

Food and Fuel R&D

A private-sector perspective

<http://www.performanceplants.com>

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Private sector issues:

- Survive, grow, be profitable
- Translate R&D into commercial activity
- Drive market share, product penetration but maintain margin

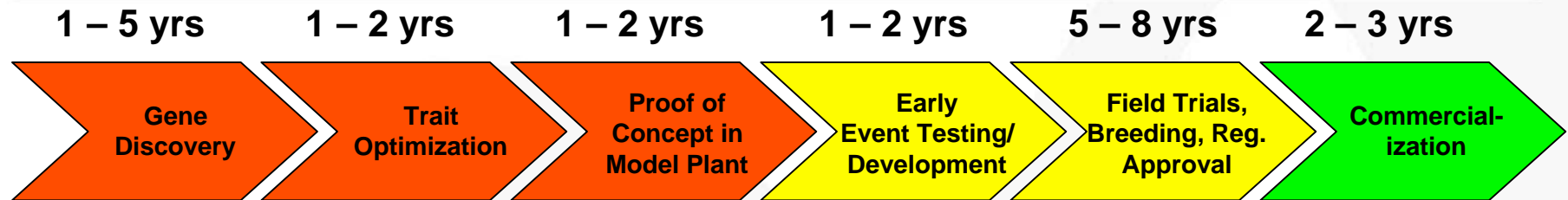
- Difficulty in predicting the future
 - Choice of target food, biofuel crops
 - Choice of traits
 - Market access

- Partnerships or go it alone?

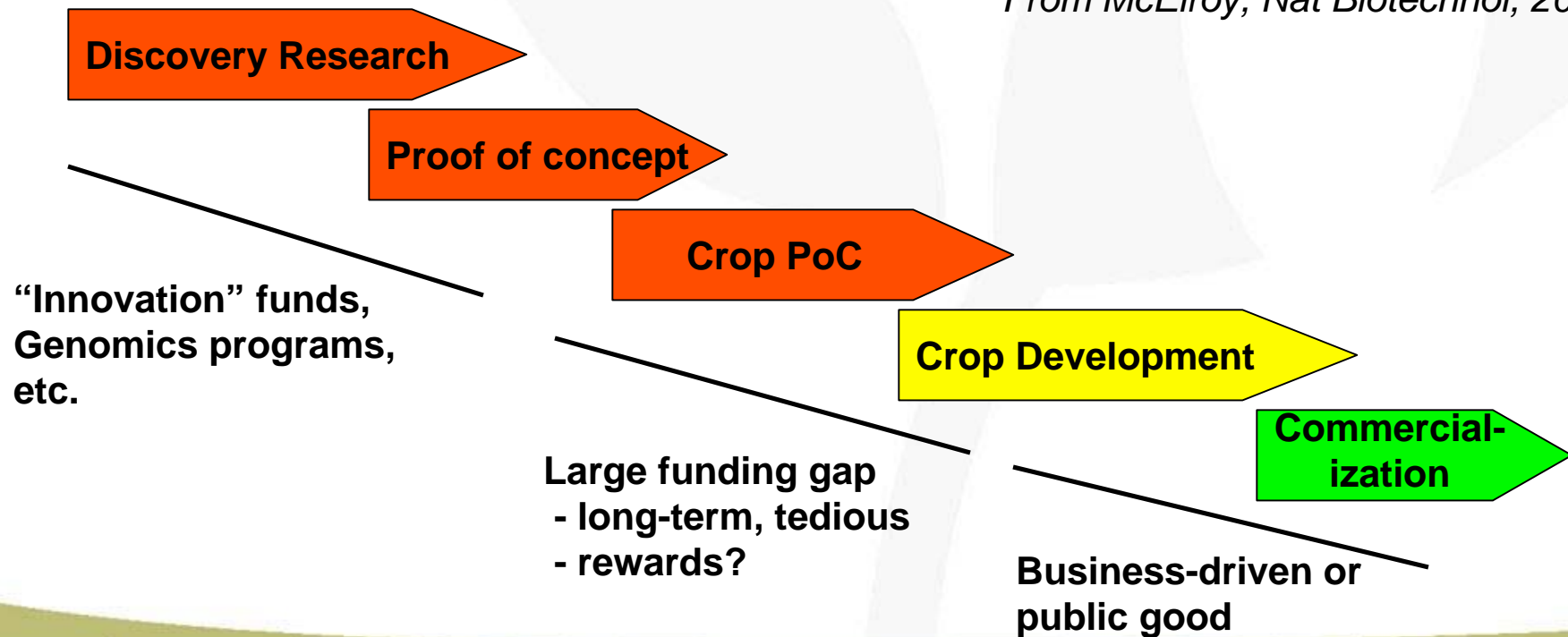
Funding R&D is *always* an issue

- Big Ag: 7.5-10% of turnover re-invested in R&D
- Early-stage companies: 100% and still not enough
- 9.1 years to Ag Chem commercialization
Same or more for crop biotech products
- If transformation of Ag is going to be achieved through Research and Innovation, who is going to do it?
 - Innovation ≠ products

GM crop development – funding issues



From McElroy, Nat Biotechnol, 2003



Traits: is crop productivity still a focus?

- Yes!
- Farmgate crop receipts still primarily based on yield
- Most traits in pipeline address yield
 - HT, IR, drought tolerance, etc.
- However, quality traits are also important
 - Nutrition traits: high-lysine corn; Vistive™ soybeans; Nexera™ canola, etc.
 - Biofuel-related traits: oil profile, starch and cellulose degradability

Performance Plants Inc. trait pipeline

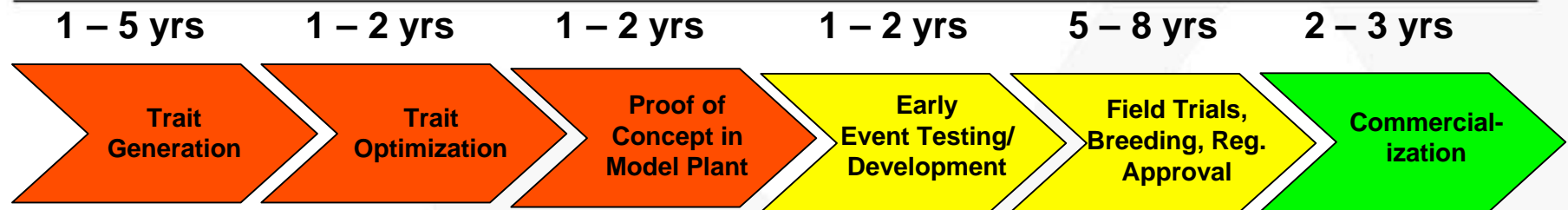
- Major traits:
 - Drought tolerance (YPT™)
 - Heat tolerance
 - Water use efficiency
 - Biomass enhancement (whole-plant)
 - Seed size enhancement
- Most traits in pipeline address yield, but looking at other opportunities

Food vs. fuel R&D

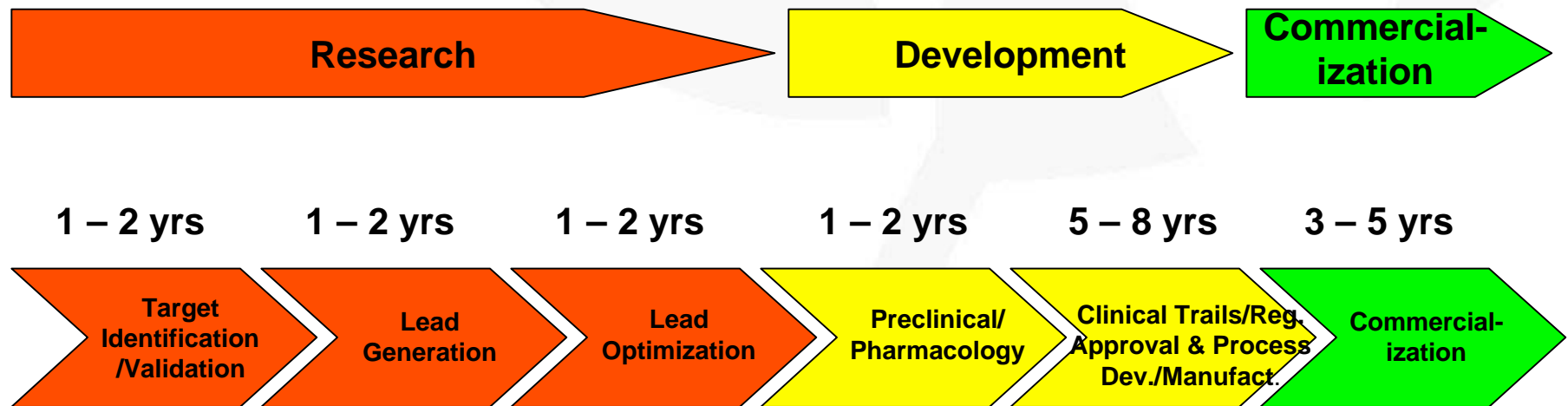
- Investment bubble – biofuels are hot
- Huge opportunity in biofuels may remove investment from conventional food/feed crop R&D
- New crops, new technologies, new business models needed
- Government policies will play a big role



GM crop vs. pharmaceutical development



R&D pipeline for an ag biotech (GM) product



R&D pipeline for a pharma biotech product

From McElroy, Nat Biotechnol, 2003