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## **Developing northern Australia's agriculture: potential scale, location, benefits and costs**

Peter Stone, Cuan Petheram, Ian Watson & Andrew Ash

Contributed presentation at the 60th AARES Annual Conference,  
Canberra, ACT, 2-5 February 2016

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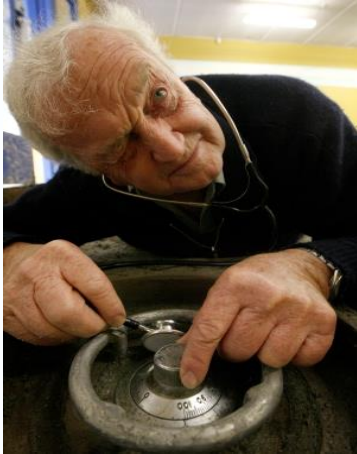
# Developing northern Australia's agriculture: potential scale, location, benefits and costs

[www.csiro.au](http://www.csiro.au)



Peter Stone, Cuan Petheram, Ian Watson & Andrew Ash

# The north has many development options



- tourism
- mining
- energy
- defence
- cultural & environmental economy
- agriculture
- aquaculture
- others

Potential to unlock value from a wide range of resources  
for a wide range of purposes

# Agricultural development opportunities





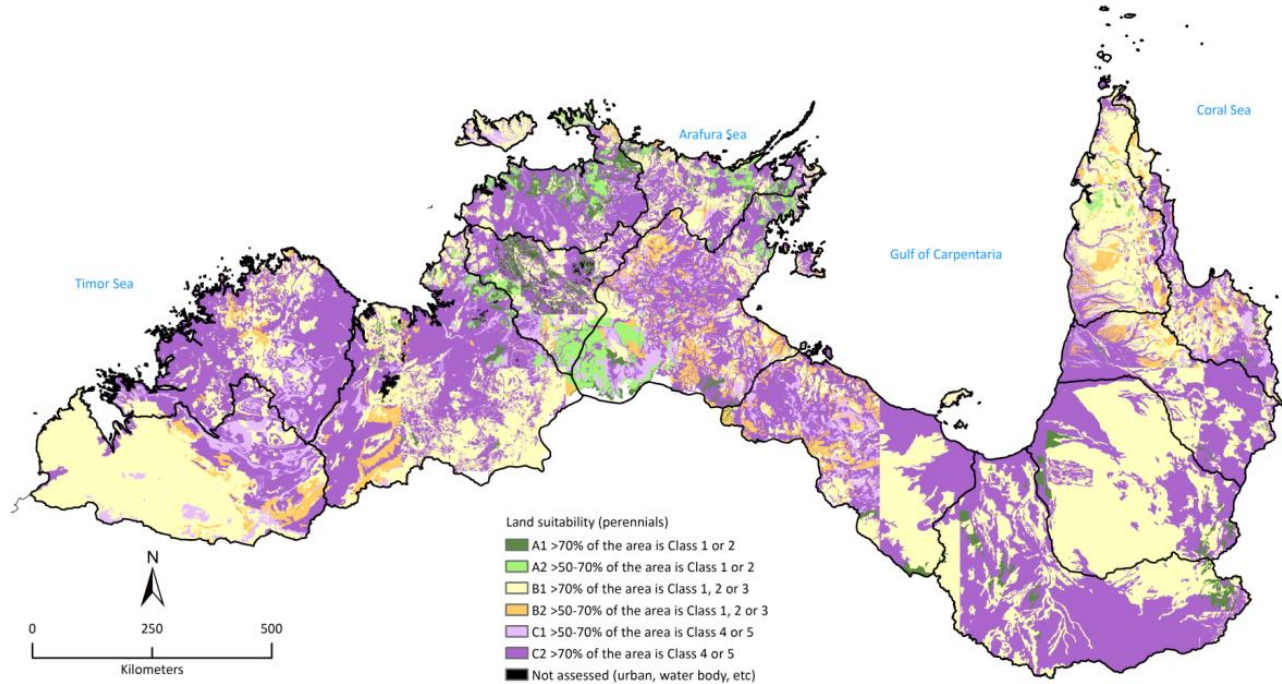
# The north is already a food bowl



# The north's climate can support virtually all sorts of agriculture & horticulture

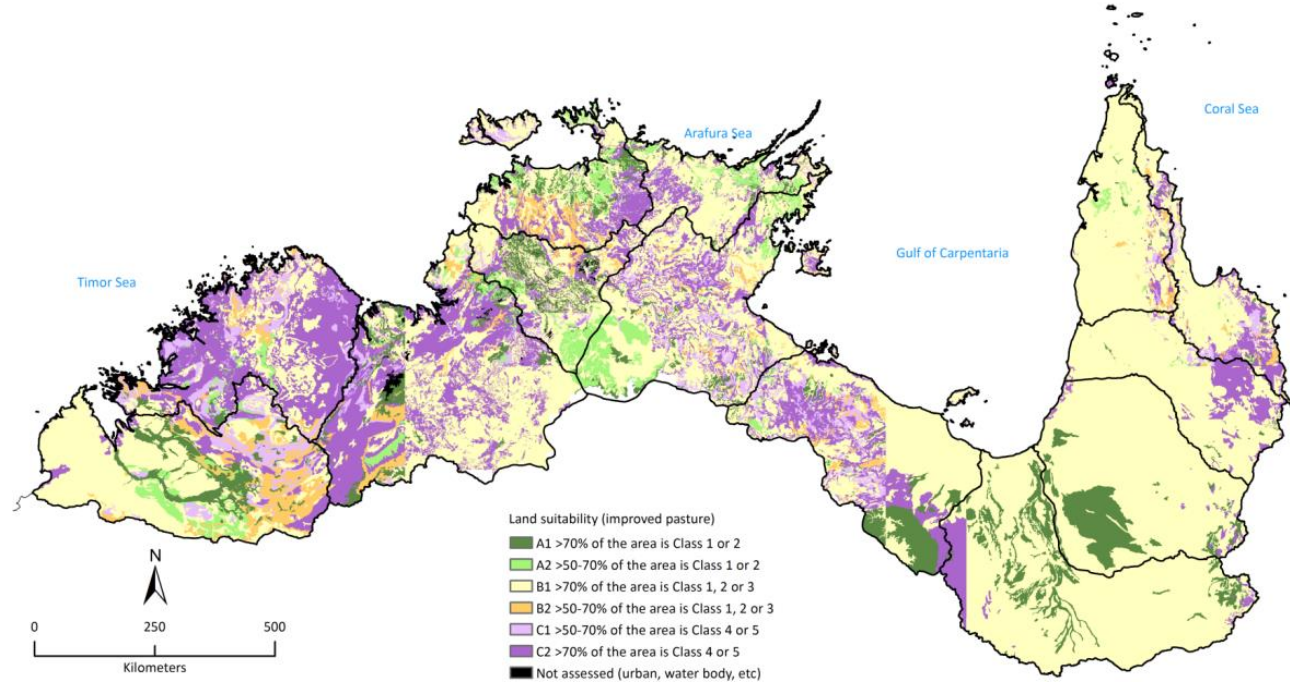
LAND USE CATEGORY	CROP EXAMPLES
Cereal crop	Maize/corn, millet, oats, rice, sorghum (grain), wheat
Citrus	Lemon, lime, citrus
Food legume (pulse crop)	Chickpea, mungbean (black), navy bean, soybean
Forage grazing, hay, silage	Rhodes grass, sorghum (forage), millet, maize (forage), bambatsi
Forage legume	Lablab, lucerne, cavalcade
Industrial	Coffee, cotton, sugarcane, guar
Intensive horticulture (vegetables)	Capsicum/chilli, cucurbit, eggplant, sweet corn, tomato, melons, pineapple, strawberry
Oilseed crop	Sunflower
Root crop	Cassava, peanut, sweet potato
Silviculture (plantation)	African mahogany, Caribbean pine, Indian sandalwood, spotted gum, teak
Tree crop/horticulture (fruit)	Avocado, banana, carambola, custard apple, lychee, mango, pineapple
Tree crop (nuts)	Cashew, macadamia
Vine	Grape

# 6.5 Mha soil suitable for perennial production

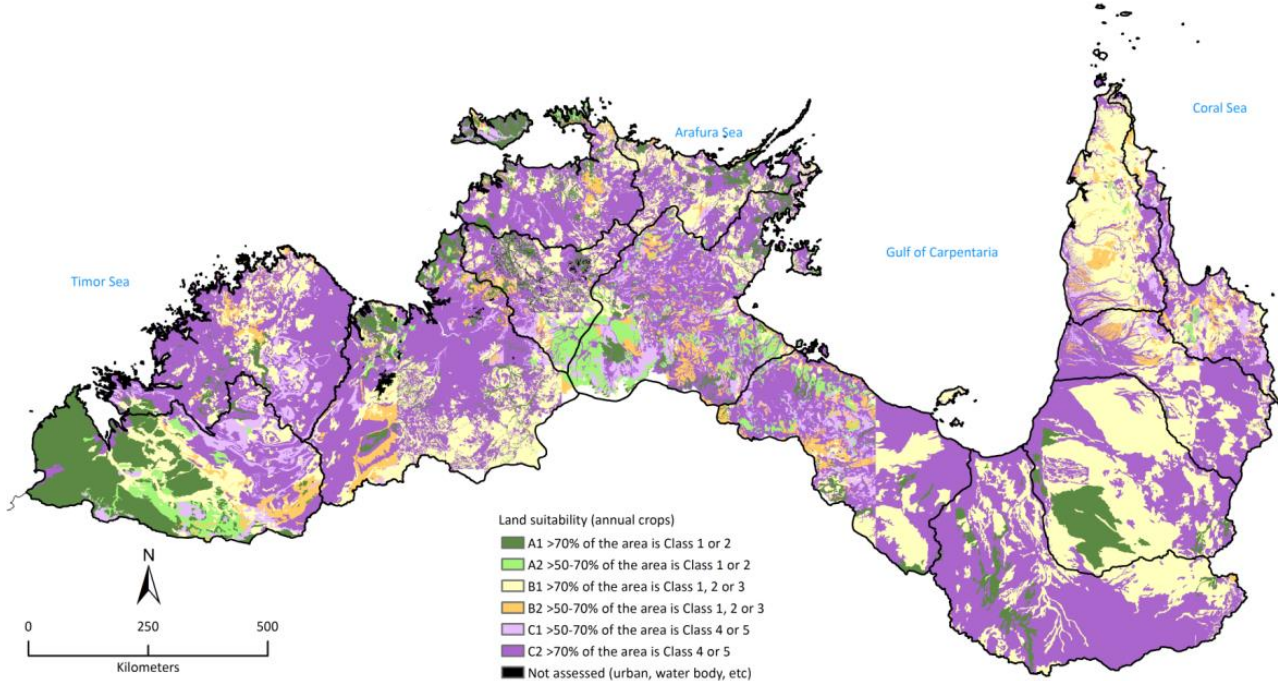




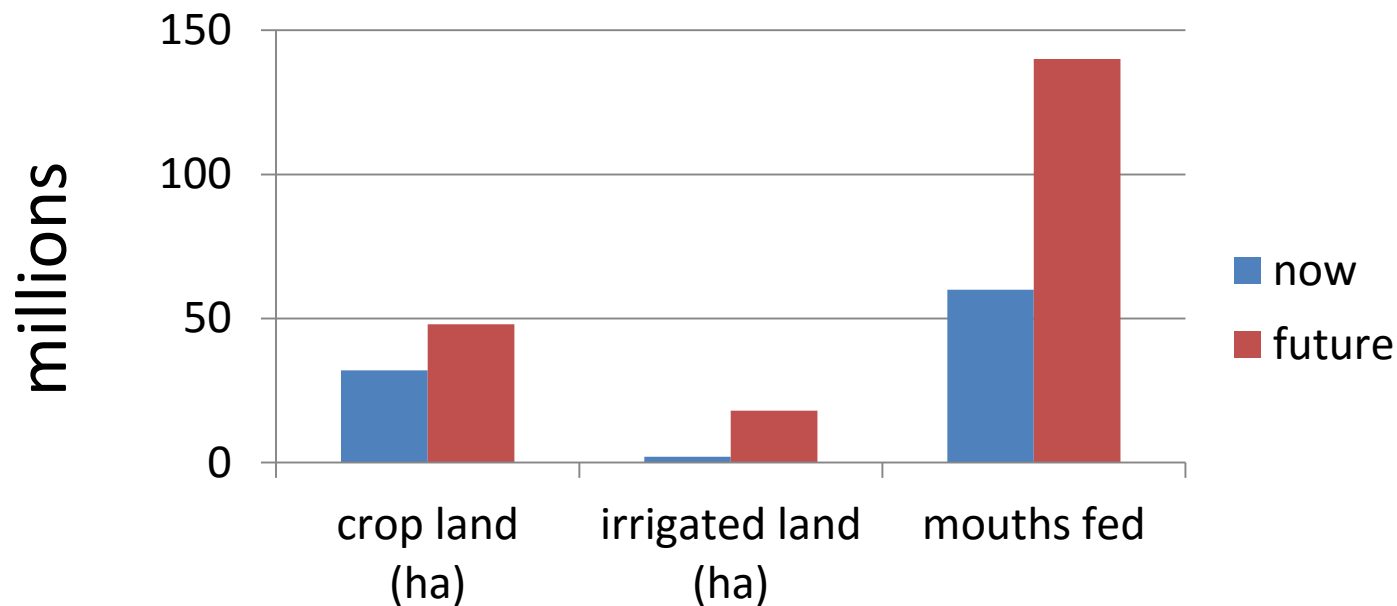
# 14 Mha suitable for improved pasture production



# 16 Mha suitable for irrigated arable production



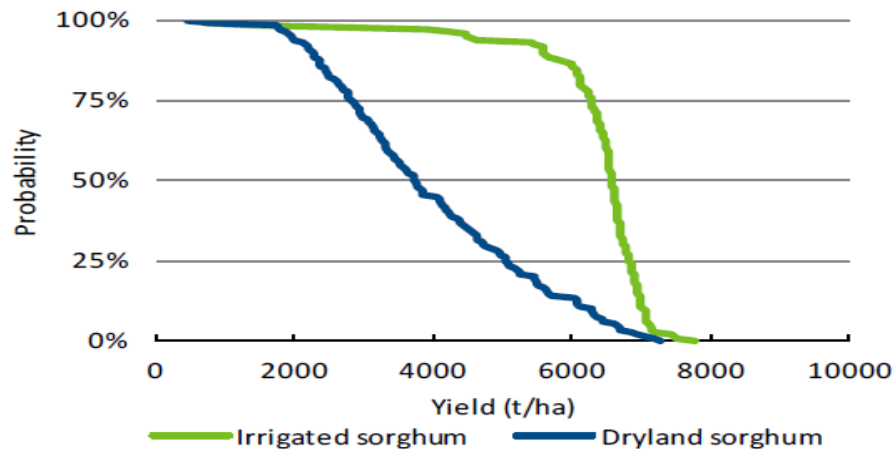
# If we could put all that soil to 'suitable use'...



increase crop 0.5x    irrigation 9x    mouths fed 2.3x

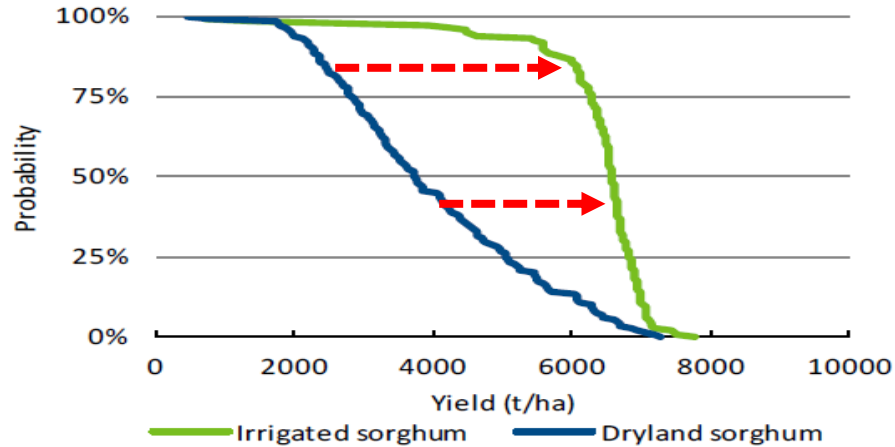
# Irrigation is helpful

Georgetown, Qld



# Irrigation is helpful

Georgetown, Qld

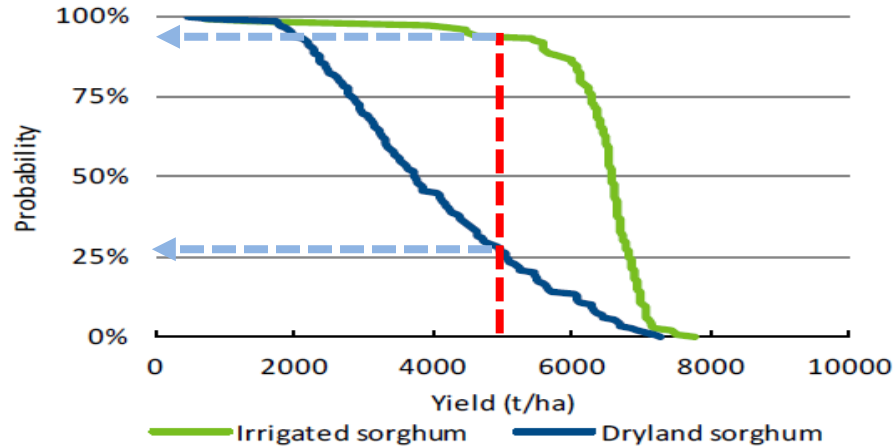


- increases yield >2x



# Irrigation is helpful

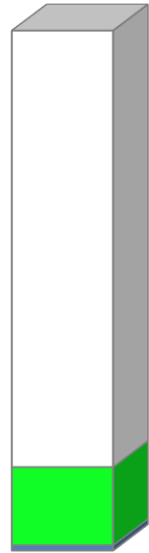
Georgetown, Qld



- break-even yield 3x

water is required for the north to reach its potential

# Water availability in northern Australia



evapo-transpiration (>80%)

stream flow (<15%)

groundwater (<2%)

2,000,000 GL of rain falls on NA each average year

# Rainfall

2,000,000 GL  
rainfall



100%

# Rainfall-streamflow

200,000 GL

stream  
flow



10%

# Rainfall-streamflow-storage



can store more water, but reliability drops



# Rainfall-streamflow-storage-yield



# Rainfall-streamflow-storage-yield-loss



# Most water can't be delivered to crops

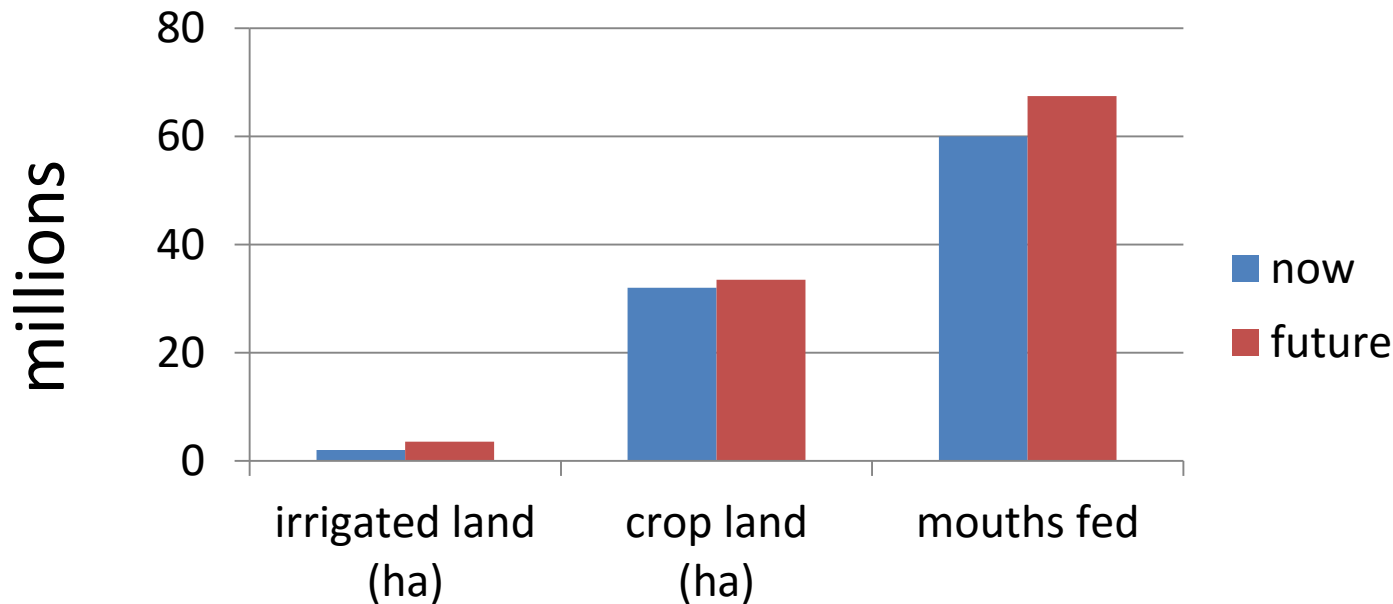
200,000,000 ha



1,500,000 ha

water sufficient for 0.4% of NA – 10% of suitable soil

# If all that water was used for agriculture...



irrigation up 75%   crop up 5%   mouths fed up 13%

# Is that a food bowl's worth?



## 7.55 million additional mouths

- Perth - x4
- Melbourne & Sydney - 87%
- Asia - 0.2%



65 days of Asia-Pacific  
population growth



# What would that require?

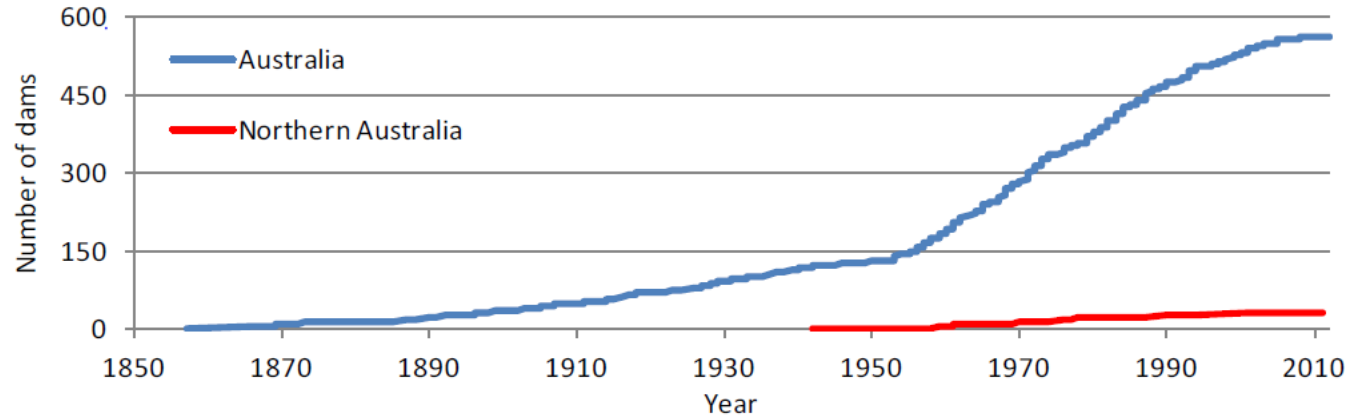


Figure 1-1 Cumulative number of large dams (>10m wall height) in Australia and northern Australia over time since European settlement

# What would that require?

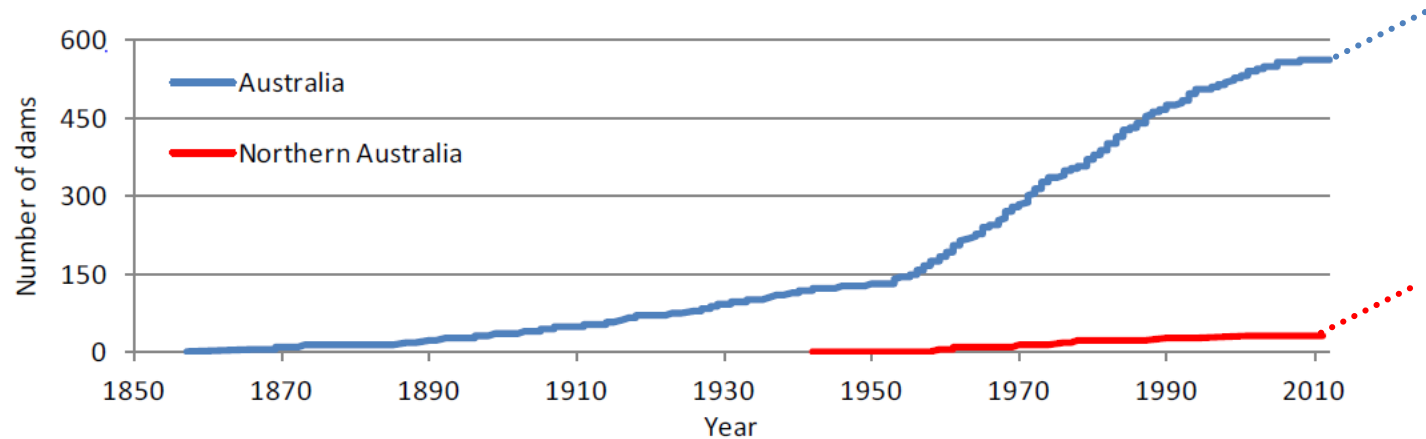
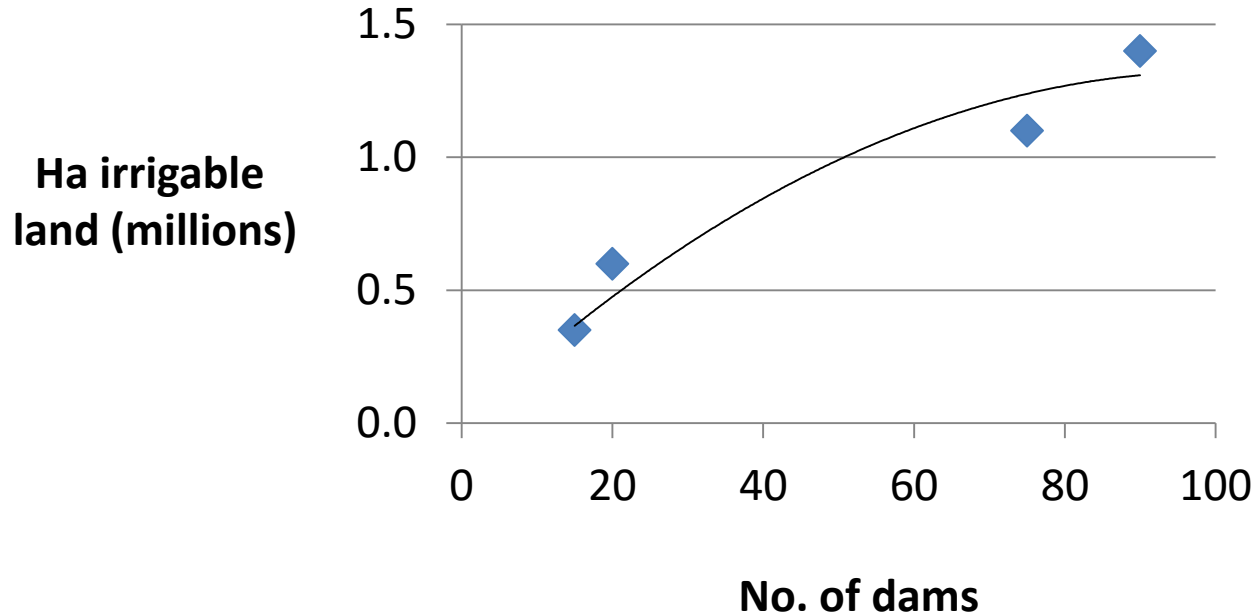


Figure 1-1 Cumulative number of large dams (>10m wall height) in Australia and northern Australia over time since European settlement

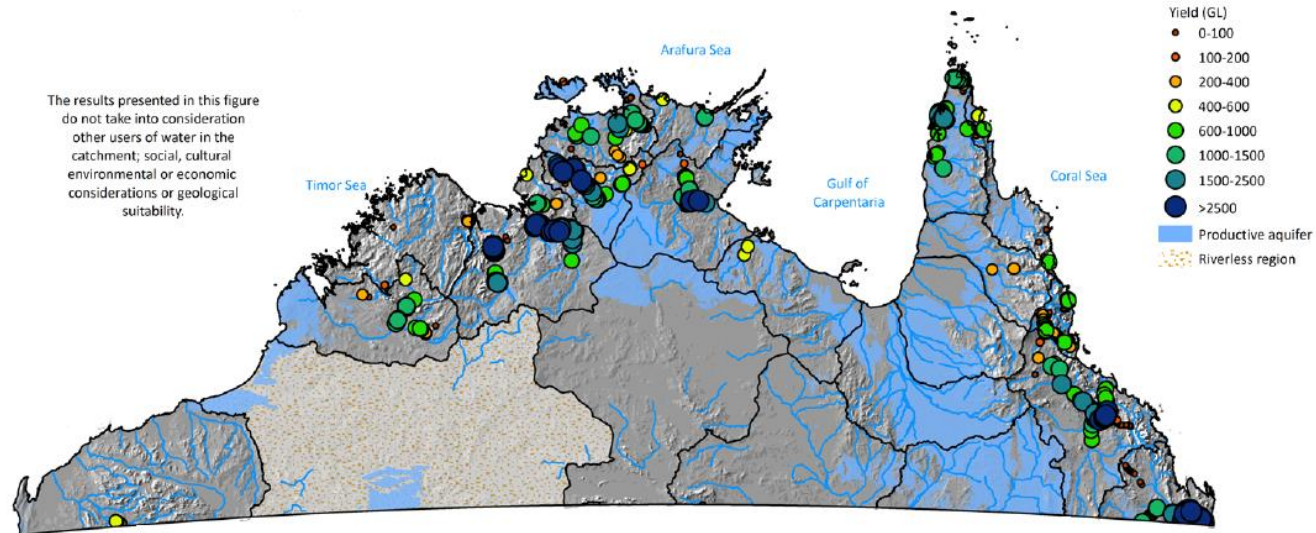
90 new dams - cost >\$45b

# If one's goals were more modest...



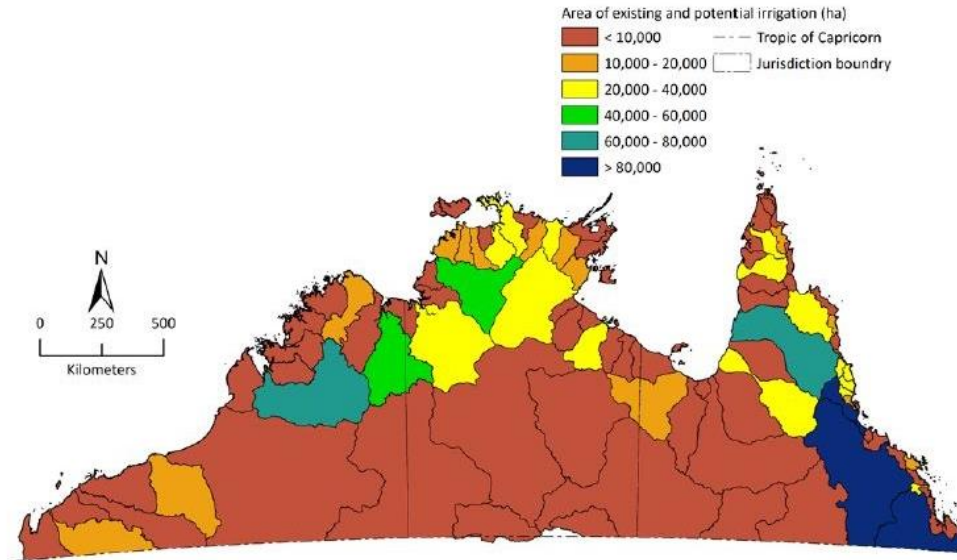
ca 40% of the available area with 20% of the dams

# Where could dams be located?



rainfall reliability an important factor

# How might irrigation be distributed?



...but co-location of soil and water also important...



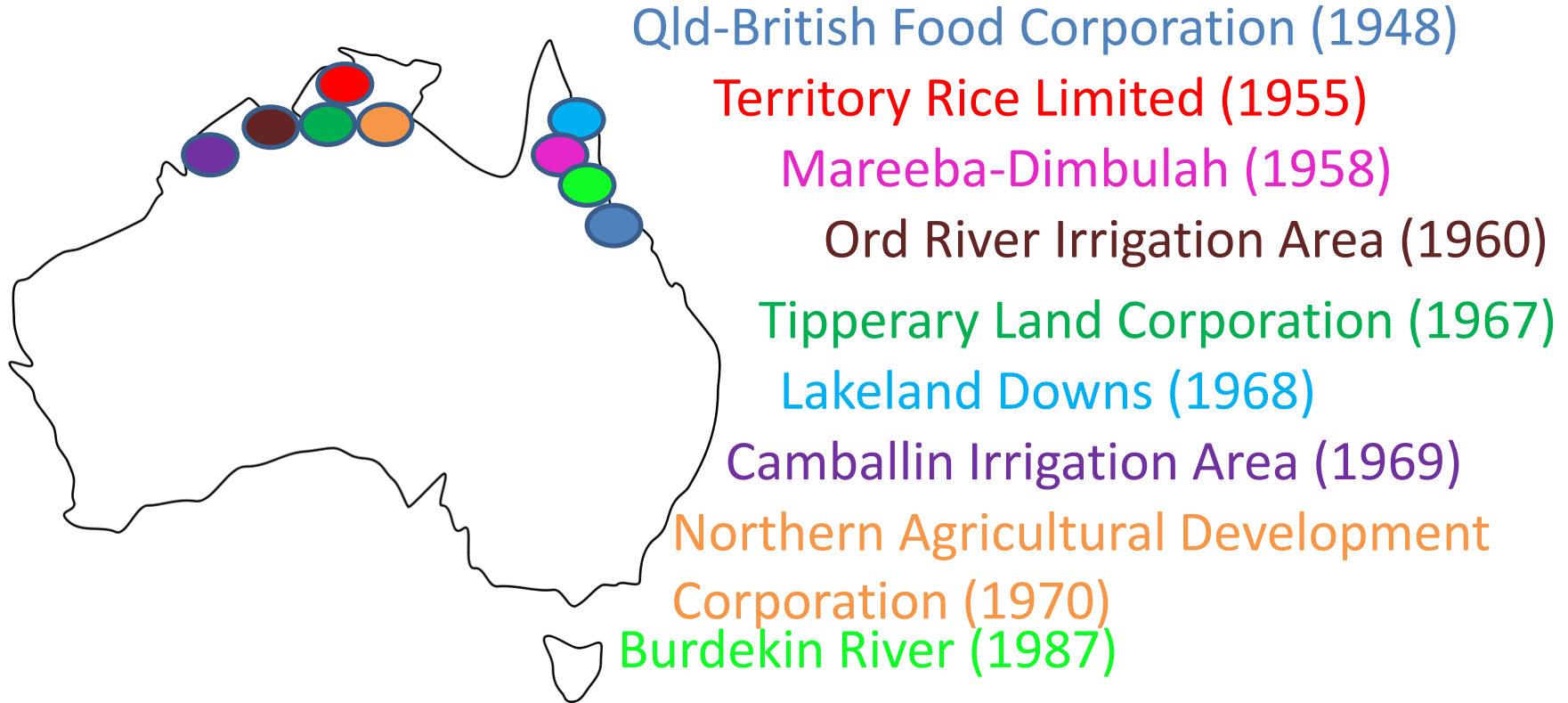


are physical resources enough to secure development?

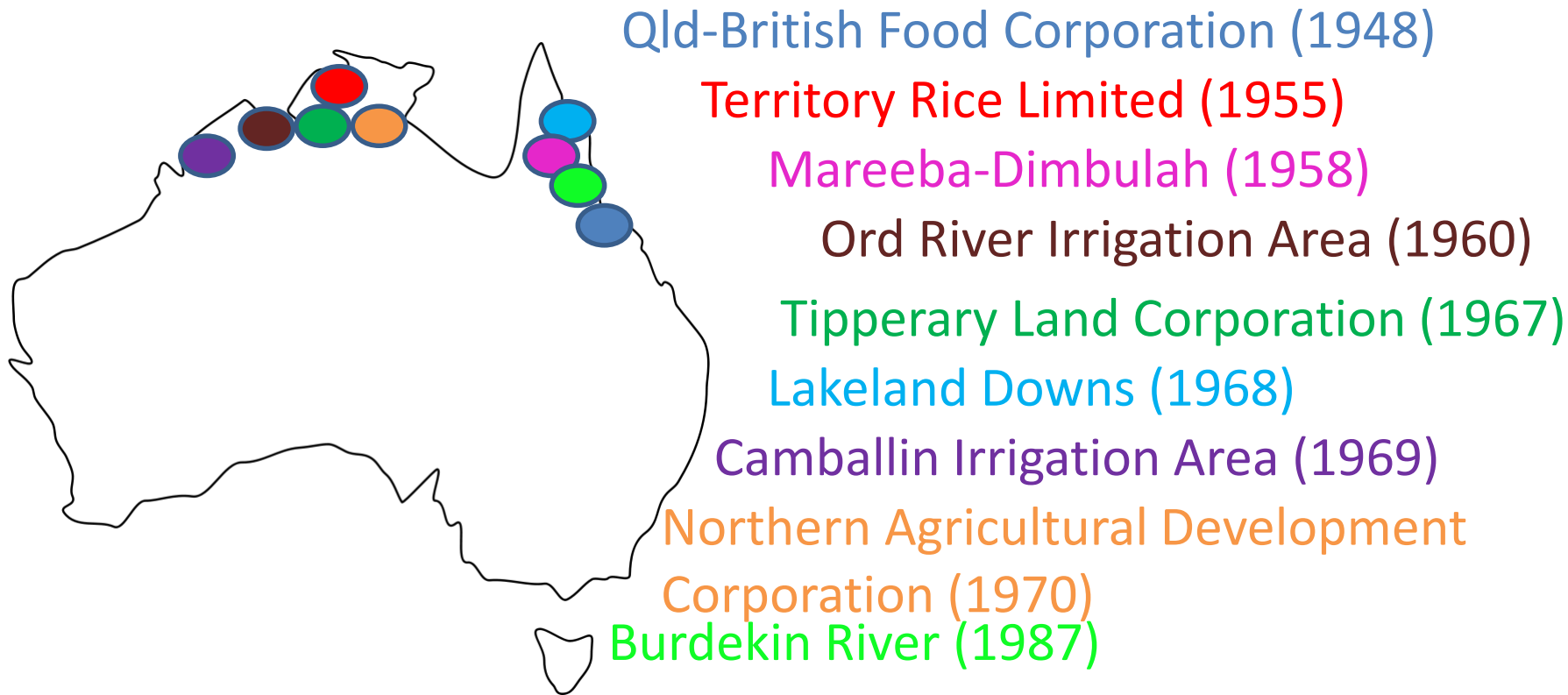


‘whole of development’ economics have proven challenging

# A history of irrigated development attempts



# A history of irrigated development success



# Anatomy of failure



- natural environment challenging but not main source of failure
- management, planning & finances most important
- overcapitalising early, before lessons learned

impatience costly

# Anatomy of success



- climate, soils, farm operations, markets & supply chains viewed as an inter-dependent system
- up-scaling occurs at a considered pace
- allow for lags before investment returns

patience a profitable virtue

# Unlocking development in northern Australia



- the basic resource base is plentiful
- the physical environment is challenging but not decisive
- soft and hard infrastructure are limiting; variously shrinking/growing
- investment horizons are extended and less certain

planned and patient capital is key

Thank you

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