Identifying and exploiting natural variation for quality

"how variation in important traits is identified and exploited from a plant breeder's standpoint: what is the role of the public sector in this"

Chris. Chapman

NICKERSON

ADVANTA

- **Breeder's view of quality**

- **Breeders' view of germplasm**

- **Implications for identification and exploitation**

- **Novel quality traits**

- **Role of public sector**

- **Targets**

Quality testing

- On seed

- So post-harvest and also post-drilling

- Tests generally labour intensive

- Some require large quantities of seed, can't be done on single plants

- Better predictive tests valuable

Nature of 'Quality'

- Synthesis of traits

    Texture – Protein {type & content} - Hagberg falling number – Specific weight - Rheology {balance of elasticity & extensibility} – Colour - Water absorbtion

- Product dependent, also customary or traditional

- Overall, as good as the worst trait

- Optimum rather than maximum

- Stability is important

- Traits largely quantitative and polygenic

Breeder's view of germplasm

Trait identification   Use in breeding

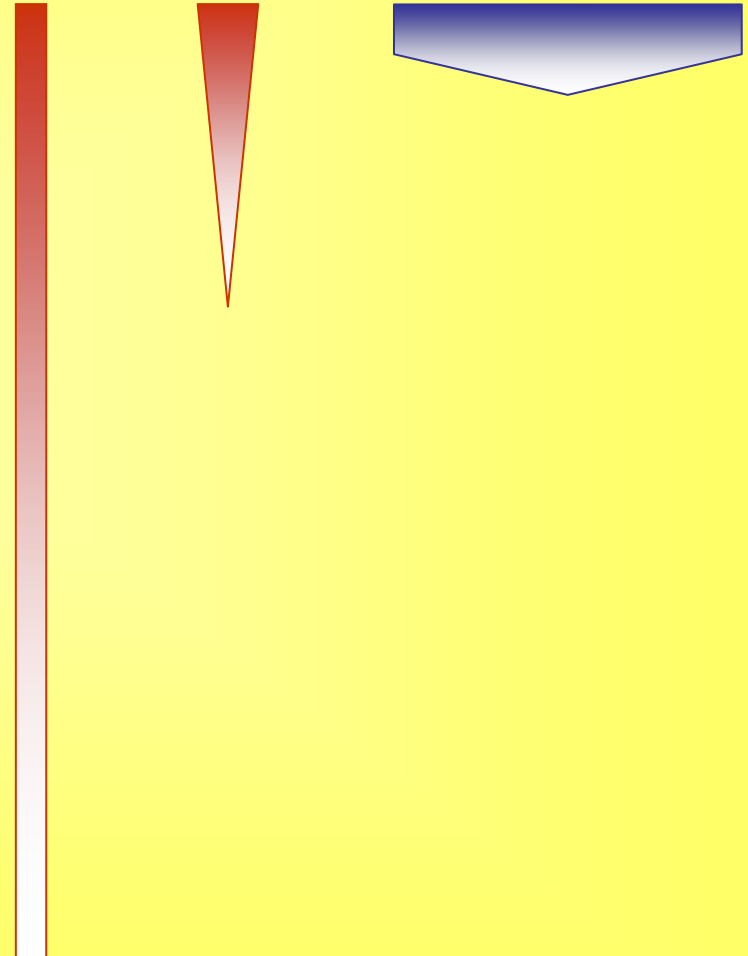qualitative quantitative

| GP-1A | Cultivars | elites |
| | | exotics |

| GP1-B | Con-specific wild relatives | synthetics |

GP-2	Genome sharing relatives	*T. turgidum*
		Ae. squarrossa
		T. uartu

| GP-3 | Other *Triticum/ Aegilops* species |
| | Other Triticeae |

For GP-1A germplasm

- **For most traits much (sufficient?) variation is available in elite germplasm – managing it is the problem**

- Map genes/QTLs

- Mark them (identify them?)

- Understand how they interact with each other and the environment (stability)

For more exotic germplasm

- **Direct identification of *useful* variation in exotic backgrounds well nigh impossible**

- **Therefore need *predictive* models to suggest which novel alleles might be beneficial**

Candidate Genes
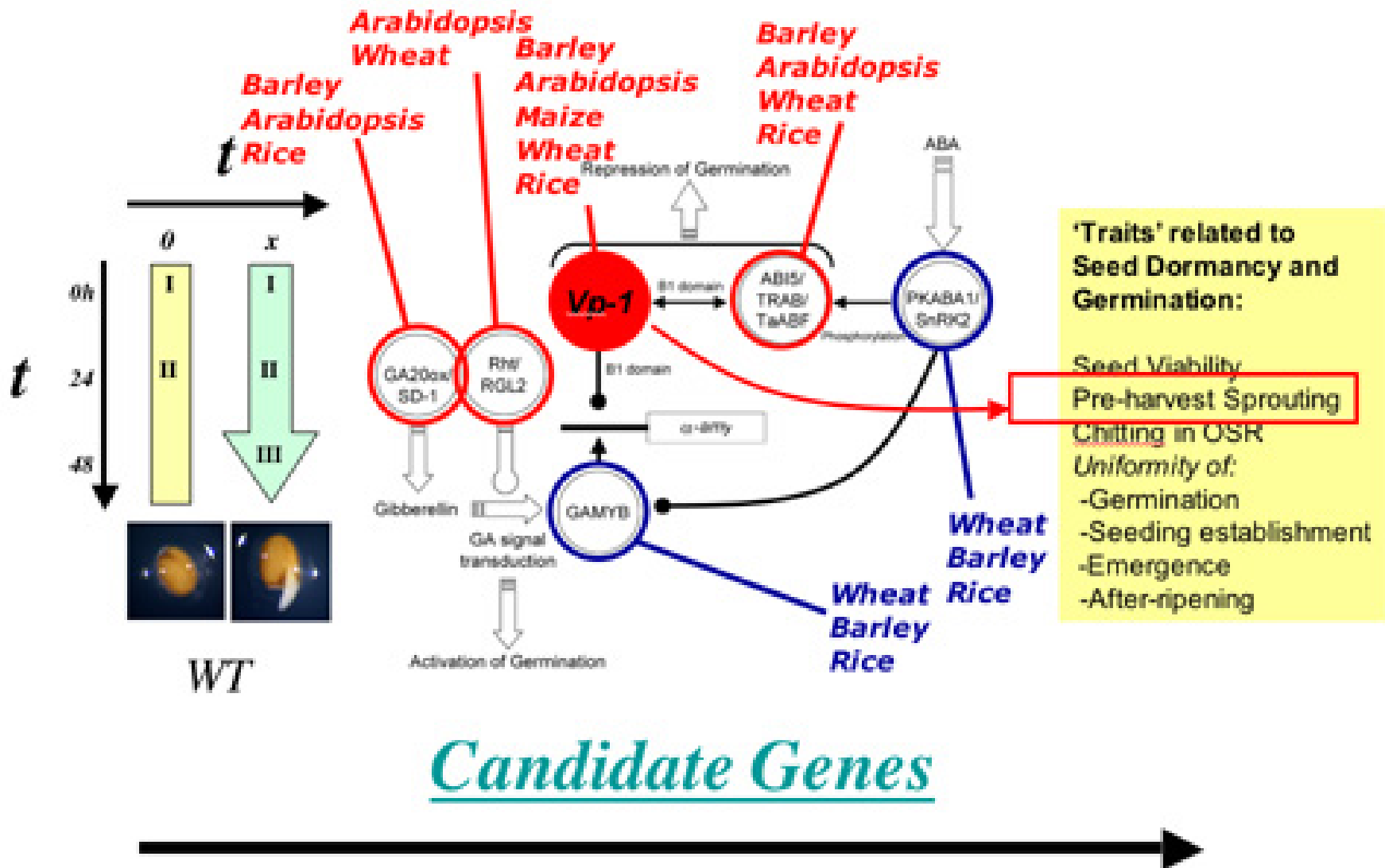
For more exotic germplasm

- **Direct identification of *useful* variation in exotic backgrounds well nigh impossible**

- **Therefore need *predictive* models to suggest which novel alleles might be beneficial**

- **Then move into advanced backgrounds i.e. Gp-1A and validate**

- **Incorporate into breeding programmes**

Novel quality traits

e.g. colours, waxy, hyper-extensibility, super-soft, chapattis, thatching straw

Breakfast cereal

1 box (½ kg) /person/year

= £ 120m sales

= 30,000 t crop

= 3750 ha

= 470 t certified seed

= £ 25,000 royalties

Beware the niche market!

Role of public sector

Fundamental

**Development of quality models ->
Identification (prediction) of superior alleles ->
{Introgression and validation of candidate genes
(alleles)}**

Empirical

**Better predictive tests
Improved understanding of elite materials**

BWB priorities in quality

- **Stability in bread and biscuit making properties**
- **Bioethanol production; yield and specification**

Possible topics

- **Retaining functionality at low protein**
- **Association genetics on UK germplasm for quality traits**
- **Improving extraction rate**