Biotechnology Opportunities and Challenges in Poultry Production

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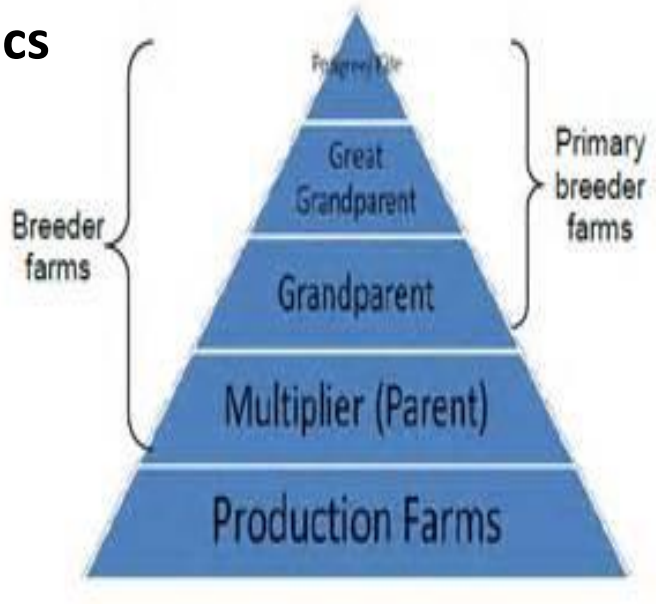
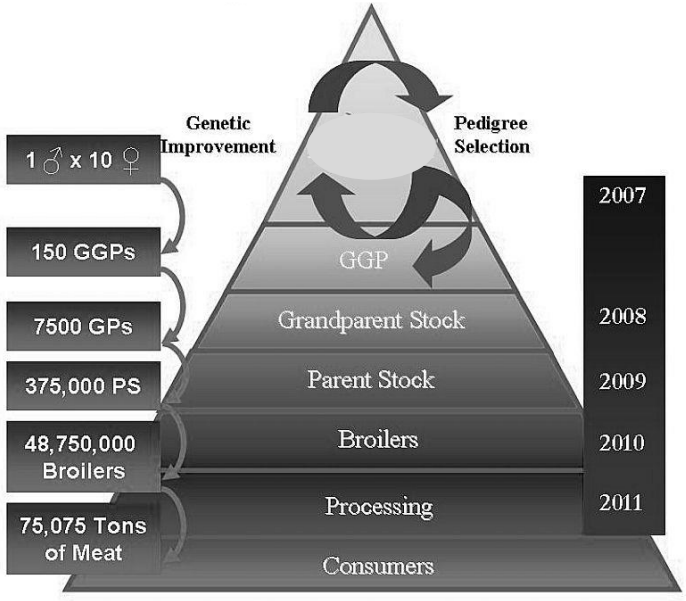
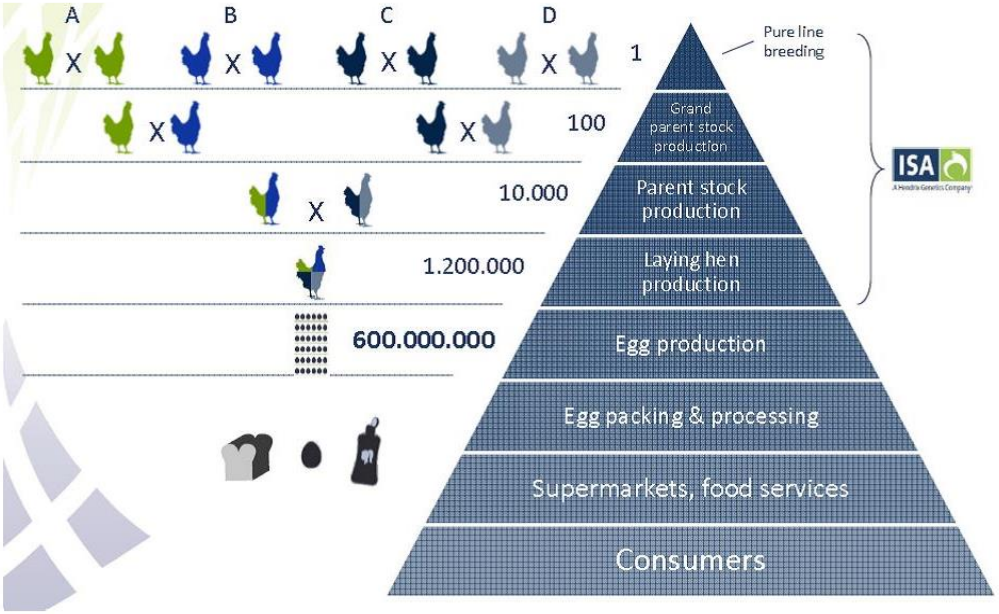
QU: How can animal biotechnology be applied to practi animal breeding and dissemination?

- Vertically structured supply chain of new genetics
- Poultry genetic are constantly being improved
- Deleterious recessive alleles suppressed by managing levels of genetic diversity - to avoid various defects



Broiler - Chicken Meat Layer - Egg Production





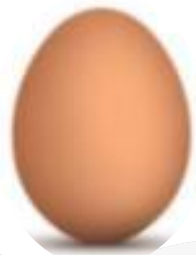
From: European Poultry Science
Arch.Geflügelk., **71** (5). S. 193- 199 , 2007, ISSN 0003-9098
Modfied from McAdam, J., 2006: Reproductive efficiency in meat type selected breeders: current and future strategies. Abstr. 10935, Proc. XII European Poultry Conference, Verona, Italy

From: http://www.hendrix-isa.com/en/products/isa-brown/

NB Figures are for just one of five layer line, of one manufacturer for one marketplace – multiply several fold for the global market.

QU: What are your ~~company's/~~ industry's perspectives on animal biotechnology.

- Very well placed to take it up and get great value from the capability of the technology
- Years of breeding improvements - great wealth of genetic and genomic data relating traits to SNPs, knowledge of QTL
- Commercial-in-confidence knowledge of traits to keep and the linked traits that need to be removed [*likely to be ideal gene editing targets*]
- Need for new options to improve health traits of their "product" as infectious disease has a large impact on profitability of final product (meat or eggs)
- Welfare and ethical issues related to production – e.g. eggs



QU: Opportunities/needs for biotechnology

Opportunities

- Rapid stacking of beneficial (production) traits
- Selection of disease resilience (or resistance?) traits
- Edits to remove virus and bacterial receptors (where known and feasible)
- Novel trait integration – anti-bacterial peptides to reduce food borne zoonotic pathogens (salmonella, campylobacter) [GM]

Needs

- Decoupling high value genetic loci from recessive deleterious traits
- Welfare issues (many equating to recessive traits)
- Improving behavioural traits (reducing aggression)
- Genetic debeaking (reducing damage due to aggression)

QU: Barriers to adoption of new technologies (in <u>developed</u> *and developing* <u>countries</u>).

1. Consumer readiness for the products (particularly if not identified as GM)
2. The impact of regulations (cost or uncertainty of process)
3. Status of a technology – (e.g. the gene editing of removal of a marker being classified as “NOT- GM” or the alternative that they are classed as “GM”).
4. Organisational philosophy regarding gene technology

QU: Barriers to adoption of new technologies (in developed and **developing countries**).

- Consumer pressures *may* be at a lower level
- Regulation likely to be a bigger issues

"**regulations have been put forward for GMO control, but poor political will renders such regulations powerless**"

- GGP, GP sourced from o/s big-business - "exploitation" concerns (mostly voiced by NGOs) [reduced if approved and used in "at home"]
- Desire to utilize with local chicken breeds - focussed on smaller scale commercial production
- Negatives counter-balanced by pressure to provide animal protein to improve national nutrition, to protect food supply, especially where these impact poverty alleviation

- Convention on Biological Diversity
  - Cartagena Protocol (bio-safety)
  - Nagoya Protocol (benefit sharing from biology)

QU: Impact of regulations on industry adoption/utilization of new technologies.

Negative impacts (if materials are deemed "GM")

- Cost of preparation of necessary data packages and licencing
- Imposed conditions of licence (biosecurity upgrades to properties?)
- Food standards issues that result from GM status
- Product labelling (and devaluation/loss of market share)
- International trade issues arising

Positive impacts (of regulation as GE but not GM)

- Potentially lower cost and low/no conditions on birds (or properties)
- Consumer confidence (low or no impact on market share)
- International trade issues – may be reduced (?)

Biggest Barrier to Biotech in Poultry

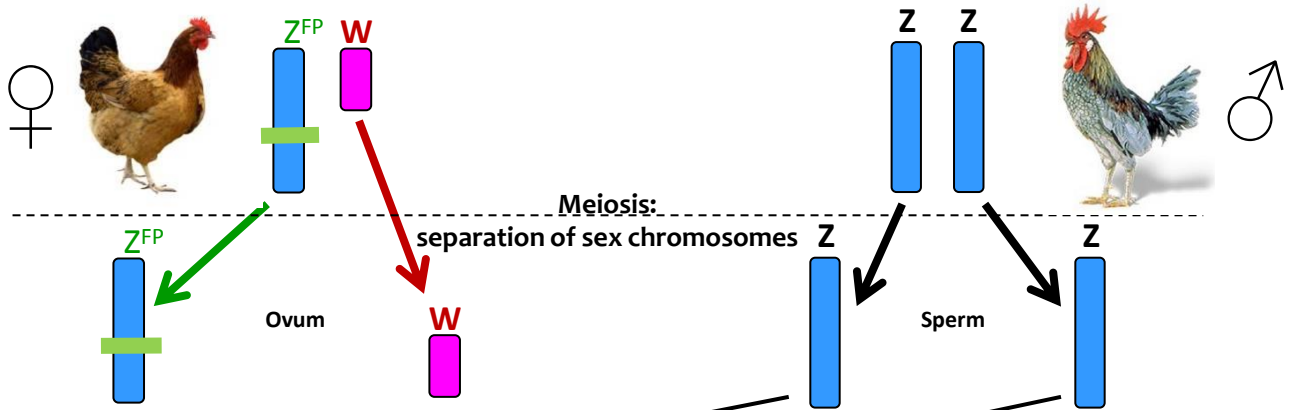
#1 consumer attitudes to “GM” food

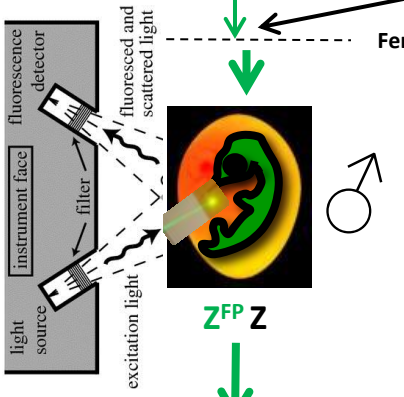
#2 industry consideration of its marketplace

#3 how regulation and labelling will impact on #1 and #2

When is GM not GM? That is the question. When it is null segregation.

A biotech approach to a sex selection system for egg laying hens…





Fertilisation

Z^{FP} Z

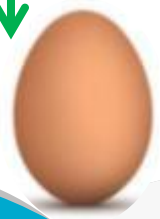
Z W

Females are not GM
So-called "null segregant"

Hatched and go into
Go into egg production
for food which is not GM

Removed from food production chain

Natural product



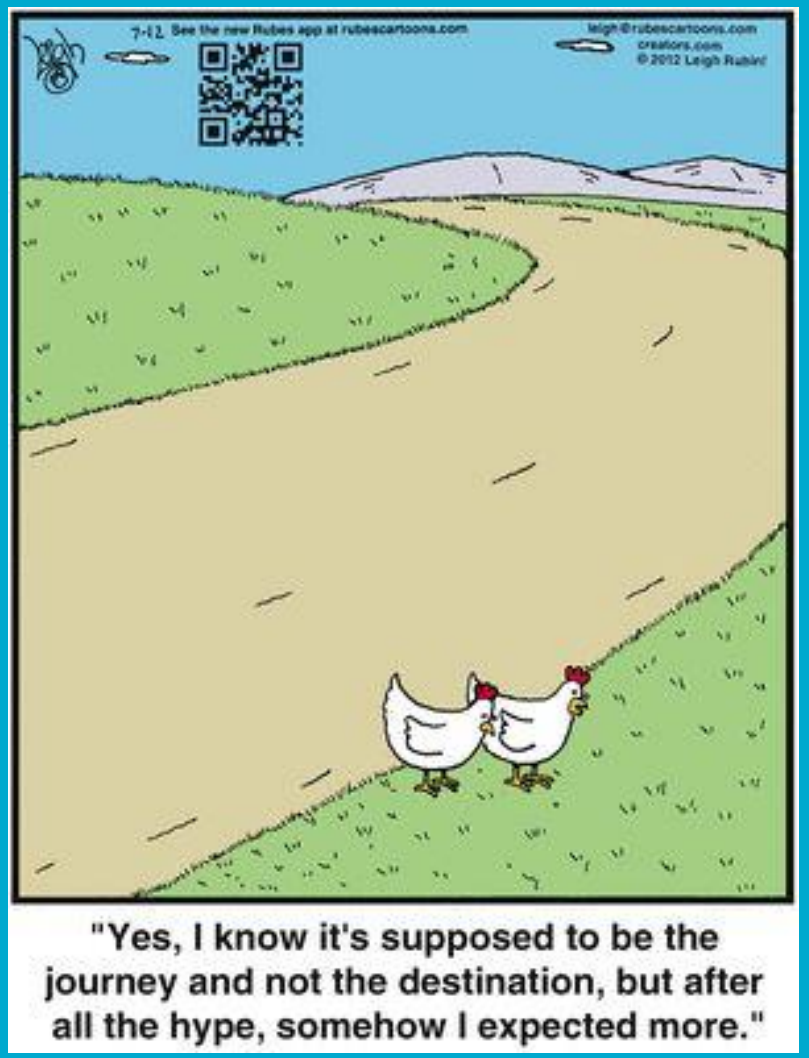
Value add by coupling novel trait to selective marker

CSIRO Health & Biosecurity

Australian Animal Health Laboratory

- Tim Doran
- Kristie Jenkins
- Terri O'Neil
- Terry Wise
- Kirsten Morris
- Sandy Matheson
- Susanne Wilson
- Mark Ford

Thank you



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