

Innovation in Agriculture: What will the future look like?

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GTA NSW&ACT Annual Conference
The Place of Geography
Ag to 2030

ANZ Stadium Sydney Olympic Park
2nd April 2019



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Pre-European Soil Classes

Calcarosols

- Genosoil
- Phenosoil 1
- Phenosoil 2
- Phenosoil 3

Brown Kurosoils

- Genosoil
- Phenosoil 1
- Phenosoil 2
- Phenosoil 3

Red Kurosoils

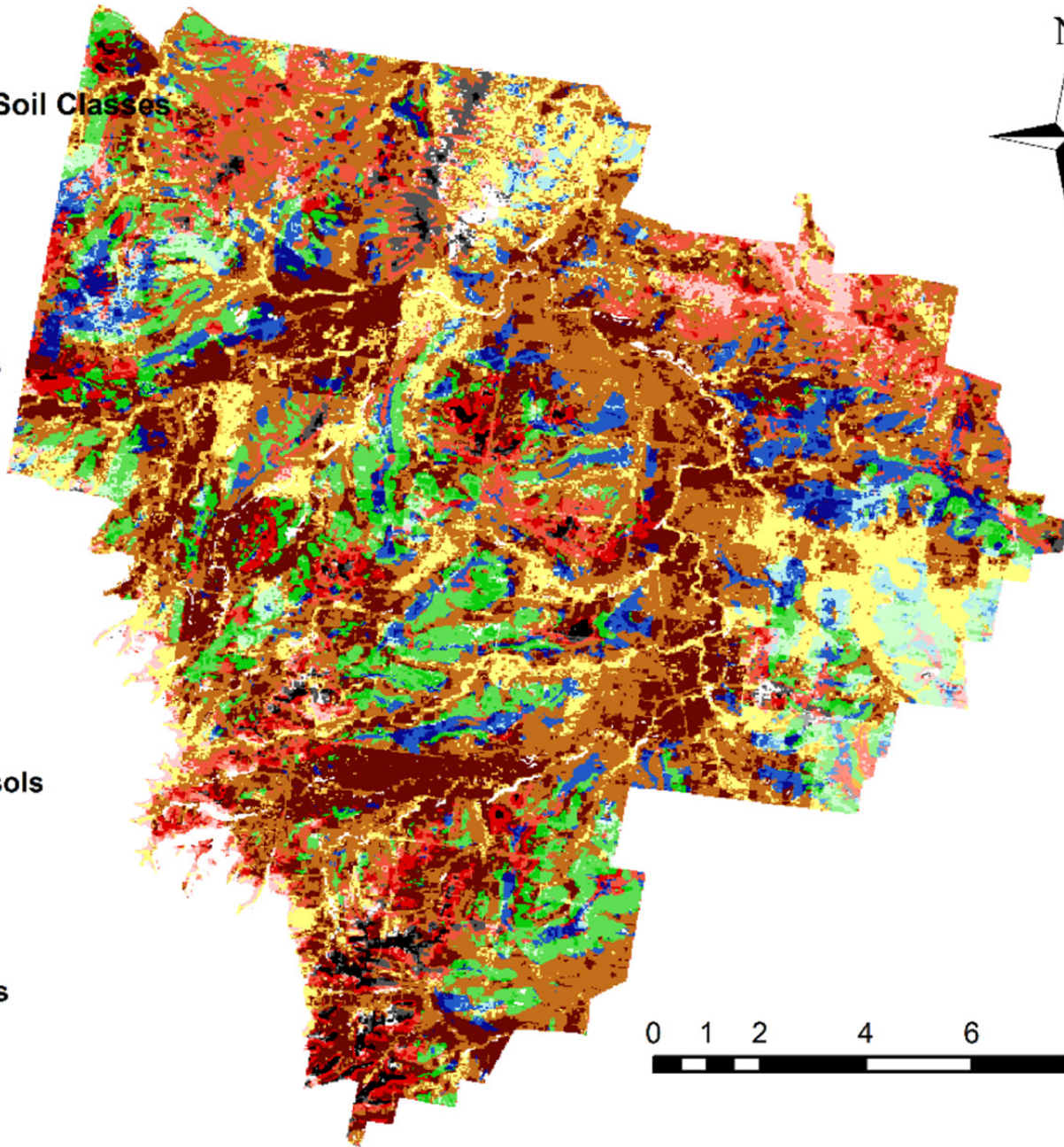
- Genosoil
- Phenosoil 1
- Phenosoil 2
- Phenosoil 3

Brown Chromosols

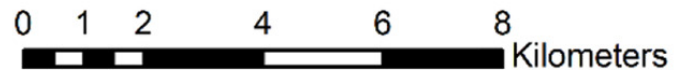
- Genosoil
- Phenosoil 1
- Phenosoil 2
- Phenosoil 3

Red Chromosols

- Genosoil
- Phenosoil 1
- Phenosoil 2
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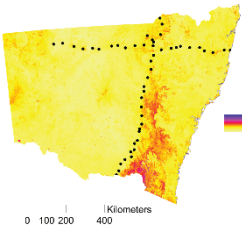
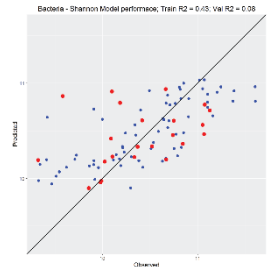
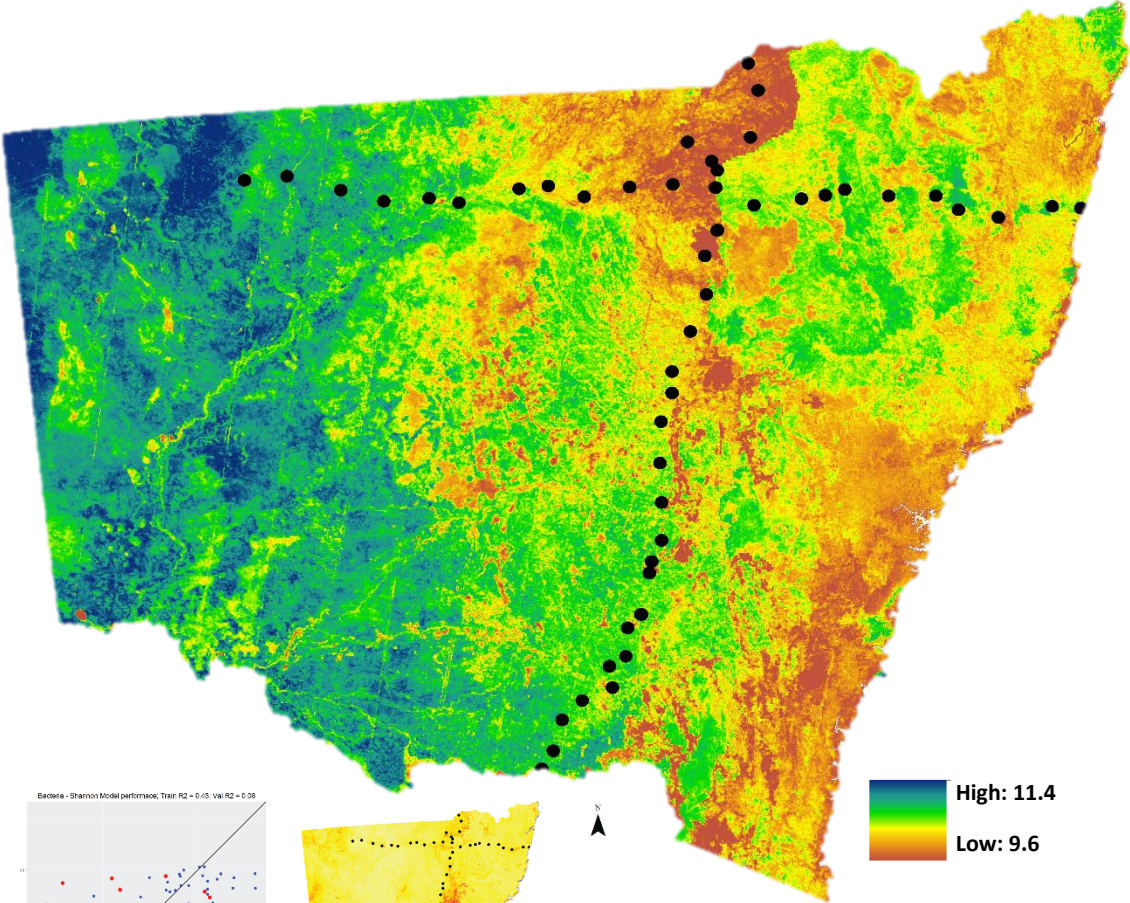


Lower Hunter Valley (Private Irrigation District)



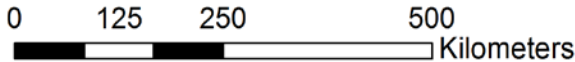
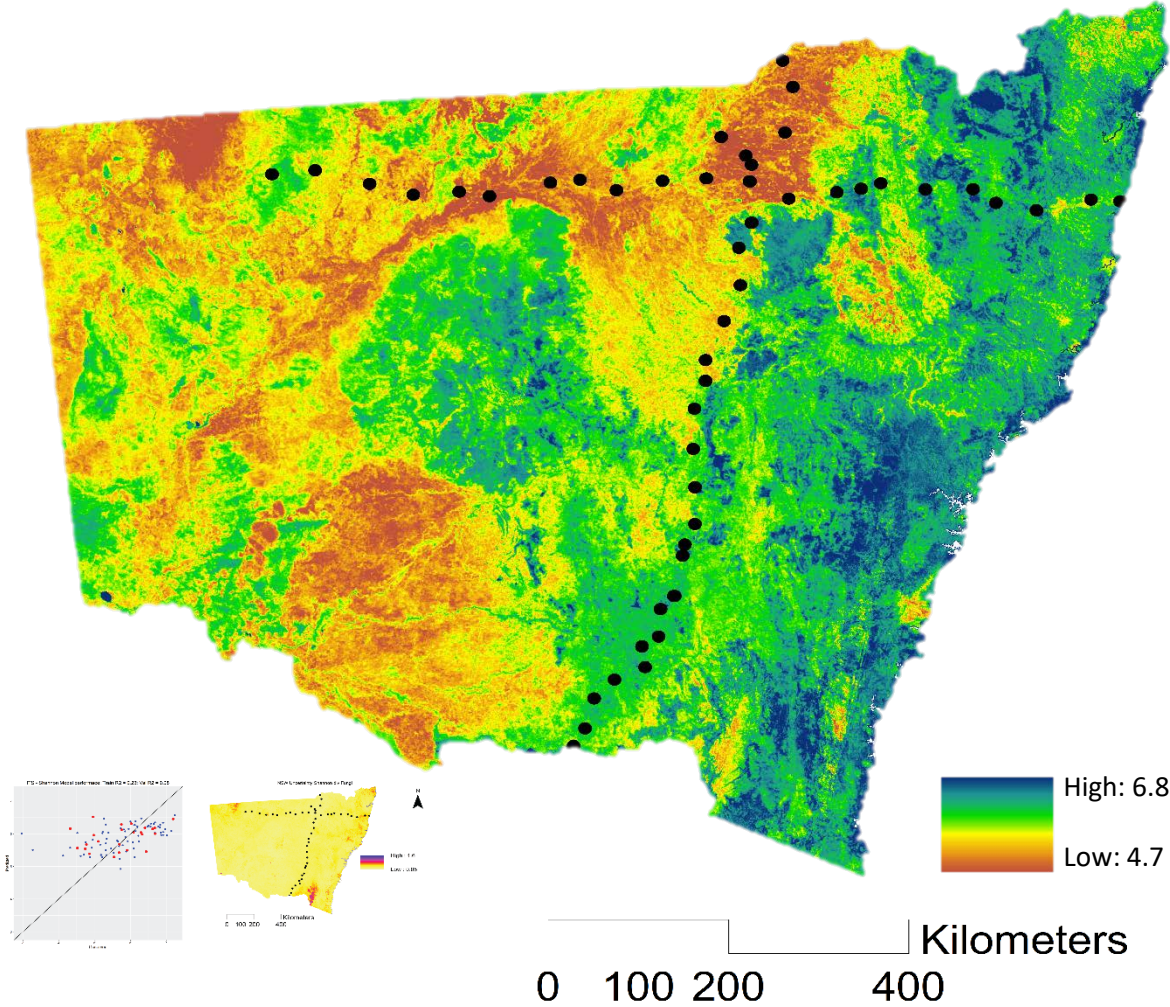
Soil Bacteria

α -diversity - Shannon



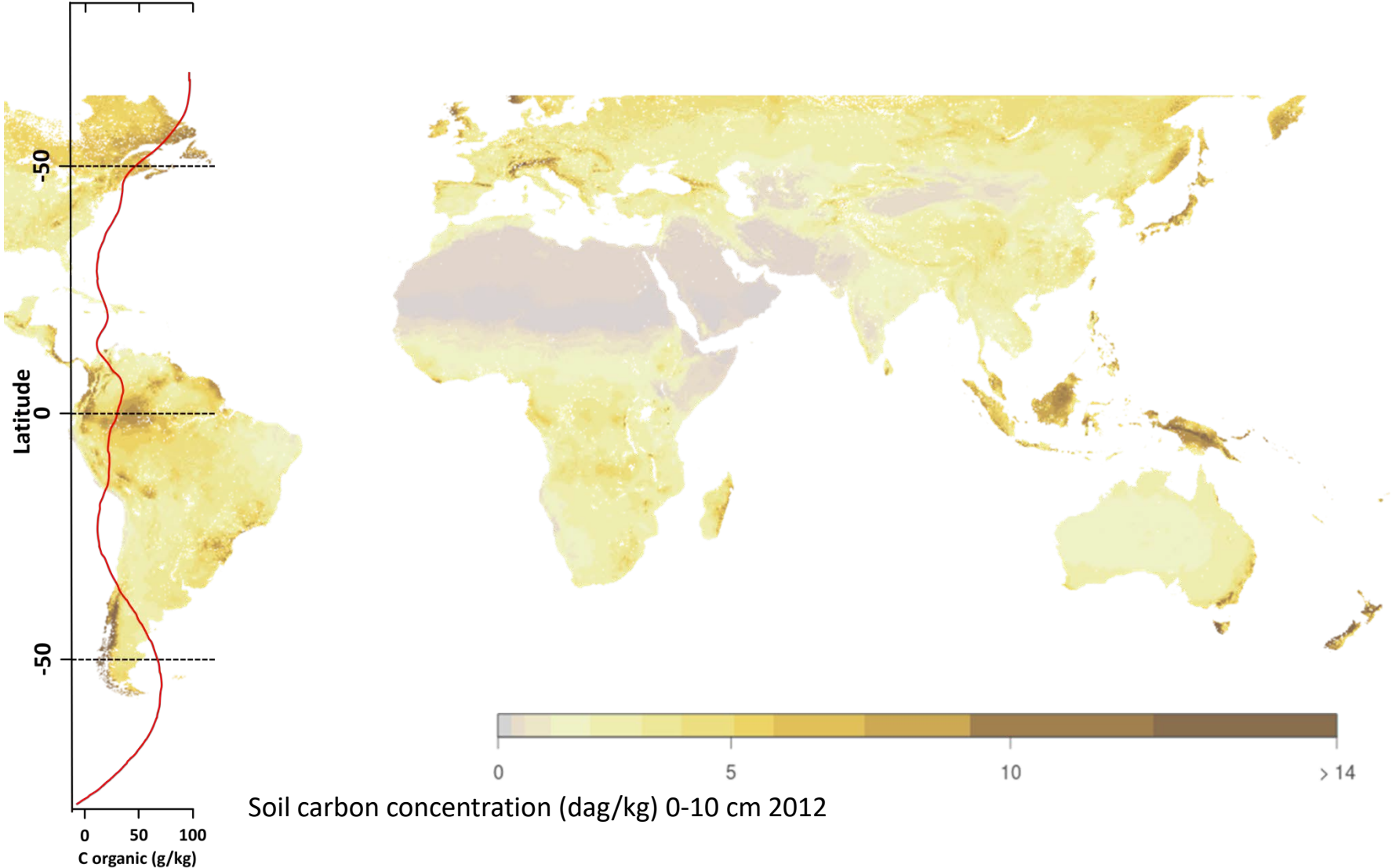
Soil Fungi

α -diversity - Shannon



GLOBAL SPACE-TIME SOIL CARBON ASSESSMENT

2012



Soil carbon concentration (dag/kg) 0-10 cm 2012

\$100 BILLION

CONTEXT

- Ag production will be a \$100 billion business
- AgTech can be bigger than that
- AgKnowHow can be even bigger than that
- So at least \$200 billion – could be a significant portion of GDP

DIGITAL AGRICULTURE?

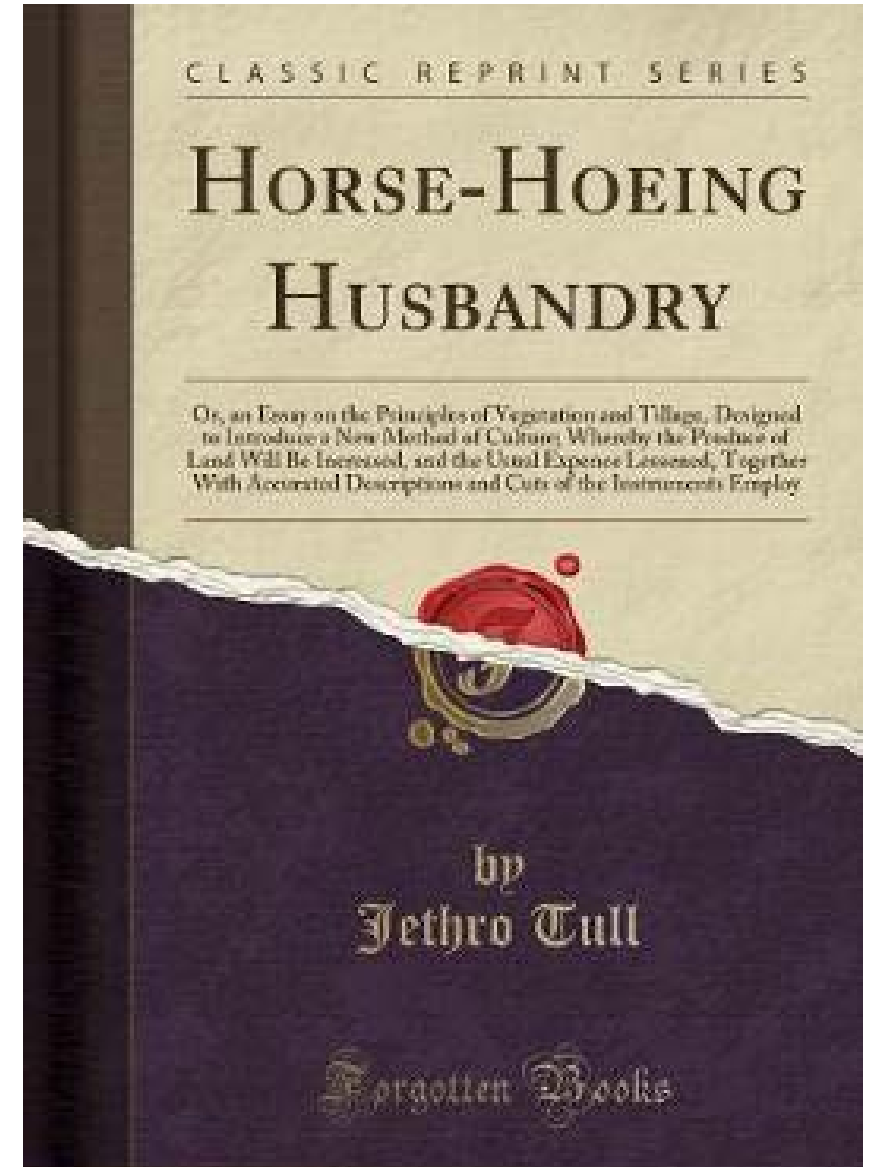
- Technology, yes – but not the fundamental driver
- We need a new way of doing agriculture – better for producers and consumers
- A ‘post-industrial’ agriculture



Enabling technologies to achieve the NEW Agriculture

1. Genes (~30%)
2. *Smart sensors* (~30%)
3. *Data science* (~20%)
4. *Robotics* (~10%)
5. Molecular design (~10%)

my guess



Commodity Death Spiral



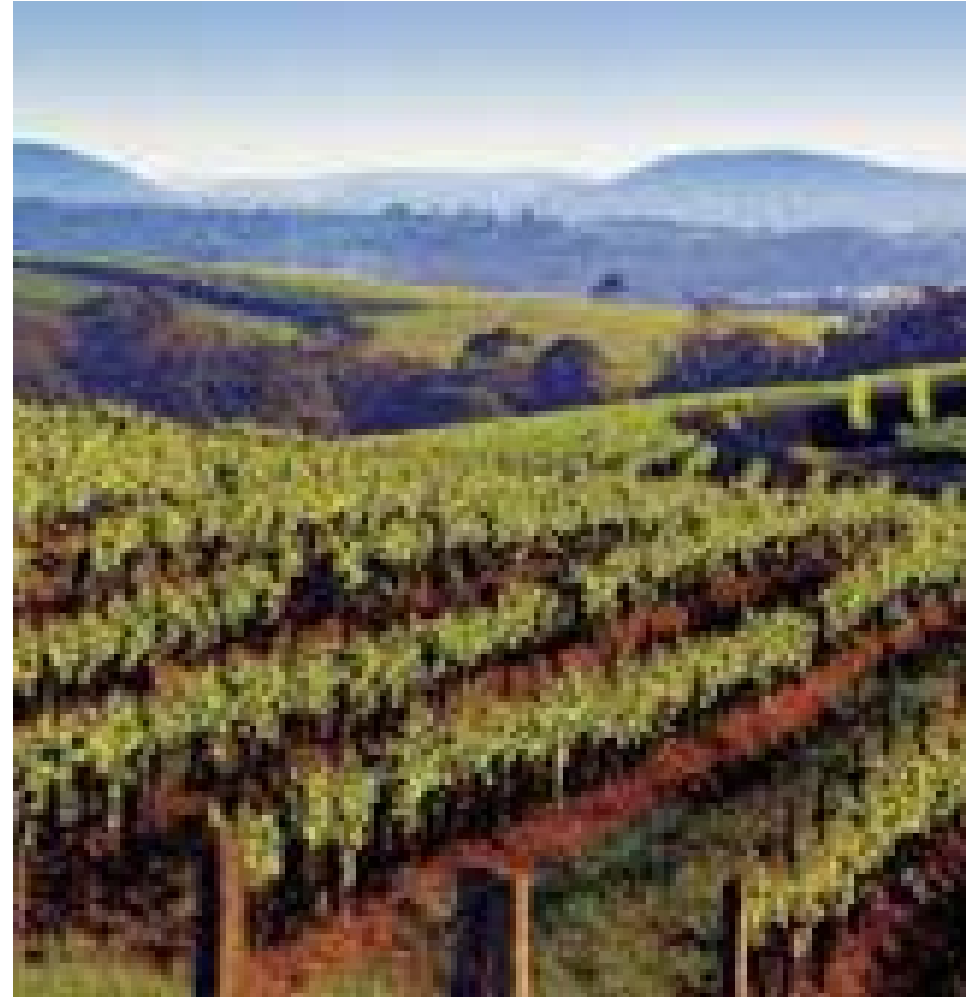
Commoditisation

- the process by which goods that have economic value and are distinguishable in terms of attributes (uniqueness or brand) end up becoming simple commodities in the eyes of the market or consumers.

Decommoditisation

Not decommodification

Basis of high-value ag products, e.g., wine, organic x



Decommoditisation

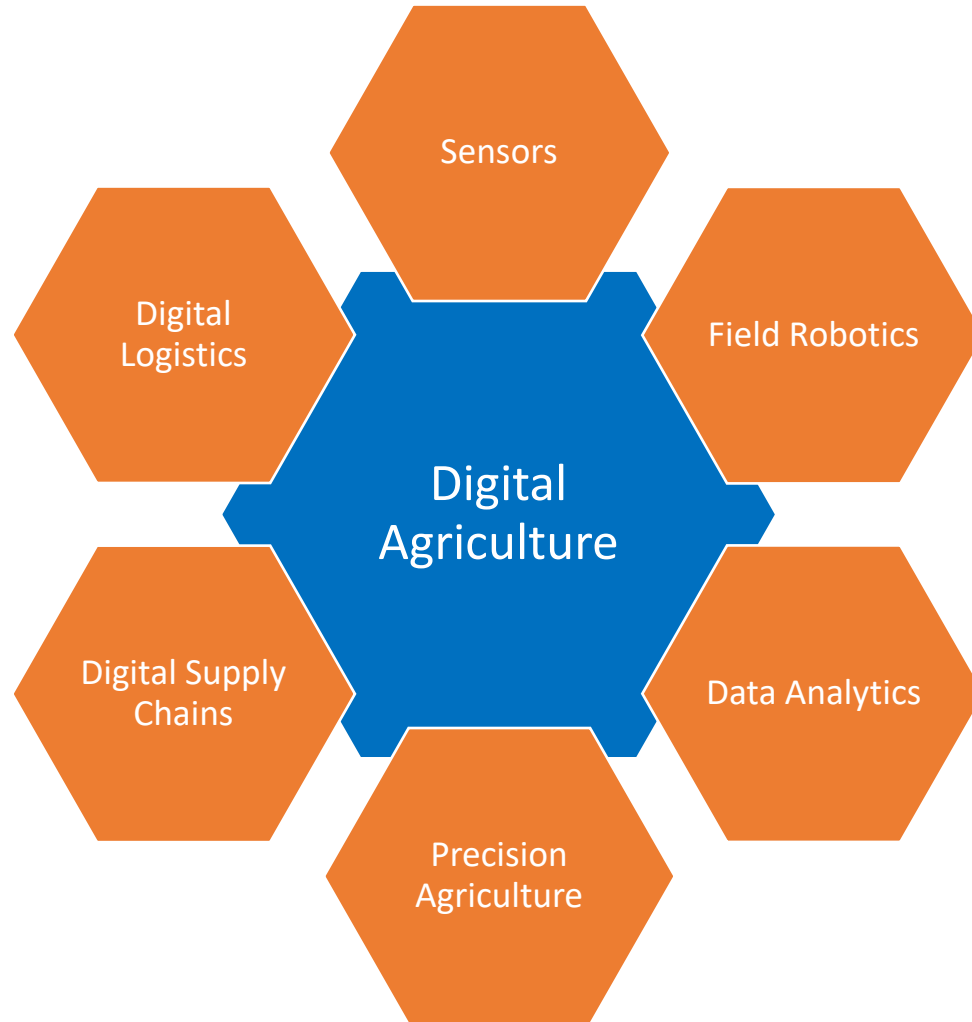


While digital ag. simply comprises optimisation behind the farm gate it can further fuel the commodity death spiral.



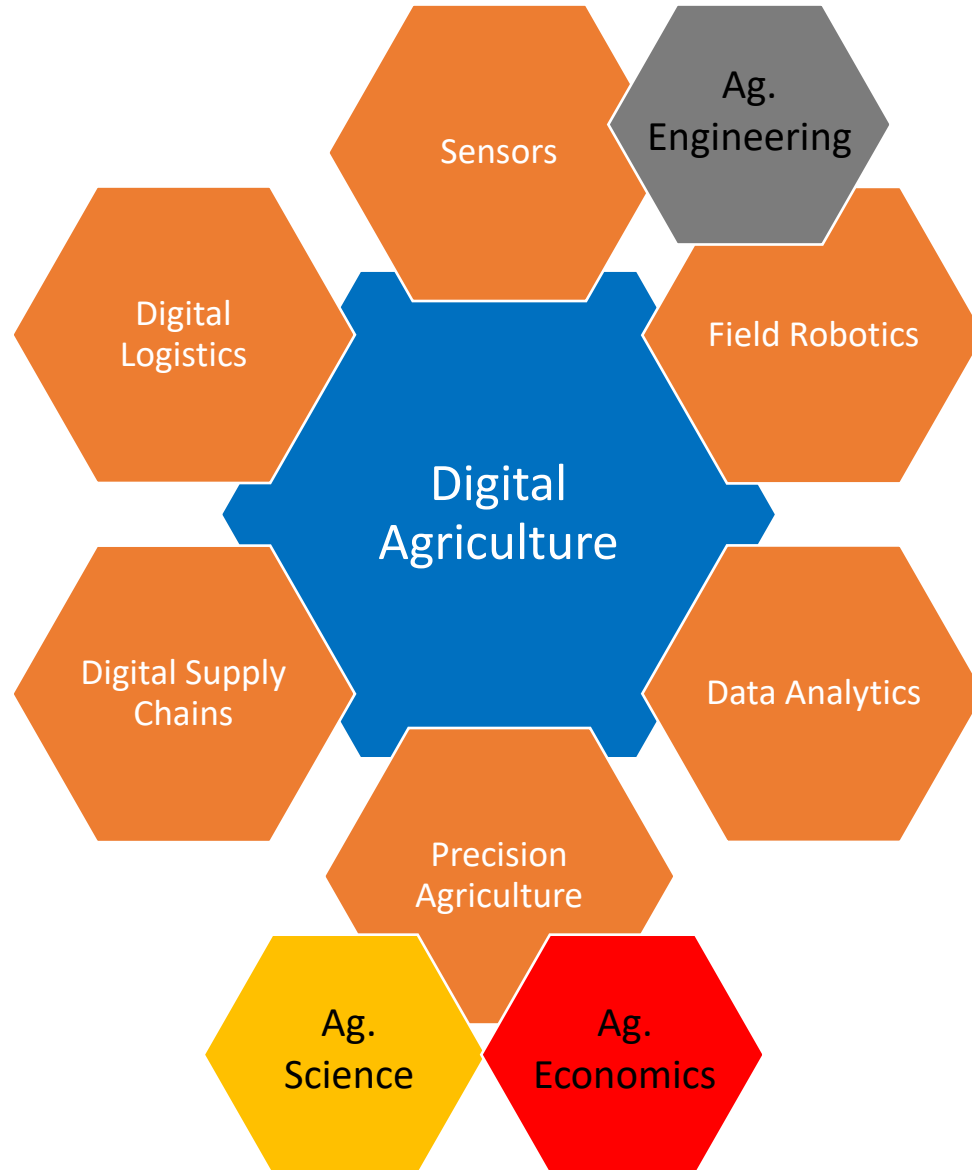
Decommoditised (segregated) product and its associated information has to flow beyond the farm gate through digitally-enabled supply chains to consumers.

WHAT COMPRISES DIGITAL AGRICULTURE?

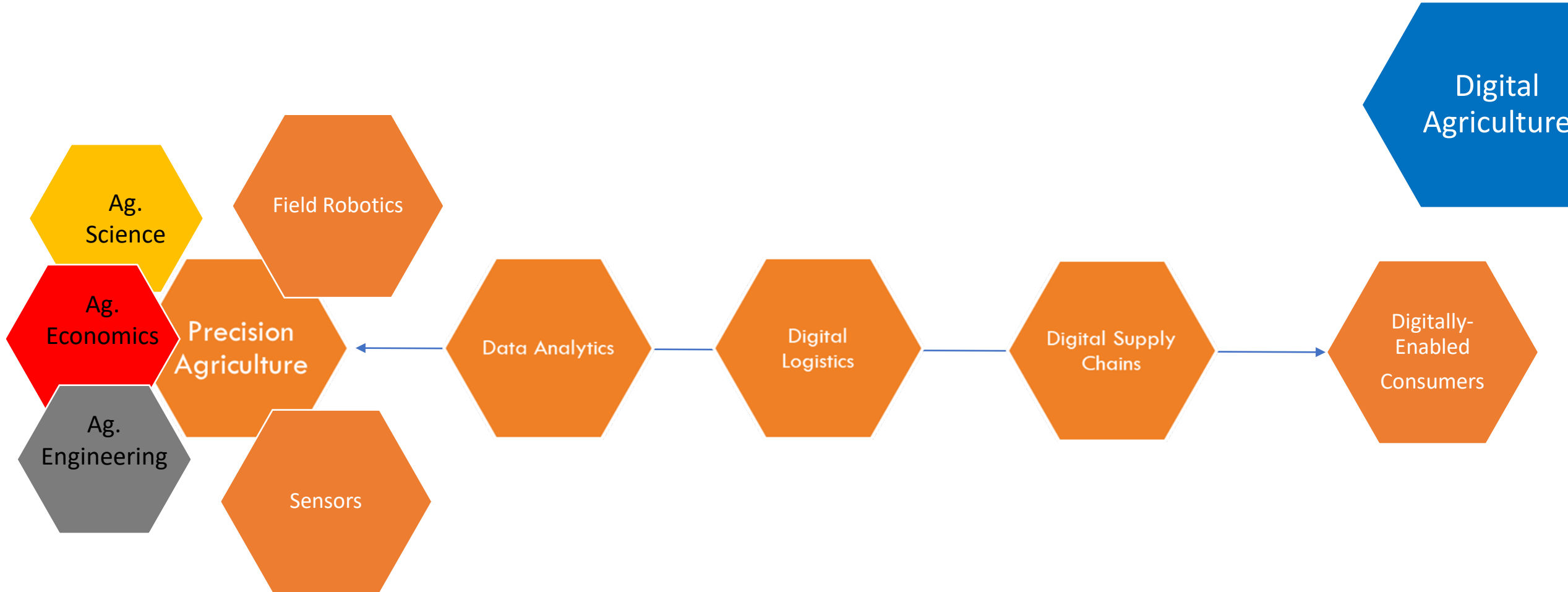


What it looks like at the moment

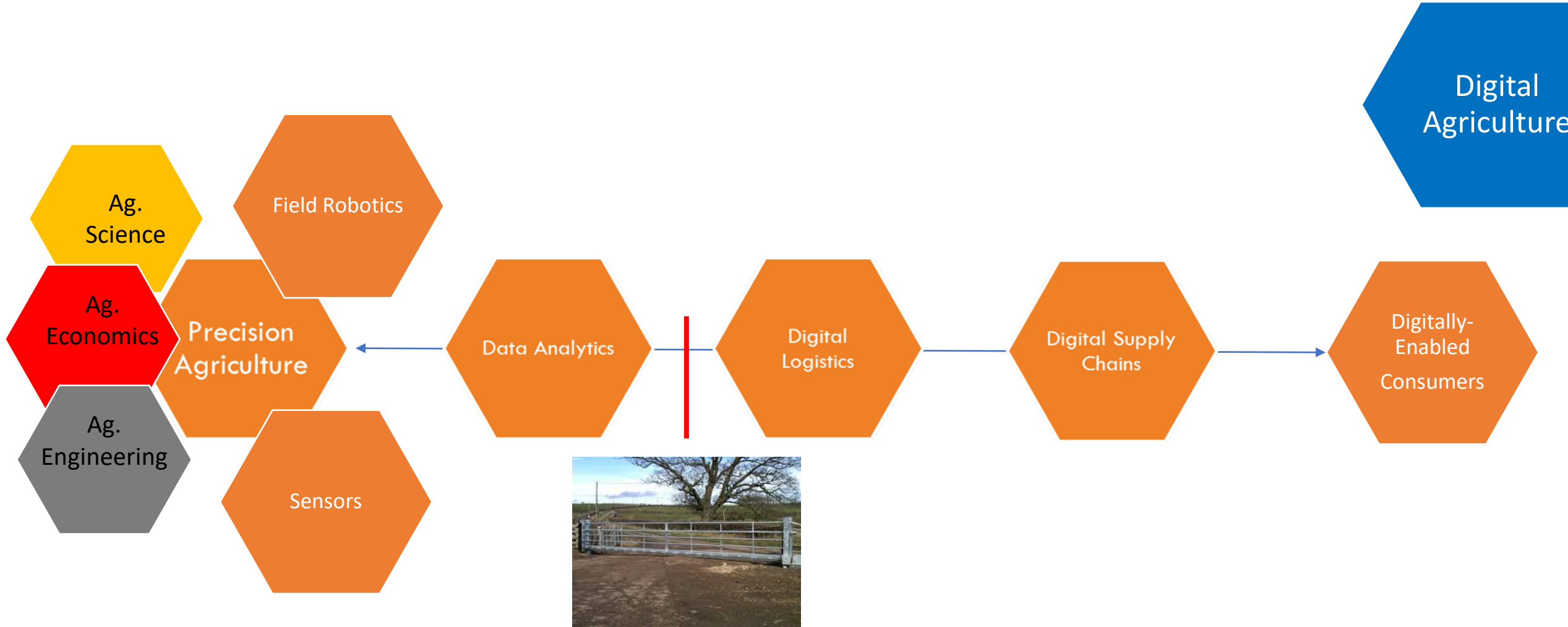
WHAT COMPRISES DIGITAL AGRICULTURE?



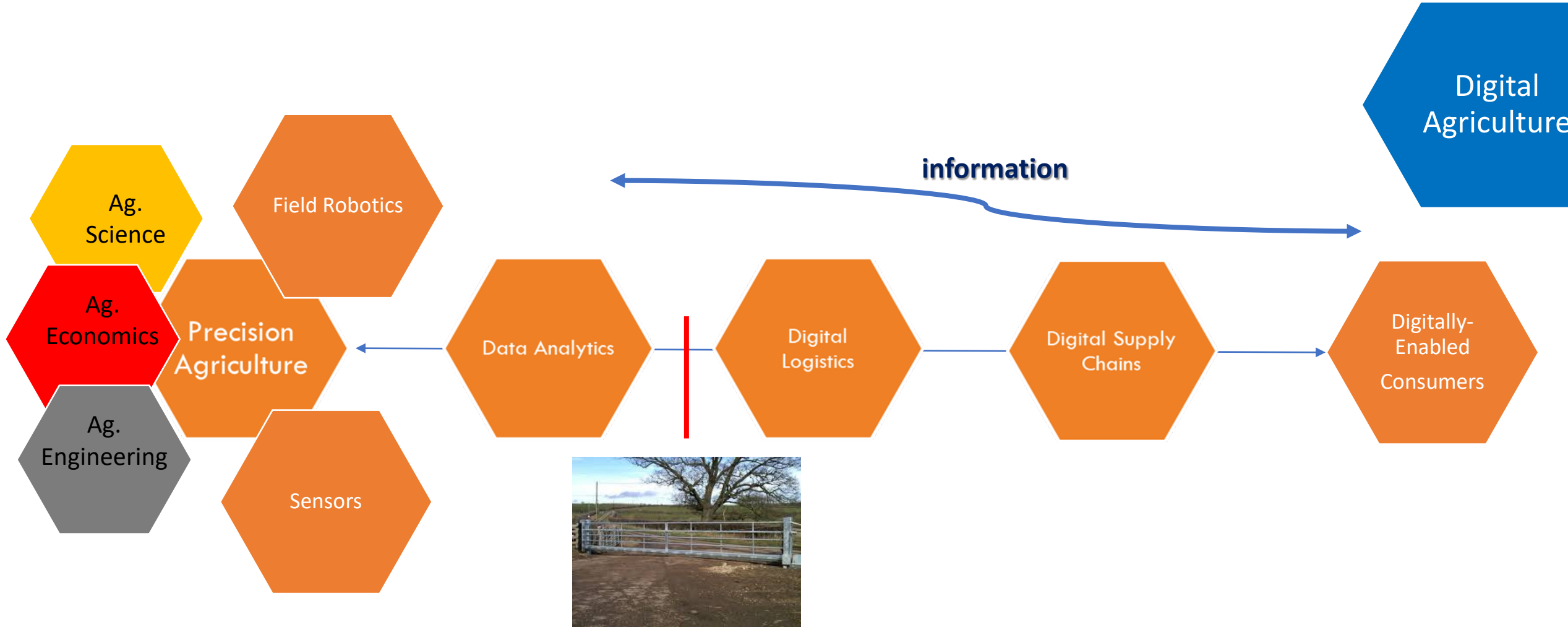
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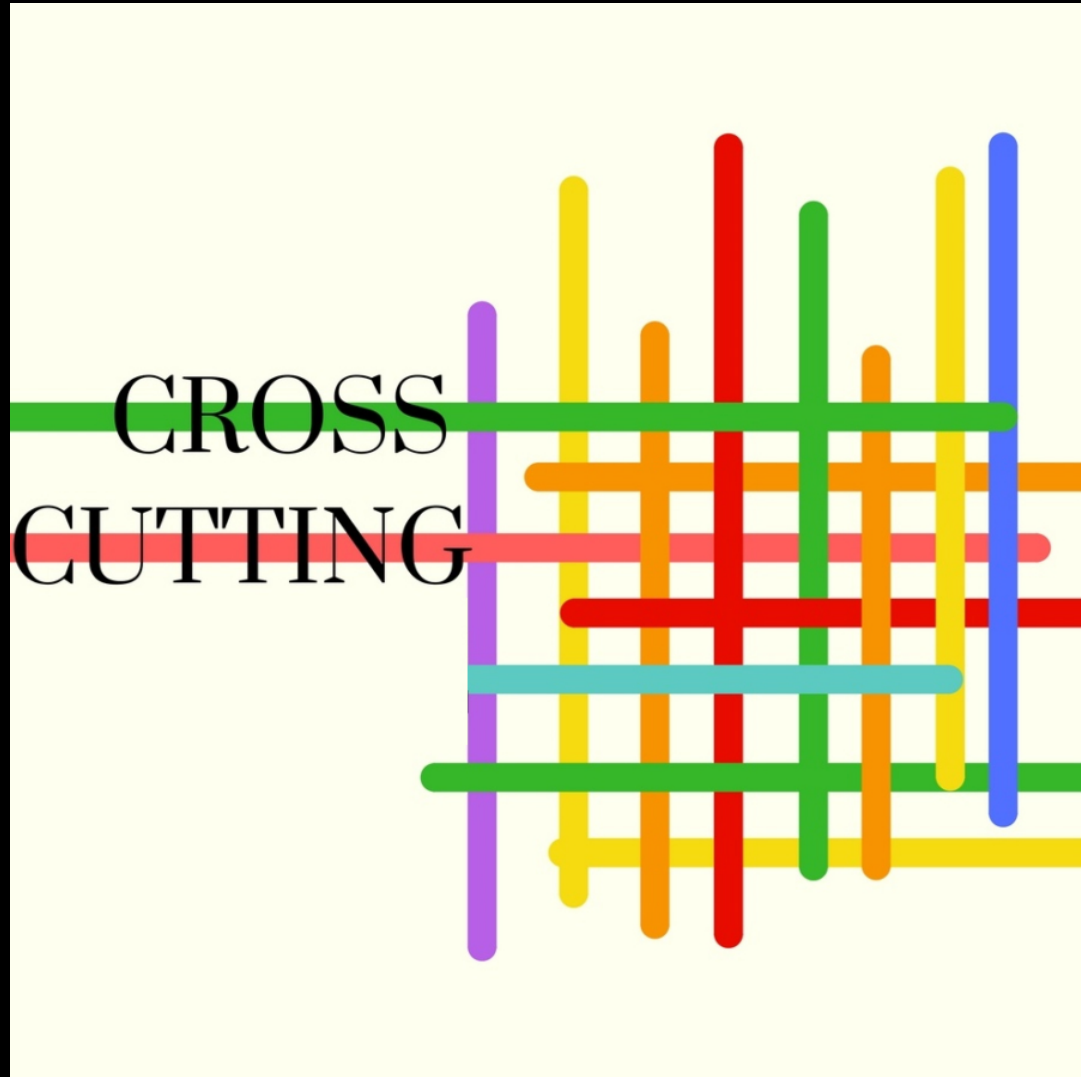
WHAT COMPRISES DIGITAL AGRICULTURE?



WHAT COMPRISES DIGITAL AGRICULTURE?



Needs circularisation



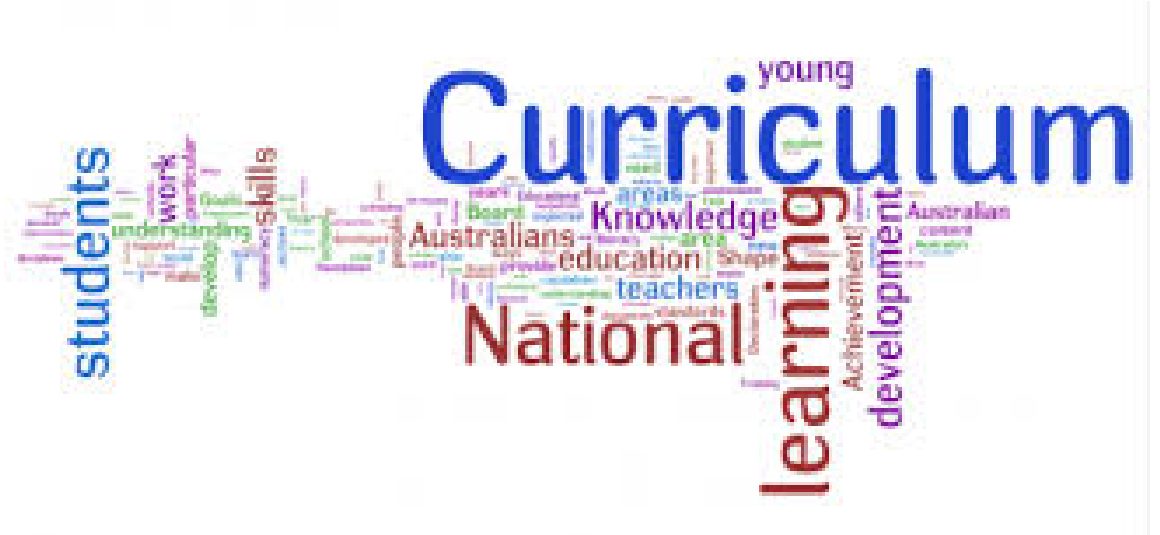
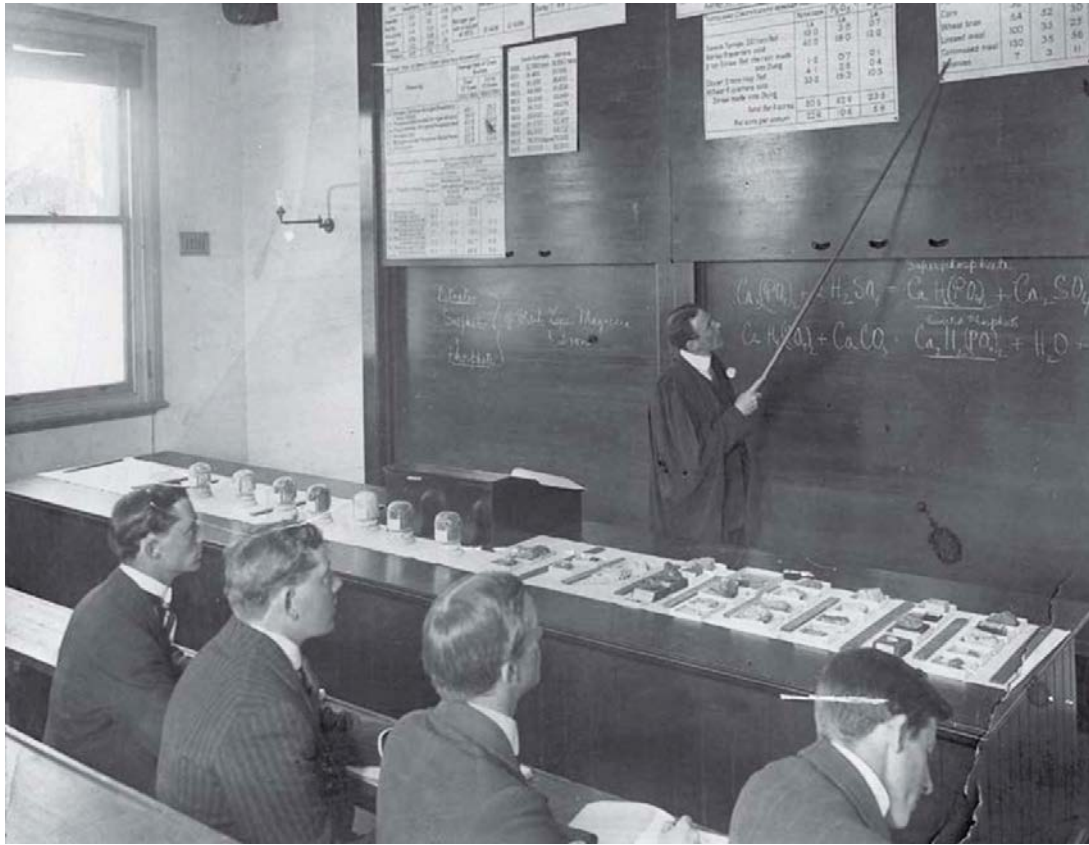
CROSS-CUTTING CONCEPTS

1. Digital transformation
2. Profitability
3. Resilience
4. Provenance
5. Connectivity

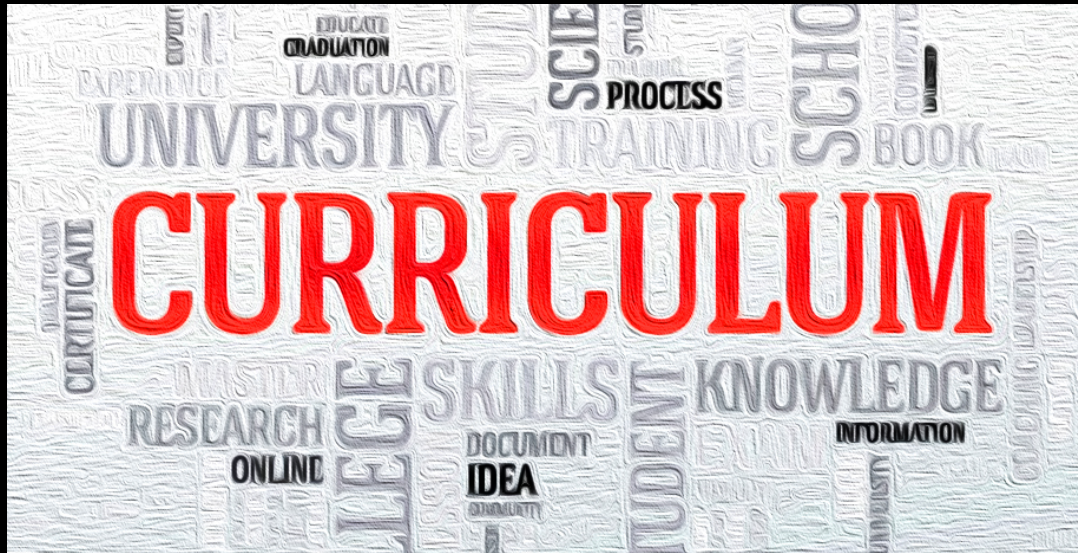


CREATING AND EDUCATING THE 'NEW' AGRICULTURE

- High-tech.
- Decommoditised
- Value-added
- Producer-consumer connected



CURRICULUM



CURRICULUM

**Cross-cutting. multi-disciplinary
AND contextual**

**STEM - perhaps less 'S&M' and
more 'T&E'**

**The jobs of the future will be
different from today**

HYBRID WHEAT

Breakthrough by the late Dr Norm Darvey & Prof Richard Trethowan.

Hopefully will put us on annual 10% yield increment.



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DIGITAL AGRICULTURE



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AreaCrop

Knowing your moisture, means knowing your bottom line.

[SIGN UP TO LEARN MORE](#)

AGTECH
startups

Daily soil moisture mapping



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WHERE ARE WE?

Digital decommoditised agriculture offers the opportunity

We have to develop curricula and standards

..... but nevertheless we are somewhere



“25 BEST COLLEGES FOR PRECISION AGRICULTURE”

<http://www.precisionag.com/service-providers/business-management/25-best-colleges-for-precision-agriculture/#Tinsel/60708/1>

In a very Americocentric evaluation

20 out of 25 in the US

#1 University of Nebraska



PRECISION AGRICULTURE FOR GRAIN PRODUCTION SYSTEMS

**“25 BEST COLLEGES FOR PRECISION
AGRICULTURE”**

<http://www.precisionag.com/service-providers/business-management/25-best-colleges-for-precision-agriculture/#Tinsel/60708/1>

- #7 The University of Sydney, Australia
- #10 Massey University, NZ
- #11 Wageningen University, Netherlands
- #13 Sao Paulo University, Brazil
- #14 McGill University, Canada



Urban Agriculture?

Do we need urban agriculture?

What role does it play? – food, lifestyle

How many people can it feed?



Vertical Farms

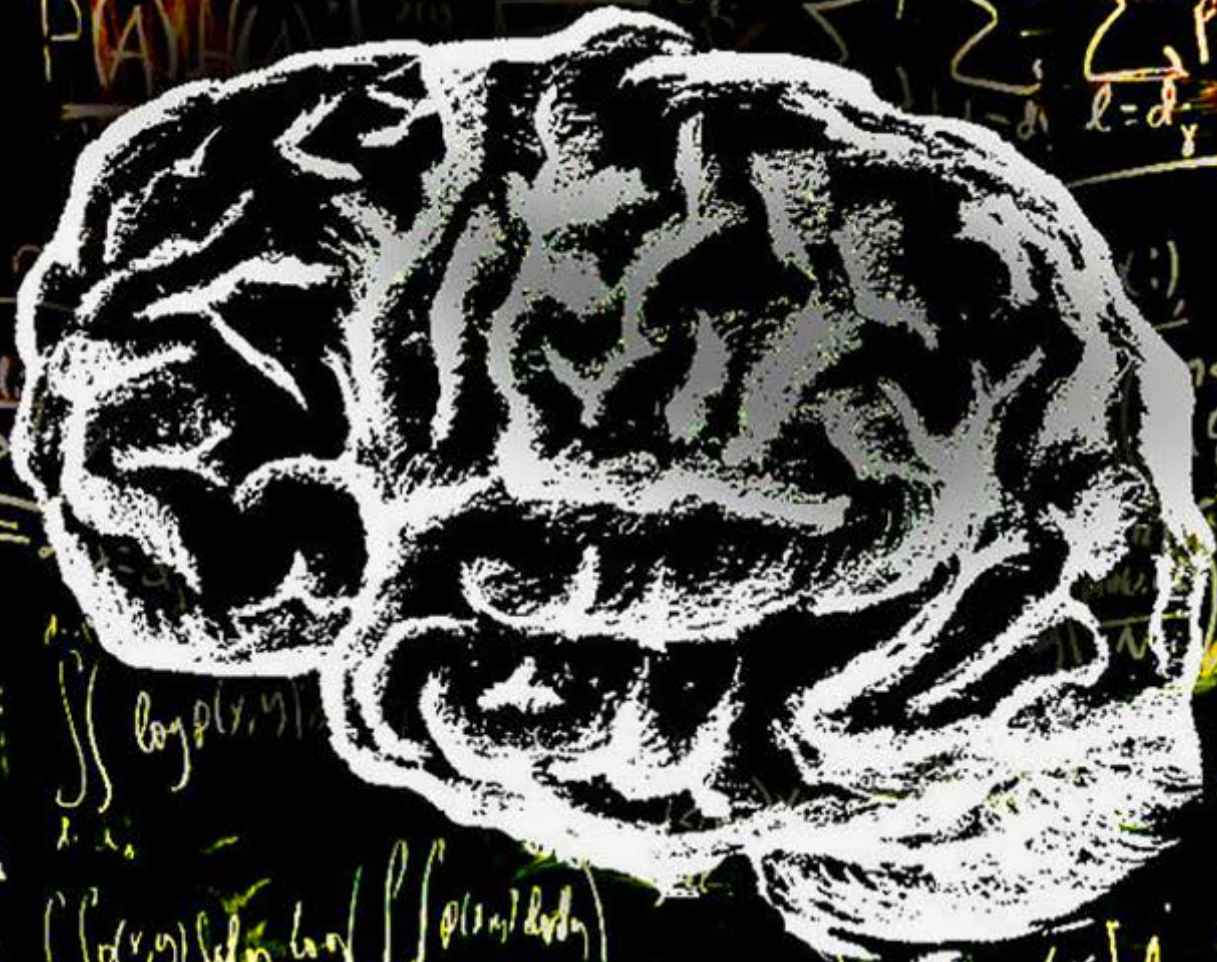


- estimated savings of 70% water;
- vegetative growth twice as fast of a plant in traditional cultivation.

My Thought

Urban agriculture, which can also be decommoditised, should be used to utilise/cycle the waste streams of the city.





Who thinks ?

Who thinks ?

Who thinks

**BROADACRE or even SUBAERIAL AGRICULTURE
will play a significant role in food production in
100 years?**

Conclusions



Digital Agriculture is the NEW post-industrial agriculture that we have been seeking.

It offers a much wider view of agriculture.

The place and role of Urban Agriculture is yet to be determined..



THANK YOU 😊

‘The pessimist sees difficulty in every opportunity.
The optimist sees the opportunity in every difficulty.’

- *Winston Churchill*



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The University of Sydney
3-5 December 2019

More details to follow at:-
sydney.edu.au/agriculture