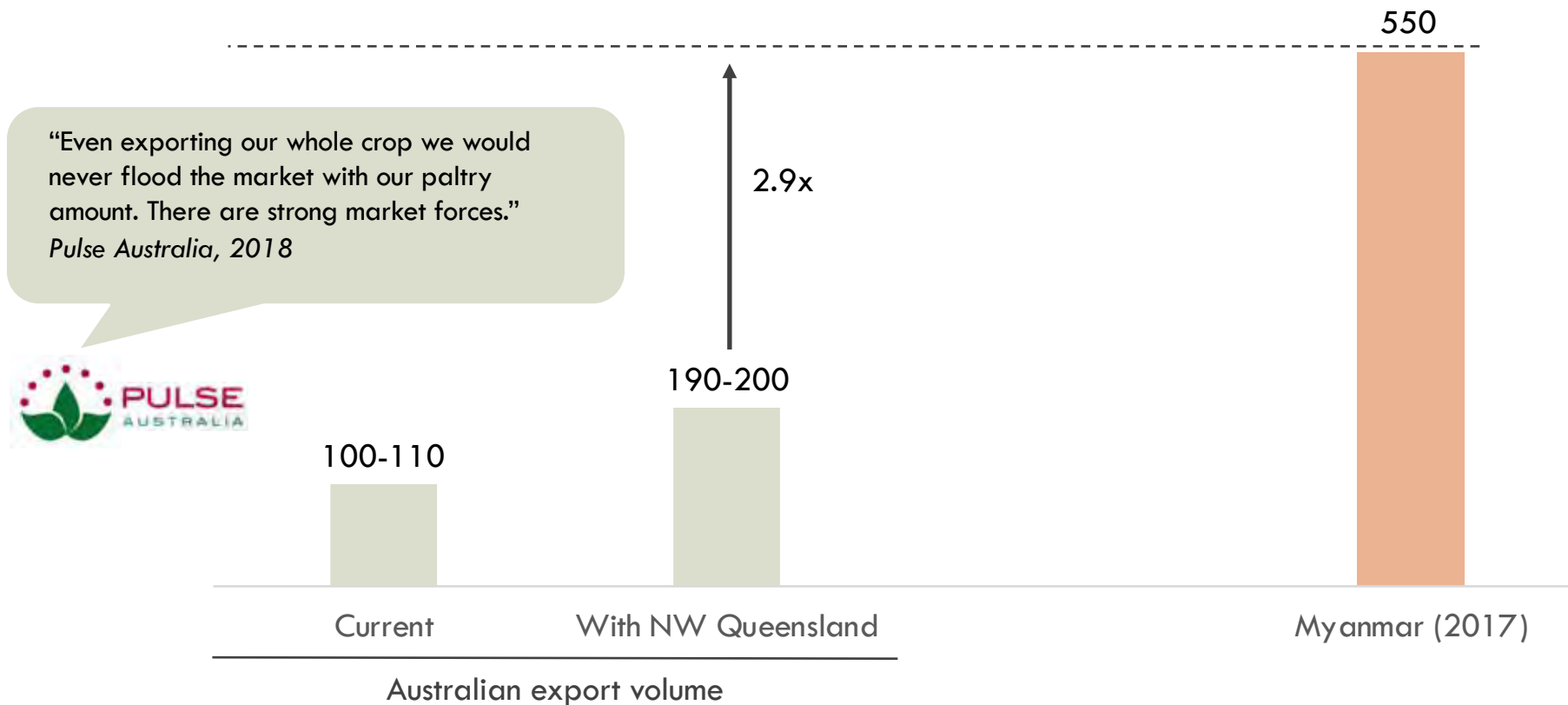
Tonnes, 000, Model

NOTE: Highly simplified "toy" model for illustration; assume all other volumes stay relatively constant and similar to last three years



# Even at these new volumes, Australia would still be a relatively small mungbean exporter relative to Myanmar

## POTENTIAL AUSTRALIAN MUNGBEAN EXPORTS WITH NEW VOLUMES VS. MYANMAR *Model*



# The technology is available to add value to mungbeans in Queensland, creating new and innovative food products

## CURRENT SITUATION

*Exporting commodities*

- ~95% mungbeans exported
- Exporting 25kg bags in containers to India, China, Vietnam
- Industry vulnerable to market fluctuations; basic supply and demand model heavily affected by India's and China's yearly production success
- "The opportunity is adding value to the beans in Queensland. At the moment they are nearly all exported. Adding value in Australia would really insulate the industry."  
*Brett Williams, Research Fellow, QUT, Nov 2018*

## POTENTIAL FUTURE

*Producing value added food products*

- Potential for value-added processing in Queensland
- Provide a supply of clean, green, traceable products to the food industry
- Develop a QLD mungbean product portfolio and brand
- Develop a USP around high protein, gluten-free, low-allergen, nut-free, chemical-free, neutral-tasting food ingredient
- Develop range of food ingredients: flours, protein powders, pastes, spreads for a broad range of food categories

# NORTH WEST QUEENSLAND CAN DELIVER

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# 04

+ Poised for success

+ Clear next steps



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## *North West Queensland is poised for success in mungbeans*

- North West Queensland has the land, water and resources required for success in mungbeans
- NW Queensland combines a safe and trusted modern economy, with African climatic conditions, that is close to key markets
- North West Queensland can succeed against the competition in mungbeans
- Four specific next steps are required to realise the North West Queensland mungbean opportunity
  1. Securing the best land in the region
  2. Securing the best available genetics
  3. Implementing production systems optimised to local conditions
  4. Targeting the product at high value markets
- Large scale mungbean production could be started in North West Queensland relatively quickly

# North West Queensland has the land, water and resources required for success in mungbeans



- Large total area 375,486 km<sup>2</sup>
- Over 28m hectares of agricultural holdings in the region
- Diverse climatic conditions
- Low cost land currently underutilised
- Fertile soils suitable for agriculture

- Plentiful seasonal rainfall
- Multiple existing dams in the region
- Numerous additional dams proposed or in progress
- Proposed dams will be transformative to regional agriculture

- World class supply chains
- Easy access to Port of Townsville and Cairns Airhub
- Ongoing investment in infrastructure
- Skilled and educated regional population
- Readily available equipment, genetics, systems and support services

# NW Queensland combines a safe and trusted modern economy, with African climatic conditions, that is close to key markets



*Efficient, world class, modern production system*

- Very large, highly efficient farms
- World class agriculture production systems and proven capability
- Modern distribution infrastructure
- Well funded science and research
- Highly skilled at producing arable crops at scale in an arid climate
- Skilled and educated farmers
- Long history of agriculture and global trade in QLD



*Crops suited to regional conditions and climate*

- Warm semi arid and tropical savanna climates with some warm desert
- Long sunshine hours
- Wet and dry production possible
- Counter seasonal production
- Supplied to world market by climatic peers and produced successfully in the region



*On the doorstep of East and South East Asia*

- Strong demand from high value markets
- Excellent proximity to high demand markets in East & South-East Asia
- Short transport times and distances
- In the same (or similar) time zones
- Free Trade Agreements with most key trading partners



*Modern, efficient economy with strong rule of law*

- Protected by Australia's island location and strong biosecurity
- Strong reputation with consumers as a safe and secure food producer
- Strong investor protection, highly ranked in "ease of doing business" and rule-of-law
- AAA sovereign risk rating

# North West Queensland can succeed against the competition in mungbeans

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> <li>- Proven capability to produce grade 1 mungbeans in the region</li> <li>- Proven capabilities at large scale mechanised agriculture/new crop development</li> <li>- Grown successfully as part of crop rotation in region (including with sesame)</li> <li>- Mungbean suits climate in NW Queensland</li> <li>- Highly skilled, technically competent workforce</li> <li>- Large, high productivity farms in Queensland relative to peer group</li> <li>- Arid tropical climate suited to many African crops</li> <li>- Large amounts of seasonal water relative to many climatic peers</li> <li>- Isolated island location with strong biosecurity; free from many diseases and pests</li> <li>- Proximity to fast growing Asian markets</li> <li>- Large area the size of Germany or Japan currently being used for large cattle stations</li> <li>- Low land cost relative to other Australian locations</li> <li>- "Brand Australia" known and trusted by global consumers</li> </ul>	<ul style="list-style-type: none"> <li>- High cost country relative to Africa, India and Asia; success requires highly efficient production through mechanisation and large farm sizes (cf. wheat)</li> <li>- Lack of large supply of low cost locals or "guest workers" (unlike some countries)</li> <li>- Low regional population; relatively high seasonal labour costs</li> <li>- Low/no historical investment in large scale dams and irrigation projects in region</li> <li>- Strong environmental protection rules and regulation limit virgin/regrowth land clearing</li> <li>- Limited support services available directly in region</li> </ul>
OPPORTUNITIES	ISSUES/THREATS/RISKS
<ul style="list-style-type: none"> <li>- Rotational cropping of mungbeans (nitrogen-fixing) with sesame</li> <li>- Continued growth of the middle class in Asia</li> <li>- Aging global population, particularly baby boomers</li> <li>- Growing global interest in health giving foods</li> <li>- Growth of nutraceuticals and the emergence of "superfoods"</li> <li>- Potential to utilise waste streams</li> <li>- Regular, ongoing corruption, political strife, civil war, revolution, rebellion and disease outbreaks (e.g. Ebola) in Africa</li> <li>- Extensive ongoing mungbean genetics research and development in Australia</li> </ul>	<ul style="list-style-type: none"> <li>- Disease outbreaks</li> <li>- Climate variability and climate change</li> <li>- Changing global trade flows and trade wars (e.g. India introducing tariffs)</li> <li>- Emergence of new competition in processing bean sector</li> <li>- Conflicting agenda and objectives of various government agencies</li> <li>- Changing foreign phyto-sanitary protocols and regulations and their interpretation</li> <li>- Politics and geopolitics, often not in support of agricultural development</li> </ul>

# Four specific next steps are required to realise the North West Queensland mungbean opportunity



# The first step is securing the best land in the region

## I. IDENTIFY THE BEST LOCATION

## II. SECURE PROVEN GENETICS

## III. IMPLEMENT EFFICIENT SYSTEMS

## IV. TARGET HIGH VALUE MARKET

### Situation creating opportunity

- NW Queensland is a large region, similar in size to Germany or Japan, with a climate suited to the crops of Africa
- This area is currently used almost exclusively to graze cattle
- Currently less than 1% of the land is farmed
- The lack of farming is due to a range of historical reasons having little to do with the capability of the land
- By any available metric, every single other country with similar climatic conditions produces much more food

### Potential investment theme

#### Identify Best Location

### What you would need to believe

- Significant amounts of cleared land with soils highly suitable for mungbean and suitable rainfall is available (<100mm plant available water on planting)
- Enough flat land available (plants do not like water-logging)
- Regional rainfall patterns match the demands of mungbean; alternatively cost effective irrigation solutions exist (require 350-550mm water)
- Survivorship in the hot conditions of NW QLD
- Establishment costs will deliver a competitive economic return

- NW Queensland receives large amounts of seasonal water
- Rainfall varies by location, by region and by year
- Available ground and surface water varies by location and region
- Mungbean suitable at high temperatures and minimal rainfall
- Recent scientific research funded by government has highlighted additional available water in the region
- Government regulates water through specific licenses tied to specific locations

#### Ensure Suitable Water

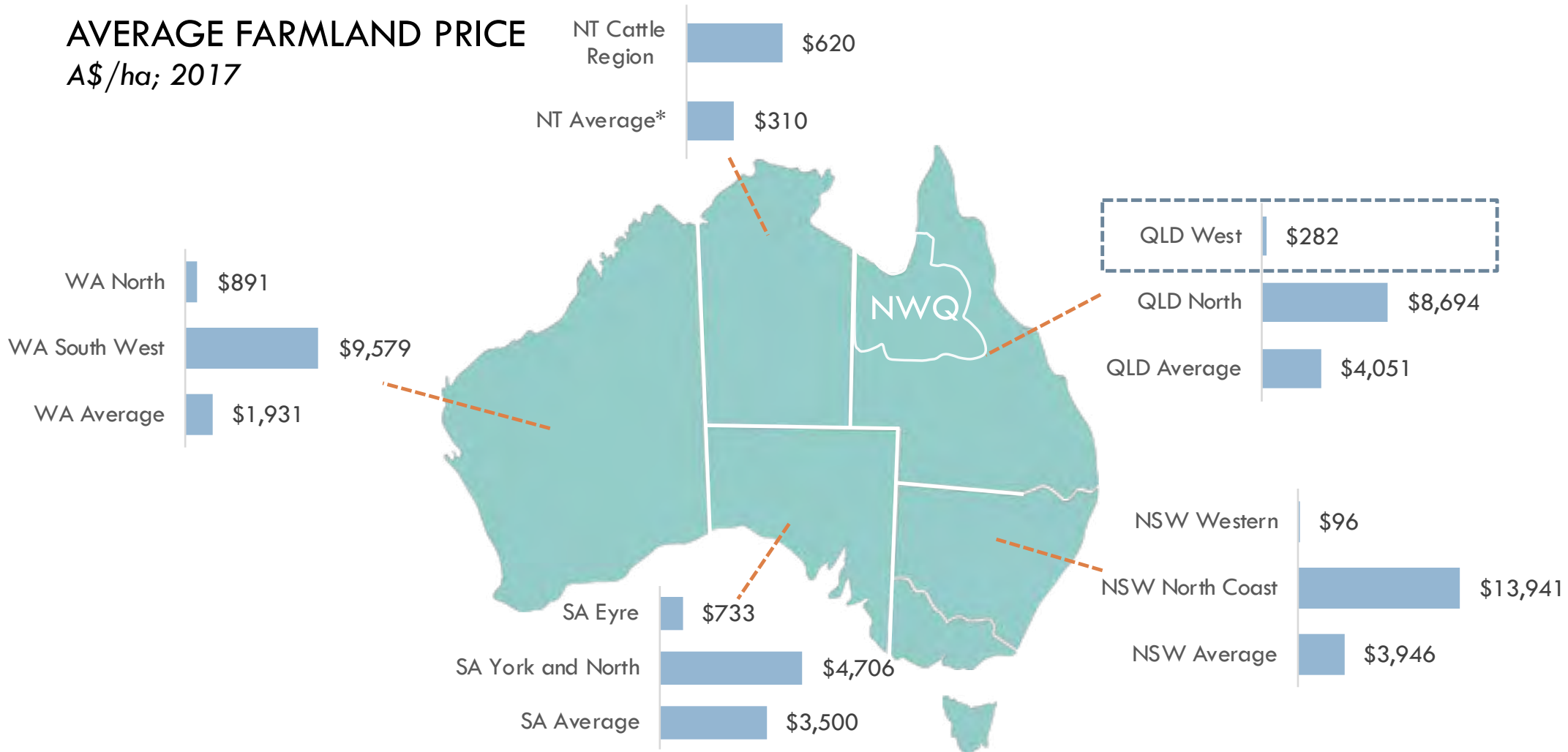
- Land in NW Queensland has a wide range of owners, including large farmers, corporate farmers, government and traditional owners
- Owners vary in their willingness to lease or use their land for more intensive production systems (i.e. not grazing)

#### Identify Willing Local Owner(s)

- Owners exist of suitable land who are willing to grow mungbean (or willingly lease their land to mungbean growers)

# Land in North West Queensland is cheap compared with other parts of Australia

## AVERAGE FARMLAND PRICE A\$/ha; 2017



\*NT Median Indexed; Source: Rural Bank, Australian Farmland Values; Coriolis analysis



# The second step is securing the best available genetics



<i>Situation creating opportunity</i>	<i>Potential investment theme</i>	<i>What you would need to believe</i>
<ul style="list-style-type: none"> <li>- Climatic peer group countries across sub-Saharan Africa produce large amounts of mungbean under these conditions</li> <li>- Myanmar, India, Brazil, United States and China also produce large amounts of mungbean</li> <li>- Teams in Australia researching new drought tolerant breeds</li> <li>- Trials of mungbean in Southern QLD achieved 2-2.5t/ha, trials in Laura (North) achieved 1t/ha</li> <li>- Trials in NWQ (Gilbert River) achieving an average of 2.58 t/ha utilising varieties bred in Queensland</li> </ul>	<p style="text-align: center;">Suited to Regional Climate</p>	<ul style="list-style-type: none"> <li>- Major export crops produced in Africa (including mungbean) could be produced in climatically similar regions of Queensland</li> <li>- Australian bred varieties will be best suited to NW Queensland conditions</li> <li>- Continued introduction of new genetics and on-going research into optimised drought resistant cultivars and disease resistance</li> <li>- Ongoing trials prove that high yields able to be achieved in NW Queensland</li> </ul>
<ul style="list-style-type: none"> <li>- Mungbean pod maturity is not uniform due to extended flowering period</li> <li>- Harvesting too early can result in loss of immature pods; too late in losses from shattering</li> <li>- Many of Australia's competitors globally use traditional farming methods, hand harvesting the crop (e.g. Myanmar)</li> <li>- Hand harvesting results in a high quality product with even maturity and purity of variety (No. 1 and sprouting grade)</li> </ul>	<p style="text-align: center;">Able to be Mechanically Harvested</p>	<ul style="list-style-type: none"> <li>- Australian bred varieties and management practices enable high quality mungbeans under mechanised production</li> <li>- Mechanised harvesting will allow Australia to compete with low cost producers who hand harvest</li> <li>- Desiccation/drying can assist with a timely and uniform harvest</li> </ul>
<ul style="list-style-type: none"> <li>- Wide range of varieties available to growers in Australia</li> <li>- To date commercial crops grown in Richmond (in North West Queensland) have always achieved no.1 grade</li> <li>- Most popular large-seeded shiny green varieties (Jade-AU, Crystal) developed with traditional cropping regions of Australia in mind</li> <li>- Niche markets only for dull seeded green and black varieties</li> </ul>	<p style="text-align: center;">Market Acceptance</p>	<ul style="list-style-type: none"> <li>- Highly accepted, large-seeded shiny varieties that have been extensively developed in Australia will be best suited to North West Queensland conditions</li> </ul>

# The third step is implementing production systems optimised to local conditions



## Situation creating opportunity

- Export mungbeans are primarily produced in Myanmar, China, sub-Saharan Africa (produced by low cost labour)
- Export mungbeans are also produced in the US, Canada, AU
- Australia has a global scale arable crop industry and associated support sectors (e.g. harvesting machinery)
- Australia has a 50+ year history of producing relatively small, highly variable amounts of mungbean
- Australia is a developed country with high cost labour that achieves export success through efficient production of arable crops on large farms using mechanised production systems and large scale, highly efficient supply chain logistics
- Able to export containers from the Port of Townsville
- 5,000 tonnes of mungbean currently exported through Townsville port
- The region has good transport infrastructure and a widespread network of regional airports
- The region has rail and a reliable central electrical grid in most key areas; some large properties are more remote
- However, as a relatively remote region, it lacks specialised services that need to be “brought in” from other areas
- There is a limited pool of skilled producers of large scale arable crops in the region directly (but many elsewhere)

## Potential investment theme

Implement Low Cost Production Suited to Regional Conditions

Organise Distribution & Supply Chain Logistics

Implement with a Skilled & Capable Team on the Ground

## What you would need to believe

- Existing Australian farming systems for mungbeans (and other arable crops) can be adapted for NW Queensland
- Improvements can be made to existing Australian mungbean production systems (e.g. lessons from the US, Canada)
- Mungbean will successfully fit into crop rotation
- A low cost production system for mungbean production adapted to local conditions can be developed relatively quickly
- Production will be competitive with global competitors
- Mungbeans can be stored in the same storage infrastructure used for grains and pulses in Australia (varietal purity is essential)
- Cost competitive grain/pulses storage infrastructure can be put in place relatively quickly
- Achieve scale so mungbean cleaning and processing facility will be established in the region or Townsville
- Existing regional farmers can quickly upskill in dryland mungbean production
- Alternatively, skilled operators from outside NW Queensland can be attracted to the region to grow mungbeans

# Finally, the product needs to be targeted at high value markets

I. IDENTIFY THE BEST LOCATION

II. SECURE PROVEN GENETICS

III. IMPLEMENT EFFICIENT SYSTEMS

IV. TARGET HIGH VALUE MARKET

## Situation creating opportunity

- Mungbeans are marketed differently to other pulses and grains as consumers buy them as a “vegetable”
- Many of the major mungbean producing countries are currently high risk, with endemic corruption, limited political or economic stability and poor infrastructure
- Some of the major producers have weak “country brands”

## Potential investment theme

Develop Clear “Unique Selling Proposition” (USP) for NW Queensland Mungbean

## What you would need to believe

- Mungbeans can be differentiated and are not a pure commodity
- NW Queensland produced mungbeans will be different in some marketable way
- A significant percent of buyers value soft characteristics such as “sustainable,” “clean and green” and “Brand Australia”

- Australians consume mungbeans sprouted fresh, dry as an ingredient in soups, or increasingly as part of gluten free products on shelf in supermarkets (pasta, noodles)
- Growth of “Australian made” and sourcing local
- Opportunities to add value to mung for alternative protein food products

Develop Domestic Australian Market

- NW Queensland can produce mungbeans at prices that are competitive with Myanmar, China and Africa
- NW Queensland produced mungbeans will be higher quality than imported mungbeans from Myanmar or China
- Able to successfully process value added ingredients domestically (protein, powders, flours, chips, etc.)

- There is a very large global market for mungbeans, valued at US\$2.4b in 2017 and growing at 6% (20y CAGR)
- Asian demand for mungbeans is growing, global production volume has doubled in the last 20 years
- Consumers across EU, the USA and Asia are demanding more mungbeans as part of a shift to vegetable proteins
- High value markets are US, Japan and Europe

Develop High Potential Mungbean Export Markets

- The drivers of Australian export success in other arable crops (wheat, barley, oats, canola) will be transferrable to mungbean
- NW Queensland produced mungbeans will deliver higher quality product at competitive prices in world markets
- A significant percent of global buyers of mungbean will be willing to switch to buying mungbean from NW Queensland

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## *Large scale mungbean production can be ramped-up in North West Queensland relatively quickly*

- World class genetics are available and mung is being grown in trials in the region
  - Dryland mungbean does not require large scale irrigation
  - Yields on average at 2.58 tonnes/ha on trials in the Gilbert River (albeit irrigated)
  - Successful commercial cropping of 300 ha multiple years near Richmond – Flinders – delivering grade 1 mungs
- Mungbean handling and logistics from the region are relatively straightforward to implement; currently in excess of 5,000 tonne per year being exported through the port of Townsville
- There are significant tracks of land well suited to mungbean available now in Gilbert, Flinders, Cloncurry and elsewhere
- Mungbean can be grown in crop rotation with sesame
  - Rotational / complementary cropping potential of Mungs as a short crop that fits within the broader cropping system that will develop across the NW

To discuss the mungbean opportunity in North West Queensland please contact



**Queensland**  
Government

**ADAM WEST**

Regional Director – North Region

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Queensland Department of Agriculture and Fisheries

North Region Office

Townsville Regional Office

9-15 Langton Street, Garbutt QLD 4814

Australia

# APPENDICES

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# 05

+ Potential Commercial  
Partners

+ Definitions

+ Glossary

## WHO ARE THEY?

CEO/MD:	Sunny George Verghese
Address:	7 Straits View, Marina One, East Tower #20-01 Singapore
Phone:	+65 6339 4100
Established:	1989
Website:	<a href="http://olamgroup.com">http://olamgroup.com</a>
Revenue:	SGD\$26.3b (2017)
EBITDA:	SGD\$1,328m (2017)
Staff:	72,000 (Headcount)
No. of plants:	200
Production:	N/A
Ownership:	Private/ Public (SGX:O32)
Country:	Singapore
Major Shareholders:	Temasek (53.6%) Mitsubishi (17.4%) Kewalram Chanrai (7.0%) Management (6.3%) Public (15.6%)

## WHAT DO THEY MAKE?

### PRODUCTS

45 Agri-commodity products across:  
 Beverages – cocoa, coffee  
 Edible nuts – almonds, cashews, hazelnuts, peanuts, sesame  
 Spices  
 Tomatoes  
 Packaged Foods – pasta, tomato paste  
 Food Staples – dairy, grains, pulses, foods, rice, sugar,  
 edible oils  
 Industrial Raw - cotton, rubber, wood, fertiliser

### BRANDS

FreshYo, Bua, Festin, Perk, Milky Magic, King Cracker  
 TastyTom, Enrista, Cherie, Cafe Delas, Eagle, NutriSnacks,  
 Chic Choc Twingles, DeRica, Sunda Hejo, Colombia Timana,  
 Dulima, Lao Naga, Laos Siho, Mexico Concordia Especial,  
 Sulawesi Rangemario, Sumatra Crowned Garuda, Royal  
 Feast, Royal Aroma, Mama Africa, First Choice, Royal Gold,  
 Adeapa, Vital, deZann, Unicao, Joanes, Macao, Huysman,  
 Britannia

### OPERATIONS

Vertically integrated value chains, farmer to manufacturer.  
 Third largest agribusiness in the world; largest almond  
 grower in Australia; peanut shelling and blanching facilities in  
 Argentina, India, USA  
 Australian operations: almonds, cotton

## WHERE ARE THEY? ACROSS 65 COUNTRIES

Europe:	39 locations: Spain, Poland, UK, Germany Netherlands...
Americas:	130 locations: USA, Argentina Brazil...
Middle East/NA:	31 locations: Turkey
Asia:	91 locations: China, Singapore, India, Indonesia, Vietnam, Thailand, Malaysia, Central Asia...
Australasia:	Australia, New Zealand
Other:	298 locations - throughout West, East and Southern Africa

## DO THEY HAVE ANY MONEY?

### RECENT ACQUISITIONS & INVESTMENTS

- 2014 acquired ADM's cocoa business for US\$1.3b
- 2016 acquired BUA Group (Nigeria) wheat milling and pasta assets for US\$257m
- 2016 acquired Amber Foods (Nigeria) for US\$275m
- 2016 acquired Brooks peanut sheller (Alabama) for US\$85m
- 2016 acquired share in Acacia Investments for \$25m
- 2017 acquired four second hand ships



# COFCO - China National Cereals, Oils and Foodstuffs Corp



WHO ARE THEY?		WHAT DO THEY MAKE?	WHERE ARE THEY?	
CEO/MD:	Yu Xubo (President)	<b>PRODUCTS</b>	Europe:	Germany, Black Sea
Address:	Beijing, China	COFCO International: Sugar, Cotton, Grain & oilseeds, pulses, Coffee, Freight	Americas:	USA, Brazil, Argentina, Uruguay, Paraguay, Chile
Phone:	+86-10-8500-6688	COFCO Group: all foodstuffs, dairy, beverages, ingredients, Biochem, feed, tea, meat, pork and processed meats, tomatoes	Middle East:	Israel, Kuwait, UAE, Saudi Arabia
Established:	1949		Asia:	India, Indonesia, Singapore, Vietnam
Website:	www.cofco.com www.cofcointernational.com	<b>BRANDS</b>	Australasia:	Australia
Revenue:	US\$69b/US\$34b (CI)	Mengniu dairy, Joycome and Maverick, Fortune, China Tea, Sea Dyke, Butterfly, Wooden House Century and Monkey King, Jiugui, Kong Yiji, chateau Huaxia, Feeding the Future, Xiangxue, GreatWall, Joycome, Womai,	Other:	South Africa, Zimbabwe Total 140 countries (COFCO International, 35)
EBITDA:	US\$394m		<b>DO THEY HAVE ANY MONEY?</b>	
Staff:	125,000 Group; (12,000 COFCO International)	<b>OPERATIONS</b>	RECENT ACQUISITIONS & INVESTMENTS	
No. of plants:	Hundreds	COFCO State-owned and China's largest food processor, manufacturer and trader; processed foods plus companies involving with planting, cultivation, food processing, finance, warehouse, transportation, port facilities, hotels and real estate; COFCO International operates all international agrifood commodity businesses; based in Geneva; vision to become a world-class agribusiness across sugar, cotton, coffee and grain & oilseeds; #2 grain exporter from Argentina, #4 from Brazil; dominant global sugar company #6 in Brazil	<ul style="list-style-type: none"> <li>- 2007 acquired first sugar mill in Brazil</li> <li>- 2010 greenfield sugar project in Brazil</li> <li>- 2014 acquired Nidera (Dutch trader)</li> <li>- 2015 acquired Noble Group (remaining shares in 2016)</li> <li>- 2016 acquired remaining shares Nidera (US\$3b investment for Nidera and Noble)</li> </ul>	
Production:	90m T processing capacity		<p><i>"We aim to become the largest international food trader by 2020, not only in assets we own and revenues we make, but also in the quality of our assets, business operation, and return on investment," Yu Xubo</i></p>	
Ownership:	Public			
Country:	China			
Owner:	SOE	AU Operations: Grain origination and trading (Perth, Melbourne), COFCO Tully Sugar (mills)		

## WHO ARE THEY?

CEO/MD:	Mark Palmquist
Address:	Level 28, 175 Liverpool Street Sydney, NSW 2000 Australia
Phone:	+61 2 9325 9100
Established:	1916
Website:	<a href="http://www.graincorp.com.au/">http://www.graincorp.com.au/</a>
Revenue:	\$4,576m
EBITDA:	\$390m (2017)
Staff:	1,400
No. of plants:	160 silos
Production:	throughput 22.7m MT
Ownership:	Public (ASX:GNC)
Country:	Australia
Owners:	ADM Australia (20%), JP Morgan (17%), others

## WHAT DO THEY MAKE?

### PRODUCTS

Canola seed, oils, animal feed  
Grains – wheat, barley, sorghum and pulses  
Food - Oils, margarines, spreads, bakery, Infant nutrition (oil blends), Malt

### BRANDS

Graincorp, Bairds Malt, Canada Malting, Great Western Malt, Barrett Burston, Country Malt Group, Brewcraft, Cryer Malt, Brewers Select, Auscol, Pilot, PLT, 92, Kristel, White Cloud, Margol, Klea, Sunola, Infalac, Molas, Rumifeed, Energro

### OPERATIONS

Graincorp operate across the Grains, Malt and Oil categories; integrated operations providing: grain origination, storage, handling, freight, bulk ports, plus vertically integrated edible oils and malt business.  
14 malting houses; 14 bulk liquid terminals; 500,000t animal feed (AU, NZ); Grain receival sites 160 with 20m MT storage capacity, 7 port terminals, sells 8m MT grains annually to 30 countries

## WHERE ARE THEY?






Europe:	Germany, Ukraine, UK
Americas:	USA, Canada
Middle East:	
Asia:	China, Singapore
Australasia:	Australia, New Zealand
Other:	

## DO THEY HAVE ANY MONEY?

### RECENT ACQUISITIONS & INVESTMENTS

- 2014 invested \$200m over 3yrs to expand storage network
- 2015 – invested \$10m in increasing liquid terminal capacity in WA
- 2016 invested \$100m+ in oilseeds plant in VIC crush increased to 1,000t/day
- 2017 completed expansion of malting facility in Idaho
- 2017 three new receival sites planned in Canada (JV with Zen-Noh Grain, Japan)
- 2017 acquired Cryer Malt for \$13.8m (Craft brewing distributor)

# Who are other potential commercial partners?

FIRM	YEAR EST.	HEAD OFFICE LOCATION OWNERSHIP	GLOBAL SALES # OF EMPLOYEES	KEY PRODUCTS	KEY REGIONS	WEBSITE NOTES
	2016	Rotterdam, Netherlands Private Glencore (Public: Switzerland; LSE: GLEN, SEHK: 0805, JSE: GLN), CPP Investment Board, bclMC	US\$25b (2017) 14,000	Grain, oilseeds, pulses, sugar, rice, cotton, protein meals, vegetable oils, biodiesel	Global	<a href="http://www.glencoreagriculture.com">http://www.glencoreagriculture.com</a> Originating, handling, processing and marketing of agricultural commodities; operations and offices in 35 countries; 6 grain port terminals in Australia; 24,000 ha of cropping land farmed and leased
	1919	Tokyo, Japan Public TYO:8053	US\$2.9b (2017) 73,016	Metal products, transportation, construction, infrastructure, media, ICT, lifestyle goods (food, juice, grains), mineral resources, energy, chemical, electronics	Global	<a href="https://www.sumitomocorp.com/en/jp/">https://www.sumitomocorp.com/en/jp/</a> One of largest Sogo shosha general trading companies worldwide; Emerald Grain subsidiary in Australia
	1986	Champaign, Illinois, United States Private TIAA – USA teacher superannuation	US\$8b in assets under management	Farmland involved in livestock and cropping	USA Australia Europe South America	<a href="http://www.wgimglobal.com/home">http://www.wgimglobal.com/home</a> Agriculture asset managers; \$1b worth of farms in QLD, NSW, VIC, WA; model of leasing back properties to owners or local farmers; wheat and other grains focus
	1941	Gurnee, Illinois, United States Private	US\$5m 50	Concentrated, dehydrated, frozen, extracted, pasteurised vegetables, fruit, herbs, spices, natural colours, proteins	USA	<a href="https://www.hbroch.com">https://www.hbroch.com</a> International food ingredient, processing and co-packing company
	1919	Chicago, Illinois, United States Public NYSE:CAG	US\$7.8b (2017) 12,600	Frozen vegetables, meatless “meats”, vegan dairy products, meat sticks, baking premixes, frozen meals, popcorn, whipping cream, pickles, tomato sauce, gluten free products, etc.	USA Global	<a href="http://www.conagrabrands.com">http://www.conagrabrands.com</a> Packaged food company including global brands Birds Eye, Healthy Choice, Slim Jim, Gardein (meatless products)

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# DEFINITIONS: This report uses the UN definition of pulses

## UN FAO PULSE DEFINITION

*Current; 2018*

**2. Pulses.** In addition to their value as food and feed stuffs, pulses are also important in cropping systems for their ability to produce nitrogen and thus increase the fertility of the soil.

**2.1 Definition.** Pulses are annual leguminous crops yielding grains or seeds used for food, feed and sowing purposes.

The denomination "pulses" should be limited to crops harvested for dry grain only, excluding, therefore, crops harvested green for forage, used for grazing or as green manure, and also crops harvested green for food (green beans, green peas, etc.), which are considered vegetables. They exclude those used mainly for extraction of oil, e.g., soybeans.

Also excluded from this group should be those leguminous crops whose seeds are

used exclusively for sowing purposes, such as alfalfa and clover.

**2.2 Classification.** Although the botanical *classification of pulses is somewhat controversial*, it was suggested that data on at least the following genera be collected and reported separately by the countries:

- Phaseolus spp. (beans)
- Vicia faba (broad beans)
- Lens esculenta (lentils)
- Cicer arietinum (chick peas)
- Pisum spp. (peas)
- Cajanus spp. (pigeon peas)
- Vigna sinensis (cow peas)
- Vicia sativa (vetch)
- Lupinus spp. (lupins)

- Vigna spp. (black gram, green gram, mung, etc.)

**2.3 Recommendations.** Production data should be reported in terms of dry clean weight, excluding the weight of the pods.

**DEFINITIONS:** This research uses “mung” to describe two related trade codes (071331 and 071333) due to African data issues

## GLOBAL TRADE CODES FOR DRIED PULSES 2018

HS CODE	NAME	DESCRIPTION
071310	Peas dried, shelled	Peas ( <i>Pisum sativum</i> )
071320	Chickpeas, dried, shelled	Chickpeas ( <i>garbanzos</i> )
071331	Urd, mung, black or green gram beans dried shelled	Beans ( <i>Vigna</i> spp., <i>Phaseolus</i> spp.) :-- Beans of the species <i>Vigna mungo</i> (L.) Hepper or <i>Vigna radiata</i> (L.) Wilczek
071332	Beans, small red (Adzuki) dried, shelled	Beans ( <i>Vigna</i> spp., <i>Phaseolus</i> spp.) :-- Small red (Adzuki) beans ( <i>Phaseolus</i> or <i>Vigna angularis</i> )
071333	Kidney beans and white pea beans dried shelled	Beans ( <i>Vigna</i> spp., <i>Phaseolus</i> spp.) :-- Kidney beans, including white pea beans ( <i>Phaseolus vulgaris</i> )
071339	Beans dried, shelled, nes	Other
071340	Lentils dried, shelled	Lentils
071350	Broad beans and horse beans dried, shelled	Broad beans ( <i>Vicia faba</i> var. <i>major</i> ) and horse beans ( <i>Vicia faba</i> var. <i>equina</i> , <i>Vicia faba</i> var. <i>minor</i> )
071390	Leguminous vegetables dried, shelled	Other

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# GLOSSARY OF TERMS

A\$/AUD	Australian dollar	HK	Hong Kong
ABS	Absolute change	IQF	Individually quick frozen
ANZSIC	AU/NZ Standard Industry Classification	JV	Joint venture
AU	Australia	m	Million
Australasia	Australia and New Zealand	n/a	Not available/not applicable
b	Billion	NA/ME/CA	North Africa / Middle East / Central Asia
CAGR	Compound Annual Growth Rate	N. America	North America (USA, Canada)
CIF	Cost plus Insurance and Freight	Nec/nes	Not elsewhere classified/not elsewhere specified
CN	China	N/C	Not calculable
C/S America	Central & South America (Latin America)	N.H	Northern Hemisphere
CSIRO	Commonwealth Scientific and Industrial Research Organisation	R&D	Research and Development
CY	Calendar year	S Asia	South Asia (Indian Subcontinent)
E Asia	East Asia	SE Asia	South East Asia
EBITDA	Earnings before interest, tax, depreciation and amortization	S.H	Southern Hemisphere
FAO	Food and Agriculture Organisation of the United Nations	SS Africa	Sub-Saharan Africa
FOB	Free on Board	T	Tonne
FY	Financial year (of firm in question)	US/USA	United States of America
GBP	British pounds	US\$/USD	United States dollar
HS Code	Harmonized Commodity Description and Coding System		



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