CIRC:
A Breeding Company Perspective

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The Grand Challenge

- Population growth (& increasing meat diet)
- Climate Change (effect of)
- Increasing input costs (fertiliser, fungicide)
- Declining resources (energy, land, water, P…)
- Increased environmental concerns (chemistry, water…)
- Etc….

Grand Challenge - Target

- Aspiration to sustainably increase yield 40-50% by 2030
  - ***<u>Easy to say</u>*** – but an enormous challenge! How will this be met? How *coordinated*???

- Historical Perspective (Wheat) :
  - On farm yield increased from 2.8 t/ha in 1948 to 8 t/ha today
  - 1948 to 2007 : 57% of increase due to plant breeding (NIAB)
  - 1982 – 2007: 93% of increase due to plant breeding (NIAB)
- Historic genetic yield advance = 0.5-0.7% p.a. (RL '90-'07)
  - *IF* maintained over 20 years = 13% (not 40-50%!).
  - *AND* maintain quality *AND* translate benefit beyond trial to farm
- How to meet this yield/quality/delivery gap?

Bridging Grand Challenge Gap:

- Better appreciation of targets for research
  - Real value in agriculture
  - Preparedness to take on difficult challenges
    - semi-dwarfing genes gave a big boost to productivity
    - many opportunities: hybrid systems; non-host resistance, roots, yield QTLs, (take all; photosynthetic efficiency)…
- Better linkage between fundamental & applied research to ensure that benefit is realised.
- Opportunity for CIRC
  - Situated between blue skies & applied (LINK/TSB)

Research Targets 1.

- Ensure they are relevant to agriculture
- Don’t neglect simply on basis of difficulty
  - Challenging targets require novel thinking
- Consider how benefits will be translated
  - Not adequate to say “this will be useful to breeders” – need a clearly articulated plan

- How?
  - Consult with industry & rep. bodies (BSPB, HGCA, NABIM…)
  - Consider *ACTIVE* project advisory committee

- Applied science can still be excellent science!

Research Targets 2.

- Not all about Yield/Productivity
  - though it is often THE major driver in farmer choice
- Consistent raw material quality cannot be neglected
  - Sometimes negative trade off yield/quality
    - Yield & protein in bread making
  - Sometimes quality acts as proxy productivity trait
    - lost input benefit when fail to meet end user specification
    - breeding cost in generating varieties which fail late in assessment (opportunity for effort redirected to yield)

Breeder Limitations

- Governed by RL performance
  - Failure means going bust so cannot ignore RL traits
  - Cannot protect IP beyond variety; FSS erodes even that
- Breeder return does not reflect genetic gain
  - 1% yield increase > £12/Ha for farmer (£150/ton & 8 t/Ha)
  - 1 ton seed = c.£75 royalty = 7 Ha sown
  - 1% royalty increase = £0.11/Ha but £12/Ha value
  - ie breeder return = 1% value !!
- (Nor does wheat cost reflect product value (£1.3 loaf = £0.04 wheat)
- Breeders cannot meet challenge alone!
- But they are prepared to help
  - Expertise, germplasm, knowledge of sector…
  - And 7 of 14 CIRC members are breeding/biotech companies!

CIRC Limitations

- Finance
  - Relatively little money (£7M) over 5 years
    - Could have been more if companies beyond breeders joined! No millers, bakers, retailers – missed opportunity for them
  - Try to make money go further
    - avoid 1 post-doc x 3 years unless really needed.
    - associated studentships offers extra hands
    - Use industry if it can help with resource, activities, advice
- Coordination with other activities
  - TSB, LINK, IPA, Lolas, WGIN (Av/Cad), OREGIN…
  - Important to build on previous investments
  - Collaborate & not compete (we are all in this together)
  - ***BUT*** we are much better at this than previously
    - Monogram meetings, WGIN/OREGIN, Plant Science Fed.

How should applications be tailored to CIRC?

(borrowed from Peter Werner, CIRC workshop 2010)

- Projects should
  - Respond to the challenges
  - Use resources that exist wherever possible
    - Involve the right team(s) of people
    - Get the right technology involved
  - Carry out excellent science
    - Test hypotheses
    - Set up a proof of concept
  - Lead to a potential product and sketch out a pathway of development
  - Have a good idea!

Thank You for Listening!