PRIMARY INDUSTRIES & REGIONS SA
PIRSA

New Horizons

Releasing the Productive Potential
Across 40% of SA

Release Productive Potential

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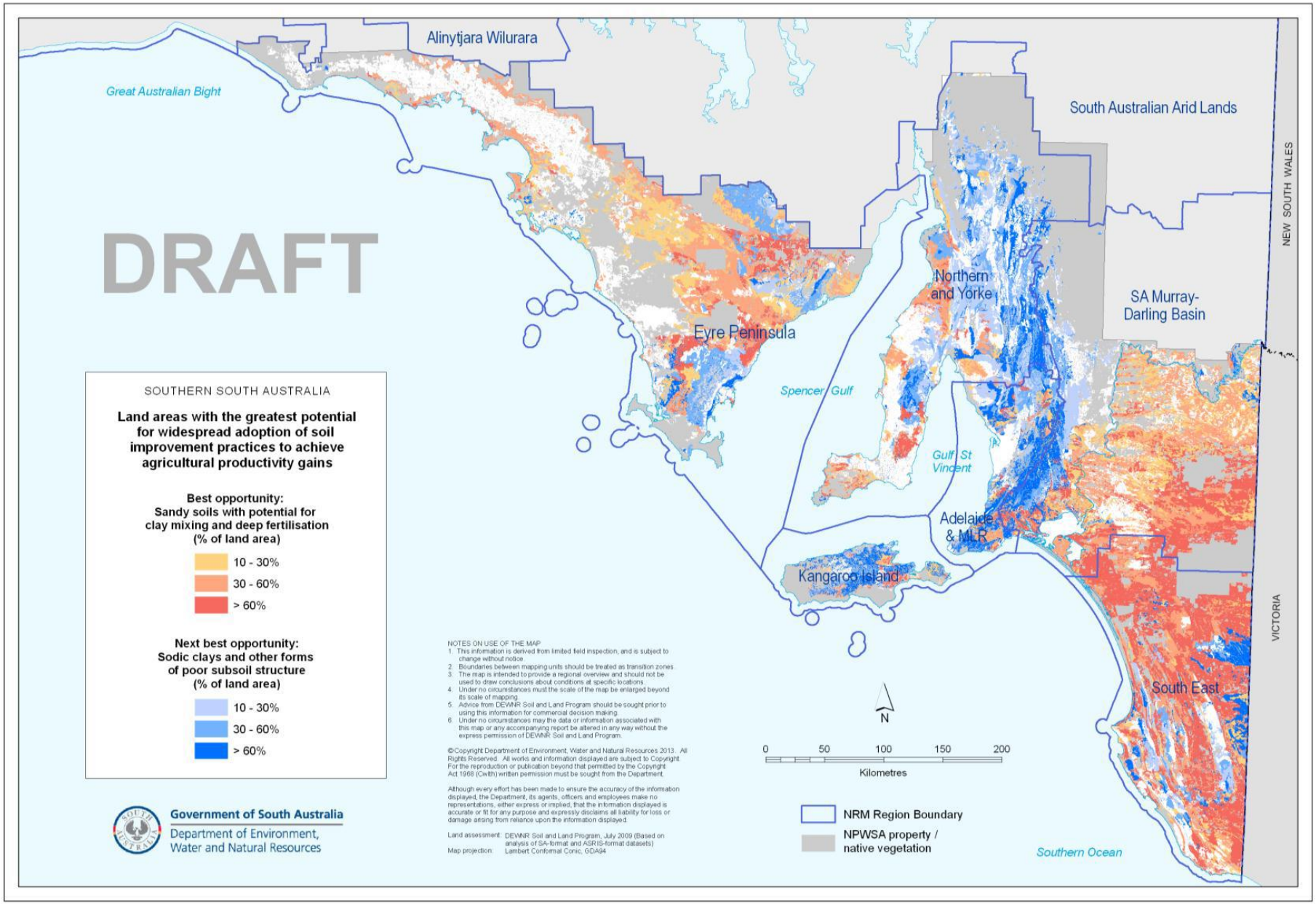
Potential
- Overcome soil limitations across 40% of SA cropping
- Would achieve $1 billion increase in food production
- And 200 M tonnes of CO2-e
- And Reduced long term soil erosion risk

Roadblocks
- Proven, consistent methods to address soil constraints profitably

New Horizons
- Science to understand the processes leading to effective soil modification
- Trials to understand how to achieve results consistently
- Engineering to improve machinery design
- Demonstration and extension
- Aim for broad-scale, rapid change in investment and practice

Sub-soil constraints

- **Poorly structured, low fertility sandy soils**
- **Poorly structured clay sub-soils**
- Alkaline soils
- Acid soils
- Boron toxicity
- Salinity


DRAFT
Alinytjara Wilurara
Great Australian Bight
South Australian Arid Lands
NEW SOUTH WALES
Northern and Yorke
SA Murray-Darling Basin
Eyre Peninsula
Spencer Gulf
Gulf St Vincent
Adelaide & MLR
Kangaroo Island
South East
VICTORIA
Southern Ocean
SOUTHERN SOUTH AUSTRALIA
Land areas with the greatest potential for widespread adoption of soil improvement practices to achieve agricultural productivity gains
Best opportunity:
Sandy soils with potential for clay mixing and deep fertilisation
(% of land area)
10 - 30%
30 - 60%
> 60%
Next best opportunity:
Sodic clays and other forms of poor subsoil structure
(% of land area)
10 - 30%
30 - 60%
> 60%
NOTES ON USE OF THE MAP
1. This information is derived from limited field inspection, and is subject to change without notice.
2. Boundaries between mapping units should be treated as transition zones.
3. The map is intended to provide a regional overview and should not be used to draw conclusions about conditions at specific locations.
4. Under no circumstances must the scale of the map be enlarged beyond its scale of mapping.
5. Advice from DEWNR Soil and Land Program should be sought prior to using this information for commercial decision making.
6. Under no circumstances may the data or information associated with this map or any accompanying report be altered in any way without the express permission of DEWNR Soil and Land Program.
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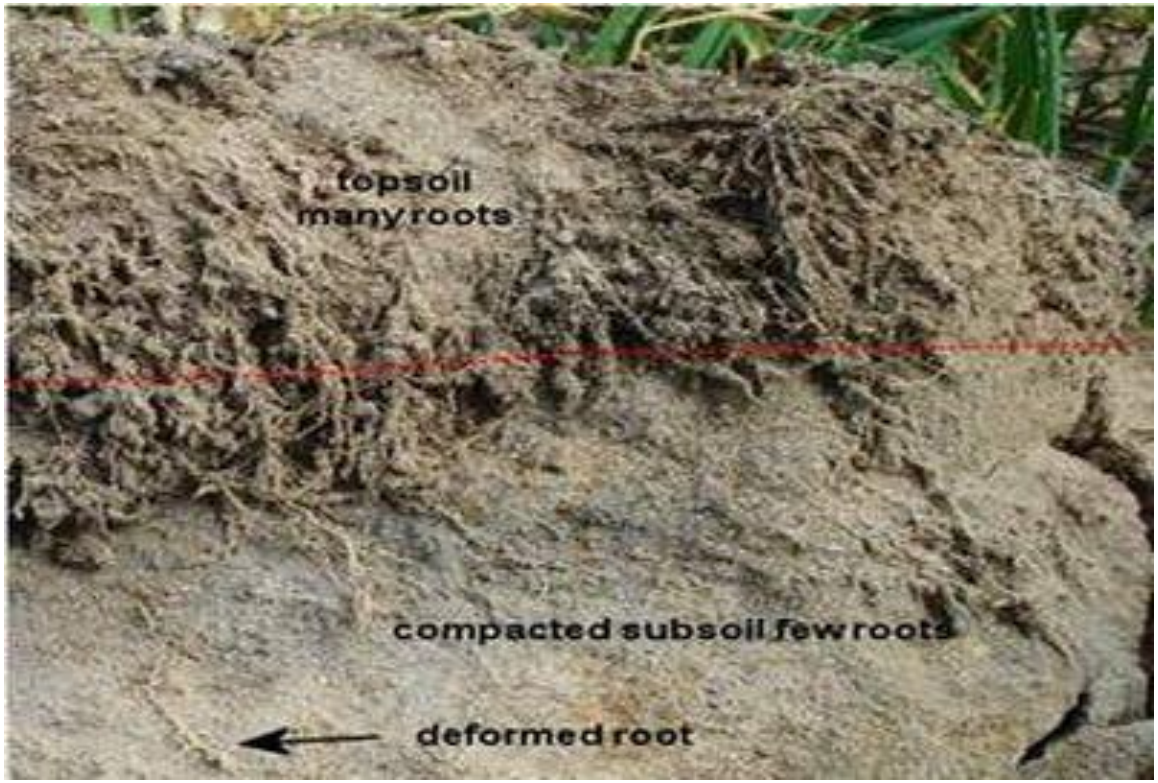
Land assessment: DEWNR Soil and Land Program, July 2009 (Based on analysis of SA-format and ASRIS-format datasets)
Map projection: Lambert Conformal Conic, GDA94
N
0 50 100 150 200
Kilometres
NRM Region Boundary
NPWSA property / native vegetation
Government of South Australia
Department of Environment, Water and Natural Resources

Sandy soils

- 2.8 million ha in SA
- 40% to 50% WUE
- Low technical risk – we know the problem and can demonstrate solutions (albeit not consistently)
- Potential for crop and pasture yield increases of 70% on average
- Potential for 200 Mt CO2 storage



- Big opportunity is to improve root exploration further down the soil profile and increase water use efficiency

Clay mixing

Study	Crop	Treatment	Yield Improvement
Cann 2000	Pasture	Clay mixing 160 t/ha clay	100%
Eldridge 2007[7]	Barley	Clay mixing to 50cm + fertiliser	60% - 90%
Hall et al 2010[8]	Canola	Clay mixing 300 t/ha clay	80% - 100%
Hall et al 2010	Barley	Clay mixing 300 t/ha clay	29%
Hall et al 2010	Lupin	Clay mixing 300 t/ha clay	29%
Rebbeck et al 2007[9]	Wheat	Clay mixing 48cm – 72cm	60% - 200%
Davoran et al[10]	Wheat	Deep ripped 60-80cm	20%
Carter and Heatherington[11]	Barley	Clay mixing 100 t/ha clay (WA)	71%
Masters[12]	Wheat	Clay mixing to 30 cm + Organic matter (10 t/ha)	34% - 71%

- Average 70% yield increases – improved water penetration and root growth and exploration

Deep fertilisation

Study	Crop	Treatment	Yield Improvement
McNeil et al 2008	Wheat & Canola	Liquid fertilisation at depth	33% - 150%
SARDI Progress Report	Cereal	Liquid fertilisation at depth	20% - 30%
SARDI Progress Report[13]	Cereal	Granule fertilisation at depth	35% - 85%
Internal Report[14]	Wheat	Deep nutrients	29% - 33%

- Average 70% yield increase – improved root growth and exploration

Poorly structured sodic subsoils

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- 1.7M ha
- We know that gypsum and organic matter can help overcome this issue, but how do we implement profitably?
- Estimated that yield increases would be similar to those demonstrated on sandy soils based on WUE

Road blocks to adoption

- Triability
- Observability
- Relative Advantage
- Compatability
- Complexity

ADOPT model

Triability

- Trials have been haphazard, not coordinated, funded to address NRM issues in particular
- New Horizons would have trials in all key cropping regions of SA, properly designed and controlled
- Trials would be undertaken in partnership with Farming Systems Groups and Agricultural Bureaux

Observability

- Individual farmers have played around with some of these techniques, but results are mixed
- The message to farmers looking over the fence is that it is risky
  - Some areas get 6x yield
  - Some get yield decline
- We want at least three demo sites in each of seven regions
- We want properly designed, replicated experiments carried out to a high standard, that shows us how to get consistent results

Relative Advantage

- The up-front costs of implementing sub-soil modification can be significant ($80 - $400/ha)
- Bankability - The benefits of increased yield only justify the investment if the results can be achieved reliably
- Our research must elucidate the process, so that we can make reliable predictions of efficacy

Relative advantage

- Sub-soil modification creates significant surface disturbance and reduces trafficability in the first year
- We propose an engineering program to design soil modification equipment that reduces the risks of implementing sub-soil modification

Compatibility

- Unless sub-soil modification fits within the broader paradigm of agronomy, adoption will be less
- We need demonstrations to show how
- We need the engineering program to reduce the risks to normal farm practice


D10R
PH519


STARTER ISOLATOR
DIESEL FAST FILL
EMERGENCY STOP

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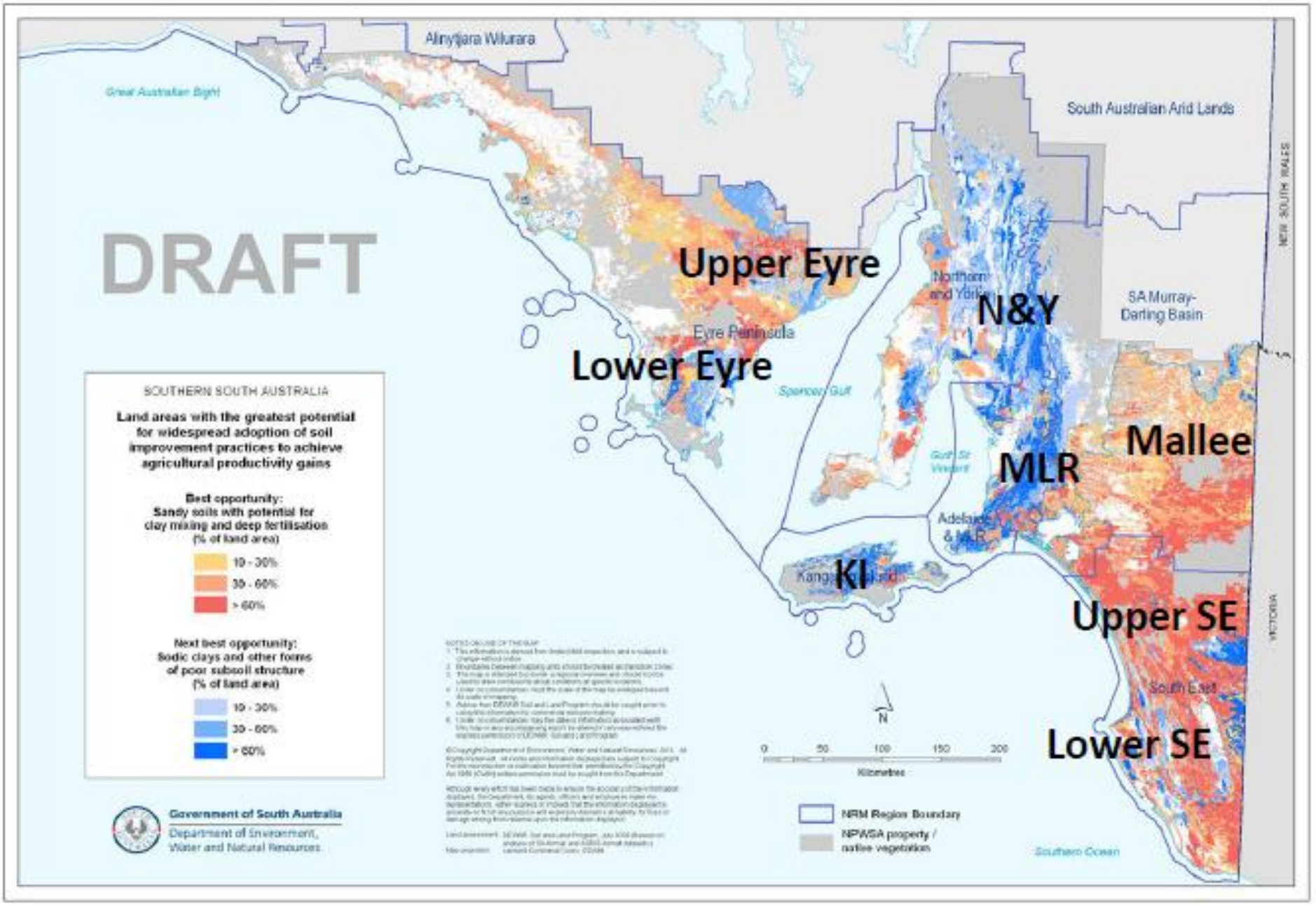
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Establishment Phase 2014

- $852,000 in year one
- Proof of concept
  - Show we can double yield
  - Identify the key knowledge gaps for larger program
  - Build community interest
- Three sites
  - SE (MacKillip), Mallee (MSF), EP (LEADA)
- Social survey of current practice and what it would take for farmers to change practice

Partners

- PIRSA (Trial management and extension)
- University of Adelaide (Soil Science)
- University of SA (Engineering)
- Ag Ex Alliance and Farming Systems Groups (Demonstrations and extension)
- NRM Boards (Communication)
- Private consultants (Extension)
- Private industry (Demonstration)
- GRDC (co-investment and complementary investment)
- Seeking Federal funding

Discussion Points

- What would it take for you to make an investment in sub-soil modification?
  - Your neighbours?
- How much would you experiment first before expanding across your farm?
  - Your neighbours?
- What would it take for you to get finance? Who do we need to convince?
- What would be the implications for your business if we could double yields?
  - What would it mean for the region?