
Commercialising early stage agbiotechnology from academia: challenges and opportunities

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Overview

- Introduction to IP Pragmatics
- Agbiotechnology crop market dynamics
- Development and investment opportunities & challenges
- Case Studies



IP Pragmatics Ltd

- Company founded in 2004
- IP Asset Management Company that combines
 - IP Value Creation (IP Consulting)
 - IP Management (IP Services)
- 10 full time professional staff in London
 - Representative office in Singapore
 - Subsidiary office in Australia
- Experience team recruited from Agbio/Pharma/FMCG Multinationals, SMEs, venture capital firms and the public sector
- Strategic partners in US (TechLink) and Japan (Japan IP Network)

Pragmatic \Prag*mat''ic\
N. 1. One skilled in affairs.
Adj. 1: concerned with practical matters;
2: guided by practical experience and observation rather than theory; "a hardheaded appraisal of our position"

Source: Webster's Revised Unabridged Dictionary



Areas of expertise

Sectors

Biotech &
Pharma

Animal
Health

Diagnostics
& Medical
Devices

Agriculture
& Plant
Sciences

Technologies

Therapeutics
CNS, Onc,
Infect.
Disease

Vaccines,
Reagents
& Ref
Materials

FMCG
(e.g. OTC,
Funct.
Food)

Assays,
Platforms,
PoC,
Imaging

Natural
Products
Biofuel,
Pest Control

➤ **Multidisciplinary capabilities**



Expertise

Healthcare	Diagnostics	Animal Health, Agriculture & Environmental Technologies
<p>Biotech/Pharmaceutical Therapeutics & Vaccine Stages</p> <ul style="list-style-type: none"> Platform drug screening technologies Cell imaging platforms Pre-clinical to Phase 3b development GMP Manufacturing <p>Biotech/Pharmaceutical Therapeutics & Vaccine Areas:</p> <ul style="list-style-type: none"> CNS (neurology & psychiatry), Women's health, Oncology, Dermatology, Respiratory Diseases Infectious Diseases (including antiviral, antibacterial, antifungal, vaccines) <p>Drug Delivery Technologies</p> <p>Fast Moving Consumer Goods</p> <ul style="list-style-type: none"> Novel cosmetics OTC pharmaceuticals Personal and consumer healthcare products Functional Foods 	<p>Diagnostic Assays & Platform technologies</p> <ul style="list-style-type: none"> Diagnostics (animal, human (including Hospital acquired infections), food and bioterror) Molecular biology (microarrays, genomics, proteomics, etc.) Point-of-care technologies <p>Medical Devices</p> <ul style="list-style-type: none"> Medical devices & imaging <p>Research Tools</p> <ul style="list-style-type: none"> Life science instrumentation and tools Life science IT system integration 	<p>Animal Health</p> <ul style="list-style-type: none"> Animal Health (vaccines, therapeutics) <p>Agriculture</p> <ul style="list-style-type: none"> Plant Health & Natural Product Discovery Agriculture biotechnology (incl. Seeds and transgenic crops) Agrochemical (including biopesticides) Forestry Biofuels <p>Environmental Technologies</p> <ul style="list-style-type: none"> Environmental monitoring Novel (surface and suspension) disinfectants Water/sanitation/hygiene and public health Biofilms and bioindicators

Value

Market Assessments

- Evaluating Opportunities and Competition
- Technology and Patent Landscaping
- Technical and commercial intelligence
- Market-pull input from target industry networks

Financial Valuations

- Independent financial valuations of technology opportunities for investment and/or fundraising opportunities
- Assistance with fund-raising

Due Diligence

- Management of due diligence process
- Commercial due diligence of IP-related contracts, patent position versus technology/product



Commercialise

Business Development

- Opportunity analysis
- Analysis of markets & competition
- IP Strategy and Business Plan Development
- Identify and prioritise development opportunities

Marketing

- Development of business development and marketing materials
- Identification/Screening/Meeting potential partners
- Representation at partnering meetings and conferences

Licensing

- IP licensing negotiations
- Deal-making support including deal valuation
- Management of due diligence process
- Assistance with spin-out formation



Our Clients

- 70% UK; 30% ROW (e.g. Japan, New Zealand, USA, Australia, India, Israel, Netherlands, Germany etc)
- Examples:
 - Leading UK biotech companies
 - World leading defence R&D company
 - UK, European and NZ universities
 - UK, NZ, Dutch and Japanese Government research organisations
 - Multinational food company
 - Major Indian chemical company
 - Leading UK, European and US patent attorney firms
 - Australian Group of 8 University



Past & Present Clients



Agbiotechnology Market Dynamics

■ Dominated by six major corporations

- Account for 80% of the global seed sales
- Top two companies (Monsanto and Syngenta) invest over US\$1 billion per year in Research & Development (ISAAA Reports)

■ View from Europe?

■ World Market

- 134 million hectares of biotech crops were grown worldwide in 2009
- 80-fold increase from 1996 to 2009 or a year-to-year growth of 9 million hectares or 7%
- 15 countries grew more than 50,000 hectares of GM crop

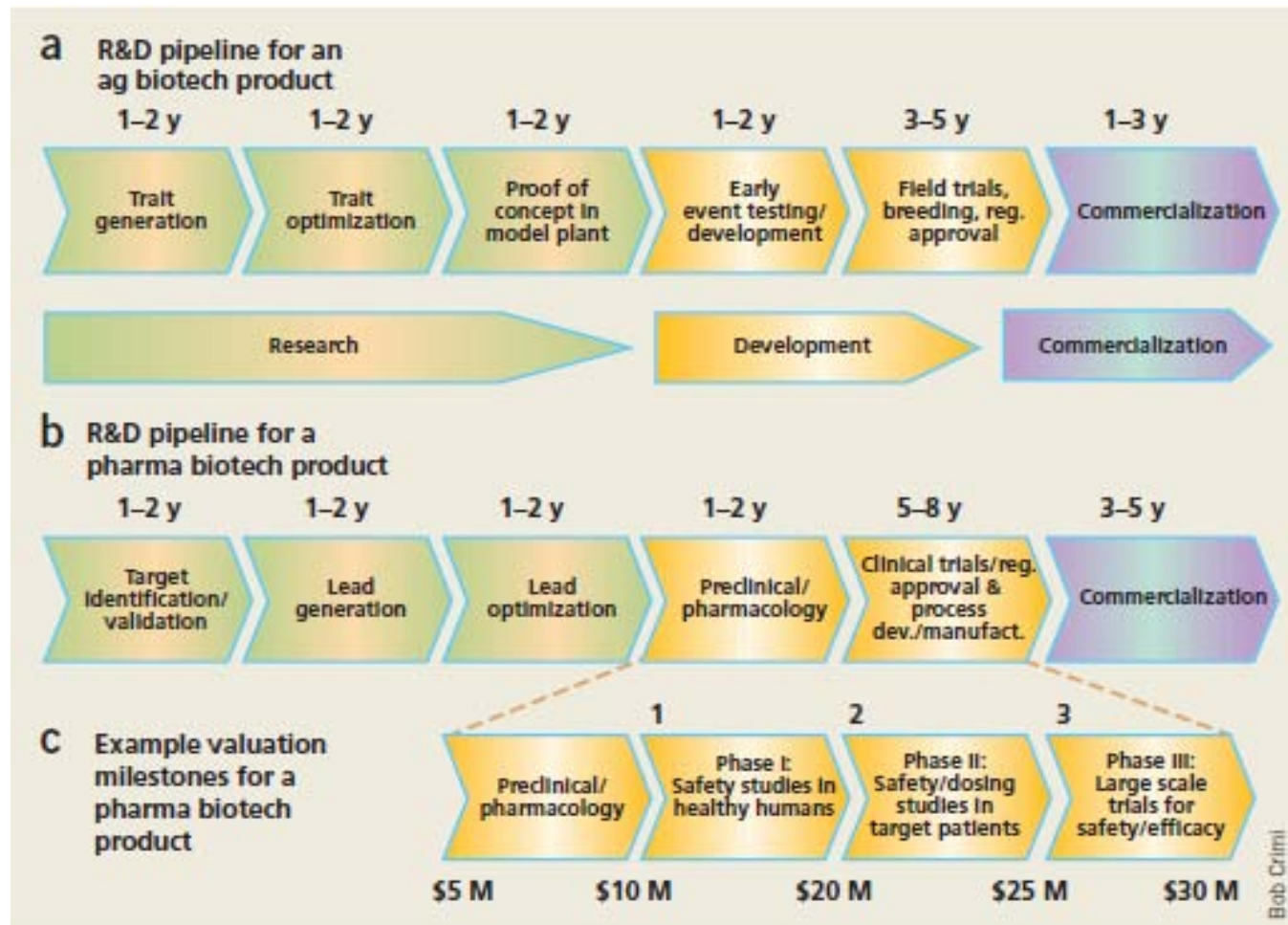


Agbiotechnology Market Dynamics

- **Few SME agbiotechnology companies**
 - In contrast to the pharma biotechnology or diagnostic sectors
- **Limits the number of partner opportunities with early stage agbiotechnology opportunities**
 - For a typical vaccine, pharma or diagnostic opportunity we typically have >50 companies to contact
 - For an agbiotechnology opportunity = <10 companies
- **Development Stage Challenges for Academia**
 - Analogy between pharma development and agbiotechnology development pipelines
 - Arabidopsis to Crop plants = Preclinical to Clinical



Development Pipeline Comparisons



Agbiotechnology – early stage investment opportunities and challenges

■ The Landscape

- UK plant science research ranks highly

■ Mind the Funding Gap

- Even larger for the agbiotech sector?

■ Licensing

- Finding a Development Partner
- Limited to the majors?

■ Creating a new venture

- Funding sources?



- Primary Research performed using SCOPUS using search string:
 - TITLE-ABS-KEY((crop AND (science OR protection)) OR (plant AND research)) AND PUBYEAR AFT 1999
- Note: this search has picked up research into herbal medicine as well as other plant sciences
- Four of the top ten papers this century in crop science, crop protection and plant research include authors from the UK.

UK research vs ROW

- UK is the third most prolific countries in terms of research papers on crop science, crop protection and plant research
- Only China and the United States have more publications

Country	No papers	%age of total
United States	13,454	24.1
China	5,345	9.6
United Kingdom	3,675	6.6
Germany	3,157	5.6
Canada	2,182	3.7

Top UK institutions by no. papers

- Number of publications
 - out of 1768 publications

Rothamsted Research (166)	University of Sheffield (78)
University of Reading (142)	Scottish Crop Research Institute (74)
Centre for Ecology & Hydrology (118)	Newcastle University (73)
Imperial College London (107)	UCL (70)
University of Nottingham (102)	University of Manchester (68)
University of Oxford (99)	Cranfield University (65)
University of Cambridge (99)	University of Aberdeen (65)
University of Edinburgh (92)	University of Leeds (63)
University of Exeter (84)	Lancaster University (62)
John Innes Centre (81)	University of Bristol (60)

Agbiotechnology – early stage investment opportunities and challenges

- **The Landscape**
 - UK plant science ranks highly
- **Mind the Funding Gap**
 - Even larger for the agbiotech sector?
- **Licensing**
 - Finding a Development Partner
 - Limited to the majors?
 - Plant Bioscience Limited
- **Creating a new venture**
 - **Funding sources?**



Agbiotechnology – early stage investment opportunities and challenges

Trait type	Trait type example	Discovery	Stage I	Stage II	Stage III	Commercial
		Lead ID & validation <i>in planta</i>	Crop transformation	Field efficacy	Regulatory approvals	Product sales
High value traits	Nematode control in soybeans	VC investors	Strategic/Institutional investors			
Market share traits	<15% yield enhancement in corn	VC investors	Strategic/Institutional investors			
Niche value traits	Improved oil profile in soybean	VC investors		Strategic/Institutional investors		
Enabling technology	Chloroplast transformation in corn	VC investors	Strategic acquirers			
Specialty traits	Plant-made pharmaceuticals	VC investors			Strategic/Institutional investors	



Agbiotechnology – early stage investment opportunities and challenges

- **Raising funding for agbiotechnology opportunities**
 - Limited opportunities?
 - Both from Public and Private Sector sources
 - Technology Strategy Board (TSB) - good new opportunities
- **Few examples of new ventures but some notable successes**
 - CropDesign (Belgium) – purchased by BASF in 2006
 - Icon Genetics (Germany) – purchased by Bayer in 2006
 - Athenix (US) – purchased by Bayer in 2009 for US\$365 million plus additional milestones
- **UK environment less favourable than rest of Europe?**
- **Licensing becomes the favoured route**



Case Study: Plastid A/S



Background

- Novel chloroplast technology from the Simon Moller's research group at the University of Stavanger, Norway
- Company formed in 2007

Funding

- Raised over £1 million through a number of sources:
 - £300k in government programmes
 - £180k from research council industrial funding
 - £600k from angels.

Development

- Data from model crop (tobacco)
- Undertaking proof of concept in wheat



Case Study: Camelina expressing omega-3 fish oils



Background

- Patented technology from the Johnathan Napier's research group at Rothamsted Research
- Builds on a long term research partnership with BASF expressing omega-3 oils in canola

Funding

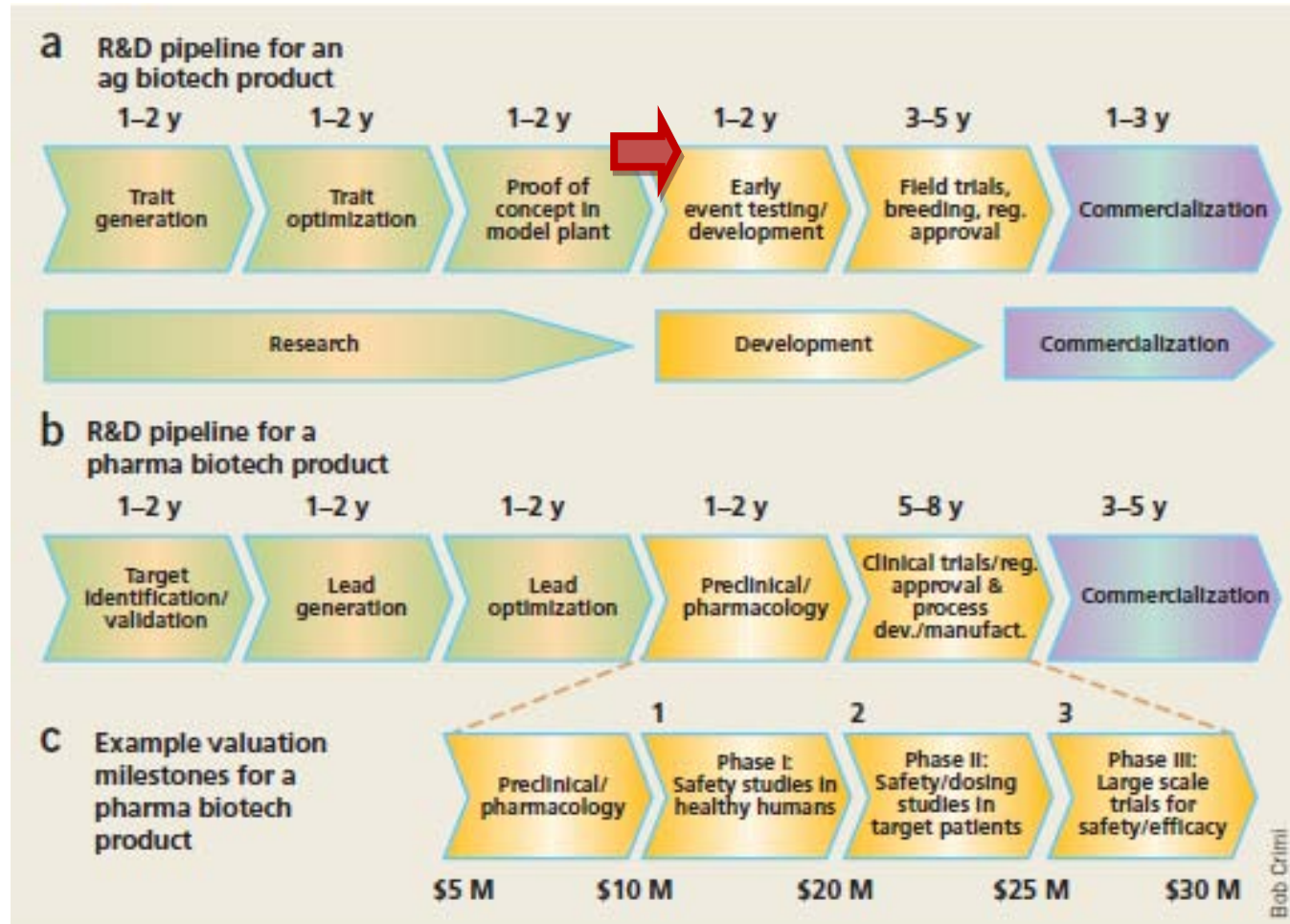
- Only BBSRC academic grants to date
- Applying for BBSRC Follow on Fund grant
- Opportunities with TSB?
- Funding from a commercial development partner?

Development

- Proof of concept achieved in Camelina
- Highest level of EPA achieved in crops to date
- Funding for field trials and oil stability / aquaculture feed application trials



Development Pipeline Comparisons



Summary

- Growing agbiotechnology sector continues to present opportunities for commercialising early stage technologies from academic research
 - UK plant science research strength
- Limited funding sources for development to get from model plants to crops(?)
 - Similar hurdle as with pharma technologies raising investment for pre-clinical testing, and then clinical
- Favours licensing as the route to market
 - Competitive, international market with few licensees
 - Few UK research bases for the majors



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