

The Future of Crop Research in Canada- Options and Consequences

by

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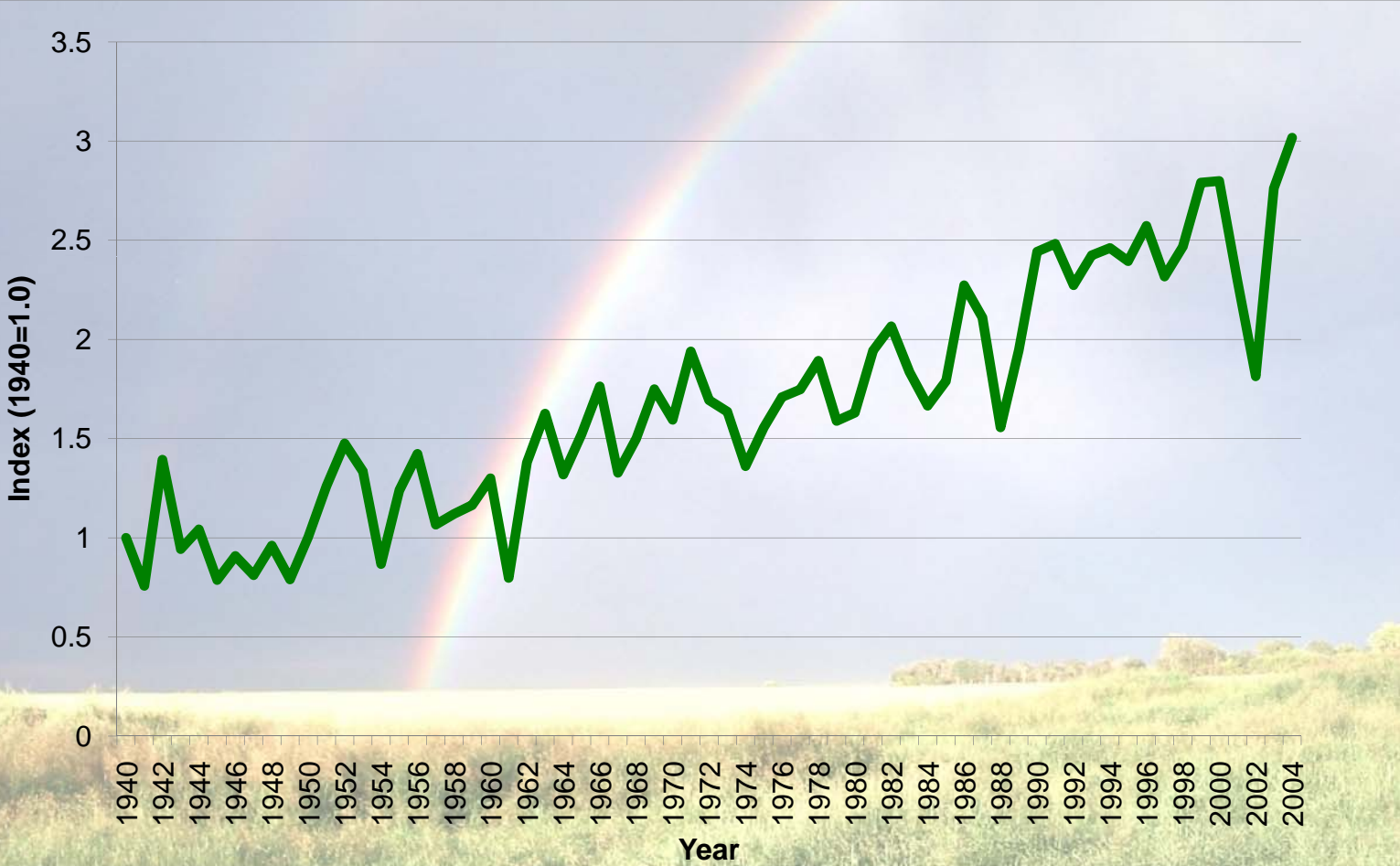
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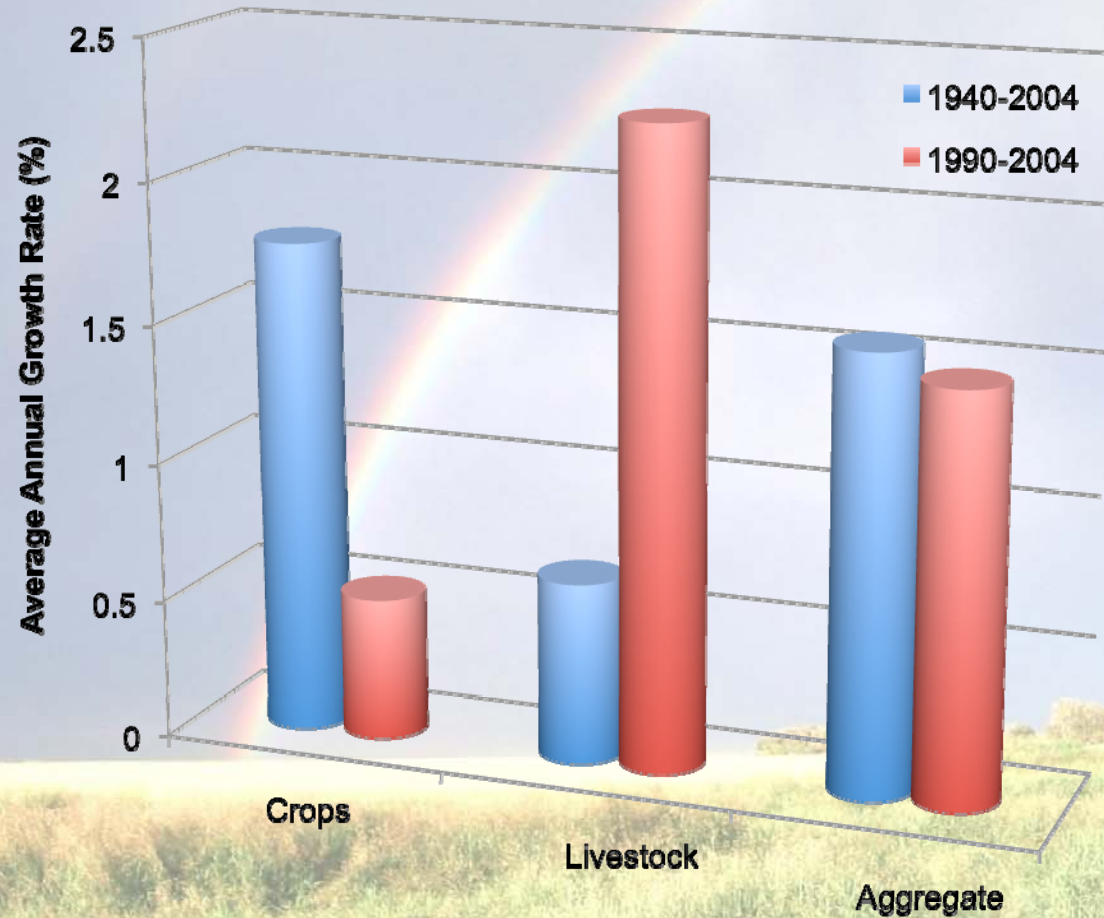
Key Points

- High returns $\leftarrow \rightarrow$ Underinvestment
- There are many options to increase funding that have been tested here and elsewhere
- Intellectual property rights change a *public good* to a *toll good* stimulating private investment and potentially creating anti-commons/fragmentation and pricing/incentive issues
- let's understand where each path to increased funding will lead and choose the best combination of options to address the under-investment issue

Crop Total Factor Productivity Western Canada 1940-2004

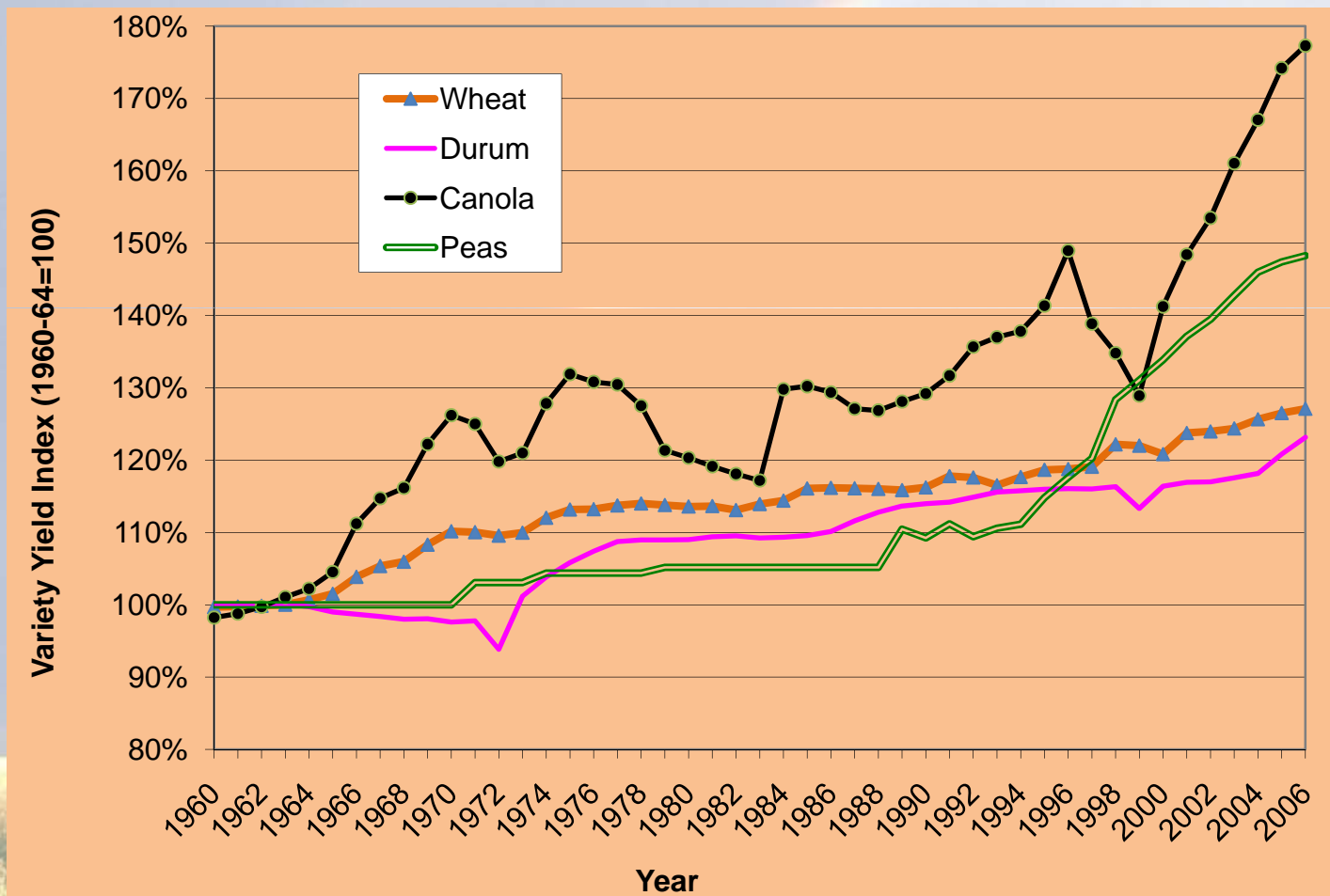


Average Annual Growth in TFP in Western Canada



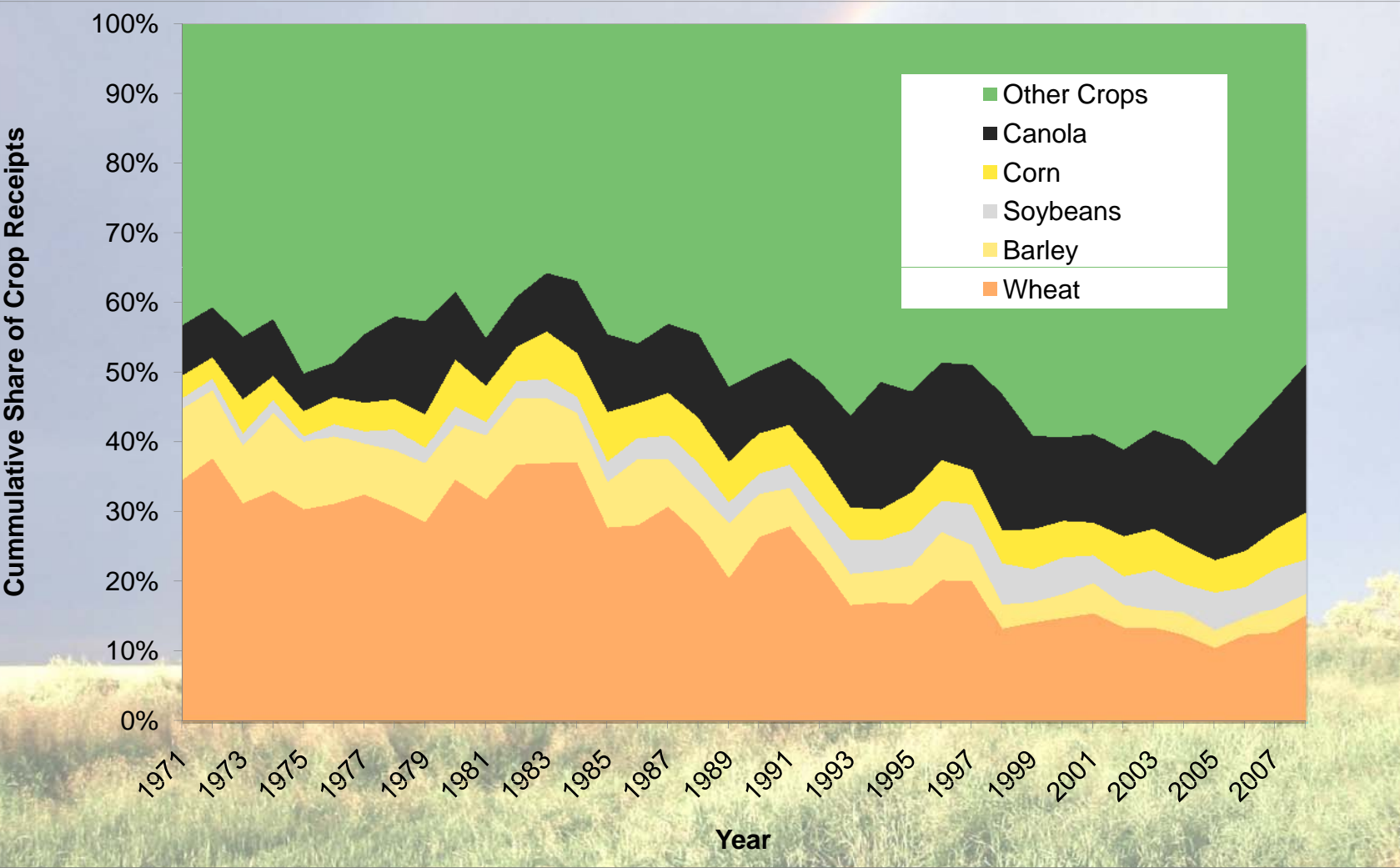
Source Stewart (2006)

Crop Variety Yield Index 1960-2006

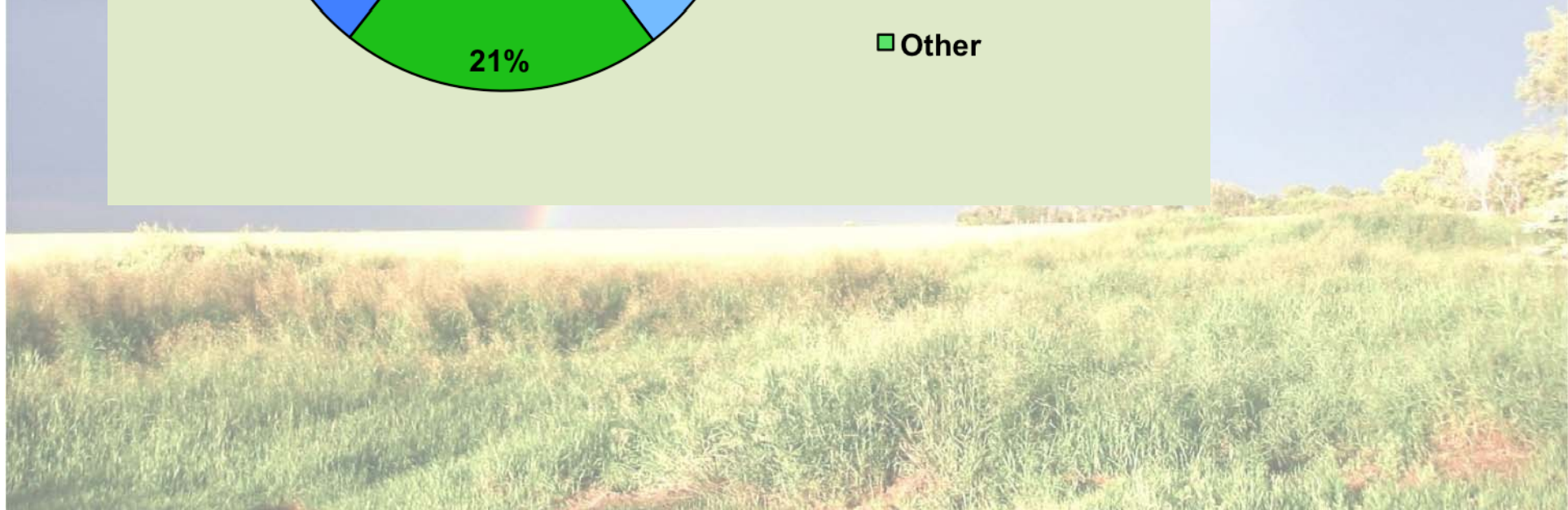
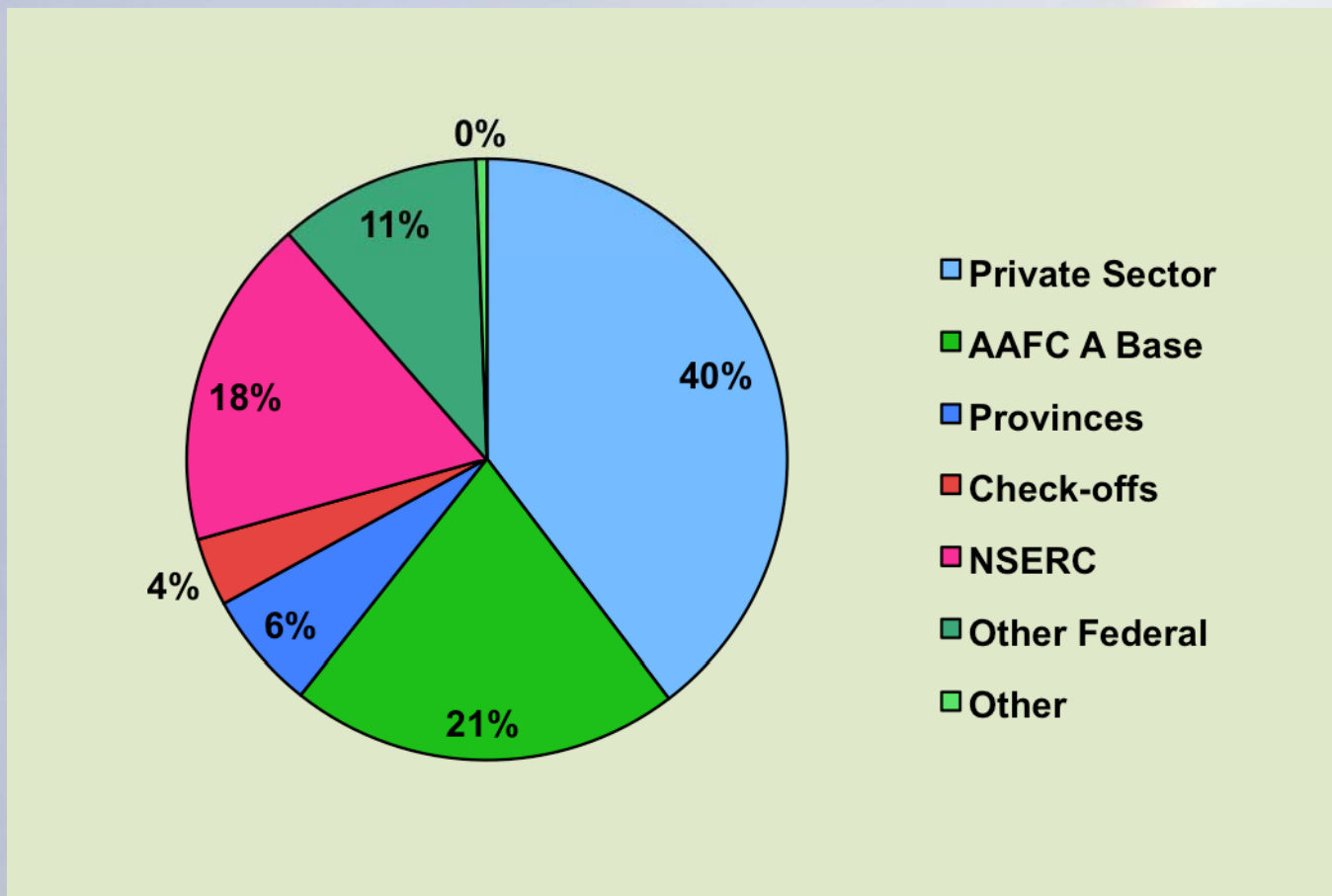


Source: Calculated from crop variety trials and area surveys

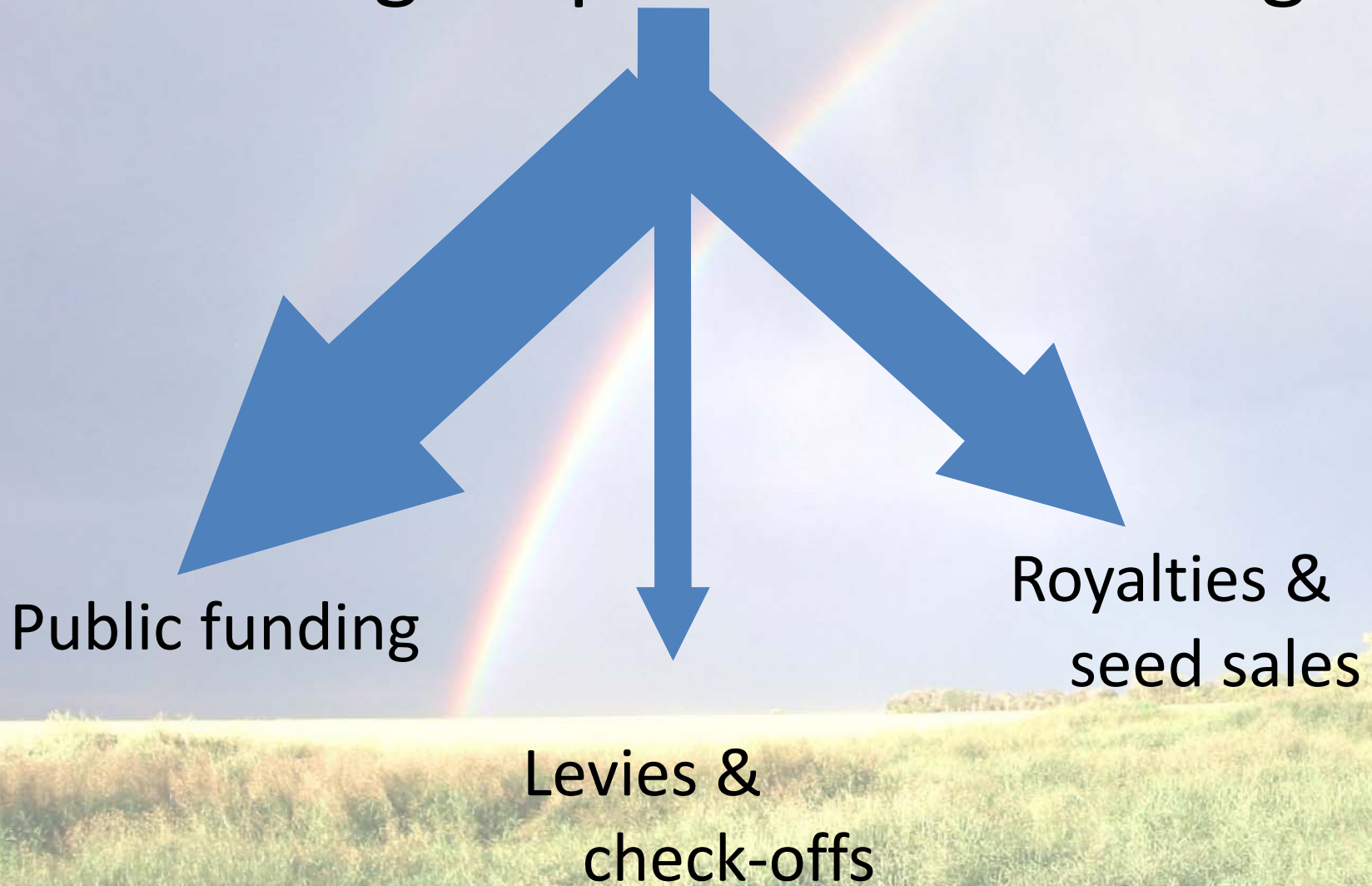
Share of Crop Receipts



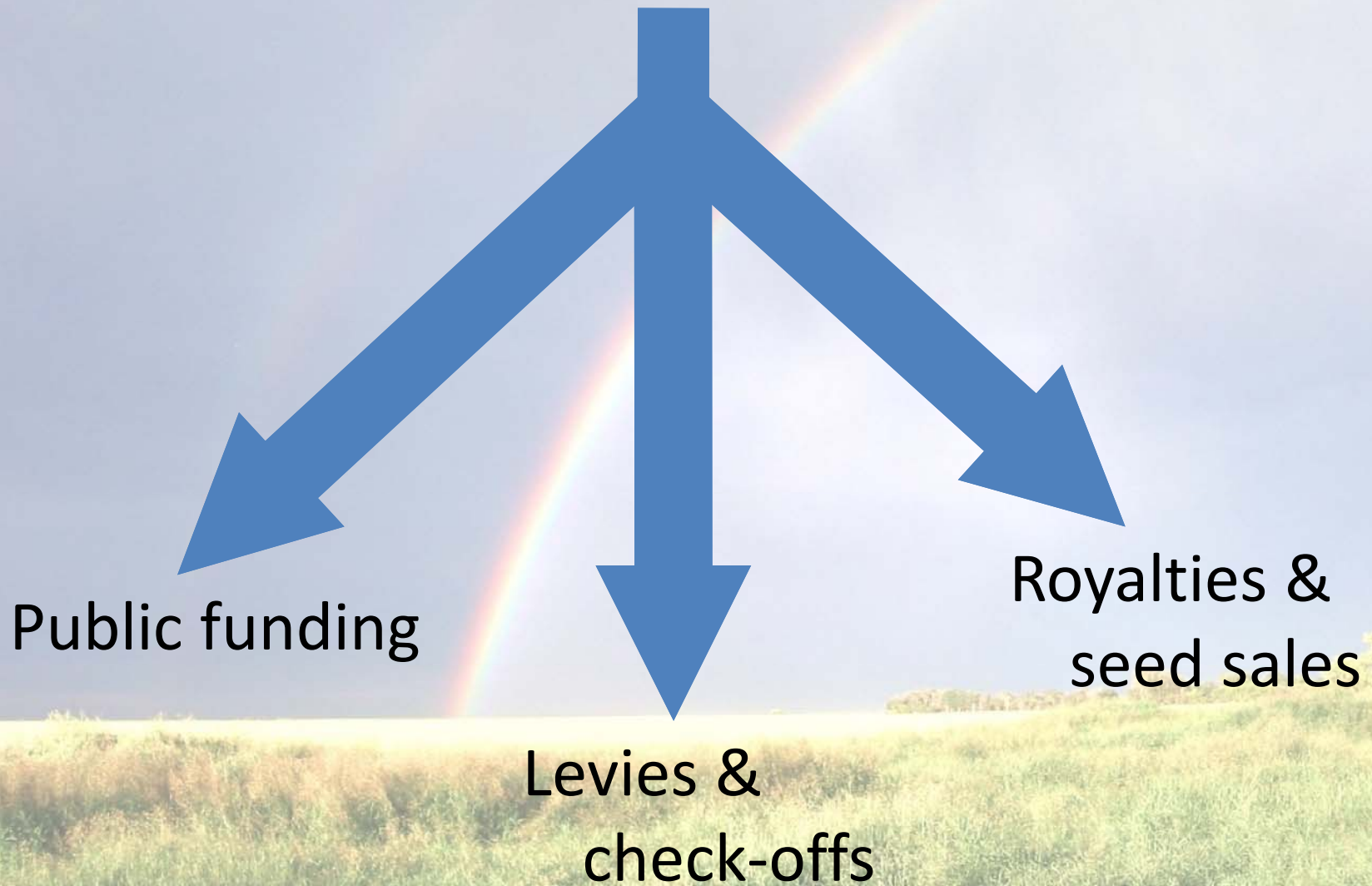
Total investment in Plant R&D (2007, \$165 million)



Existing crop research funding



Sources for increased research funding



Increased public funding for research?

- Perception by some that ag is old with low rates of return
 - Continued benefit cost analysis is useful
- even if governments know the rates of return are high:
 - discretionary \$ are short-many non-ag demands
 - politically, short term concerns dominate long term thinking – i.e. easy to forget the objective is to drain the swamp
 - There are other ag issues (environment, food safety, food quality) closer to the hearts of the general public that divert agricultural research resources away from crop research
 - There are some private funding alternatives
 - History speaks for itself ...expenditures have declined

Increasing research through levies

- Economically levies make sense
 - Costs and benefits align the incentives for research
 - Cheaper than tax dollars
 - industry voice improves governance
 - Non-refundable levies reduce the public good problem
 - can add research and price competition
- Politically they require producer support
 - Individual choice is cherished by some producers
 - In Canada, check-offs are collected through marketing legislation, which is a shared fed-prov jurisdiction.
 - Ability increase is limited without a strong drive by producers and governments
 - Commitment by government to match would help

Increased research funding through royalties and seed sales

- This is an important source of research funding where intellectual property is protected, allowing owners to capture the value from their innovations
- Can be increased by:
 - stronger IPRs, patents, end point royalties, PBRs
 - hybrid technologies
- Attractive to MNE but can also be a source of revenue for public/producer research organisations

Can we rely only on royalties?

- Most areas of research still lack complete property rights and will be somewhat neglected by private industry
- A research industry that uses knowledge (ie. a toll good) as an input has economies of size and is a *natural monopoly*
- If there are many separate owners of IP required for an innovation they may never be combined – anti-commons issue
- Maybe a mixed strategy works best so public can address missing markets and the presence producer can address market power issues

2.0 Other Roads Taken- Examples of Private Research in Innovation systems

- There are many different examples of how other countries and other crop sectors have incorporated private research in the innovation system



Canadian Canola Innovation System

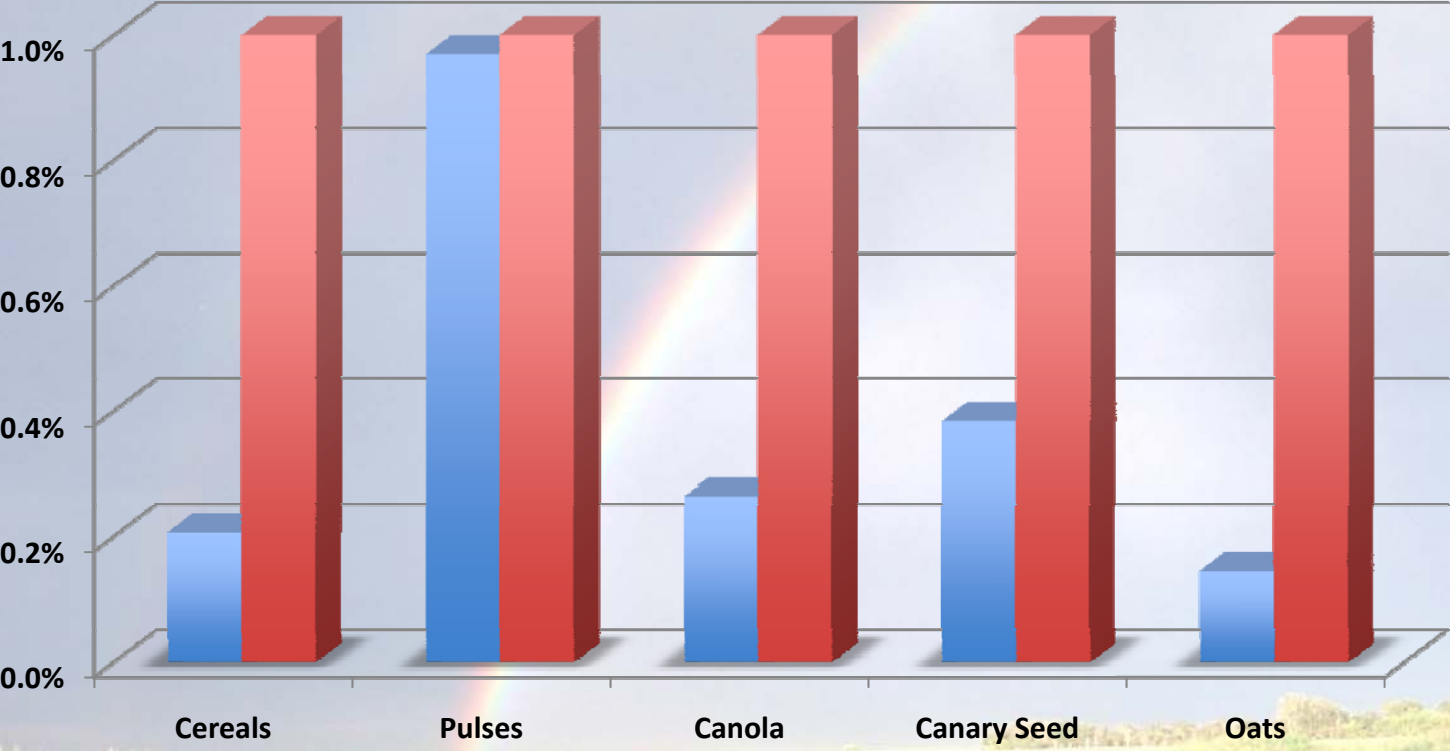
- Very successful innovation system
- Now Monsanto, Bayer Crop Science, Cargill, Dow Agri-Science, and Pioneer Hybrid
- Hybrid varieties complete IPRs (\$40 + per acre per year technology costs)
- Of approximately \$600M in gross revenue about \$40M is reinvested in research
- AAFC/ NRC etc. still support trait development \$15-20M per year. Producers fund agronomic research
- Freedom to operate, knowledge sharing is limited
- market size and research fragmentation are issues

Australian Crop Research - GRDC

- GRDC 1% research levy across all crops
- Matched by Government up to .5%
- GRDC has become the primary research organisation
- Producer and industry reps manage the GRDC



Canadian and Australian Levies as a Percentage of Farm Cash Receipts



■ Canada ■ Australia

Australian Crop Research- EPRs

- End point royalties go to variety owners each time crop is grown-similar to hybrids.
- Each owner sets a different rates.
- The rates have gone from about \$1 per tonne produced to about \$3 per tonne over the past 5 years.
- Currently about 2.5% (1.5 %levy +1 EPR %) of gross revenue for research- this will grow over time –
- GRDC involved in variety development for smaller crops
- GRDC no longer commercializing wheat –focus is on germplasm
- GRDC invested in the seed industry through partnerships

InterGrain – very interesting

- Joint venture with GRDC/State of W. Australia
- Objectives
 - To provide the Australian grains industry with access to elite varieties that will enable growers (and in particular growers in WA) to compete effectively in domestic and international markets.
 - To provide a business-like, market driven approach with a mix of government, industry and commercial funding and ownership, that is profitable and ultimately self-funding.

Wheat EPRs in France

- A end point royalty of 0.5 Euro/t for farm saved wheat seed. 85% goes to variety owners but some (15%) for general research and variety testing
- Uniform same rate across wheat varieties—this keeps EPRs simple to administer
- Negotiated 5 year agreements signed by producer organisations- producers are giving up the right to save seed for this agreement

Sask Pulse Growers

- Non-refundable levy @ 1% of sales
- Very successful and growing research program
- Very little MNE presence in Pulses
- Rapid growth in pulse yield and area
- Producers maintain cheap access to seed
- SPG control “their” varieties
- Intellectual property is managed for producer interests

3.0 Wheat and smaller crops: Options for public and levy research

- Currently these crops are very dependant on public and levy based funding- limited IPRs
- Research is performed primarily in public organisations
- IP and locally adapted germplasm is “owned” by public organisations
- MNE investment is very limited- few partnerships – so access to their IP is very limited

Key Considerations/Components of Change

1. Getting enough investment in innovation activities
 - Addressing market failures due to non-excludability
2. Putting the right pieces of IP together
 - Locally adapted germplasm
 - International public and private IP
3. Getting prices and incentives right
 - Vehicles for commercialization
 - Market power with concentrated ownership
4. Minimizing transactions costs throughout
5. The distribution of benefits and costs
 - This depends on perspective

Outcomes of not taking action

- Underfunding would persist for some time
- MNEs would not “rush in” but may enter if the means to protect IPRs develop. They will find ways.
- MNE may demand that AAFC stop commercializing varieties in return for making investments in Canada
- Lost opportunities in the short run, loss of control for public/producer IP in the long run

4.0 Final words

- The status quo is not a good option- too little research investment
- There is some momentum for change
- Producers, industry and governments have to get informed, push for change and be willing to compromise if change to achieved

Sources for increased research funding

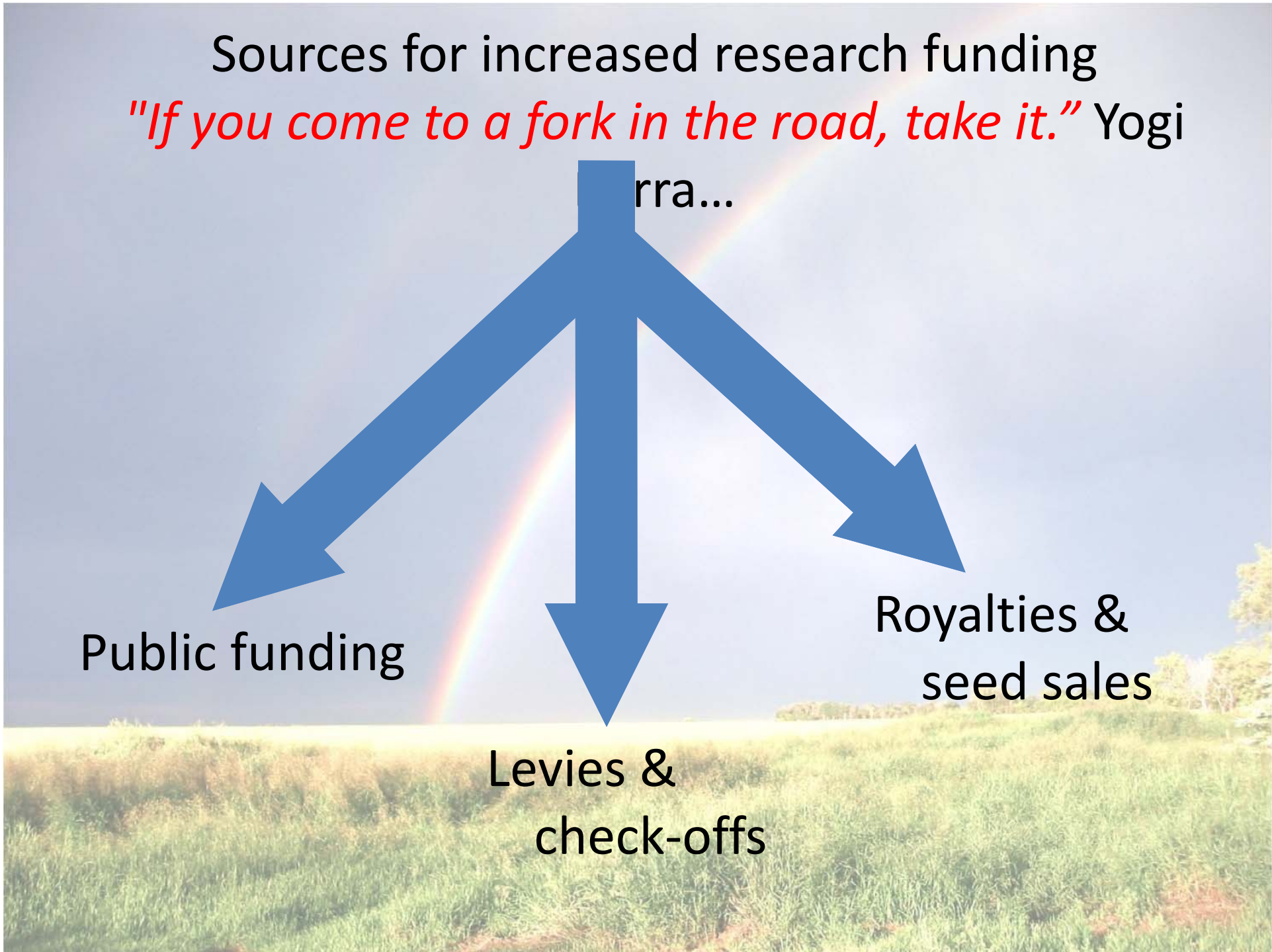
"If you come to a fork in the road, take it." Yogi


rra...

Public funding

Royalties &
seed sales

Levies &
check-offs



A vibrant rainbow arches across a clear blue sky, its colors transitioning from red on the left to violet on the right. Below the rainbow, a lush green field of tall grasses stretches towards the horizon. The field is bathed in bright, natural light, creating a warm and inviting atmosphere. The overall scene is peaceful and scenic, suggesting a beautiful day in nature.

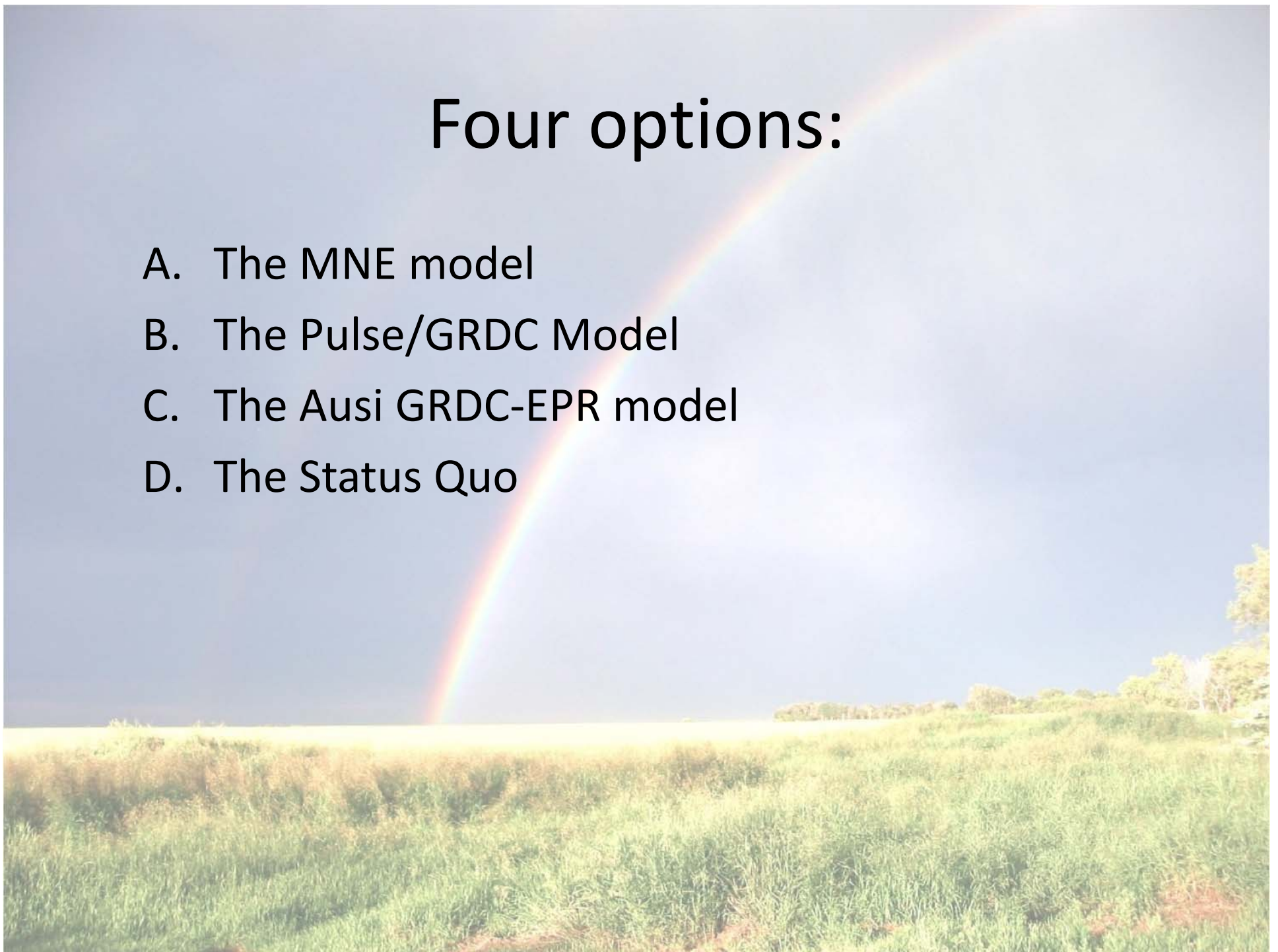
Thank you for your Attention!

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Four options:

- A. The MNE model
- B. The Pulse/GRDC Model
- C. The Ausi GRDC-EPR model
- D. The Status Quo



A. The MNE model

- Maximize MNE investment
 - Increase Intellectual Property Rights
 - End point Royalties are the ultimate
 - public institutions get out of breeding
 - public institutions move to supportive research and upstream germplasm development
 - Tax credits and other research subsidies

Outcomes of Option A:

- Entry of MNE research investment leading to an acceleration of yield improvement.
- The loss of public varieties in the medium term
- eventual concentration of the seed industry
- A significant reduction in knowledge sharing and in the freedom to operate for plant breeders
- Much higher wheat seed costs/technology use fees for producers

B. The Pulse/GRDC Model

- Producer levies would be increased to 1% of sales
 - This would require producer support and law change
 - Government matching would make this more attractive
- a non-profit “Producer Inc.” would breed and commercialize new varieties
- MNE would be free to enter the industry and negotiate access to the remaining pool of germplasm

Outcomes of Option B:

- At the new levels the “Producers Inc.” Would have funding well beyond current levels
 - \$40-50 million per year for wheat
 - Large by Canadian terms but small by MNE terms
- Producers Inc. would be short of capital to get up and running- contracting
- Private MNE could enter the industry expanding the choice for producers
- The existence of the *Producers Inc.* varieties in the market place could moderate the prices charged by the private industry but might deter entry

C: The Ausi GRDC/EPR model

- Legislation would be introduced to establish:
 - End Point Royalties
 - 1% levies
 - Producer Inc.
 - *Producer Inc.* would partner with one or more MNE to set up a for profit corporation for wheat breeding and variety commercialization.
 - The Producer Inc./MNE joint venture would return a portion of their dividends to the Producer Inc., which would reinvest their dividends into research

Outcomes of Option C:

- If the Producer Inc. is committed to reinvesting all dividends into research the MNE company would grow into a research intensive company that should eventually become the dominant wheat breeding company.
- seed prices would increase as the low price pre-existing public varieties slowly are replaced by newer varieties that outperform them.
- This model would generate more research than Option B and could generate more than option A

D: The Status quo

- No change in AAFC funding levies, EPRs or commercialization vehicles

