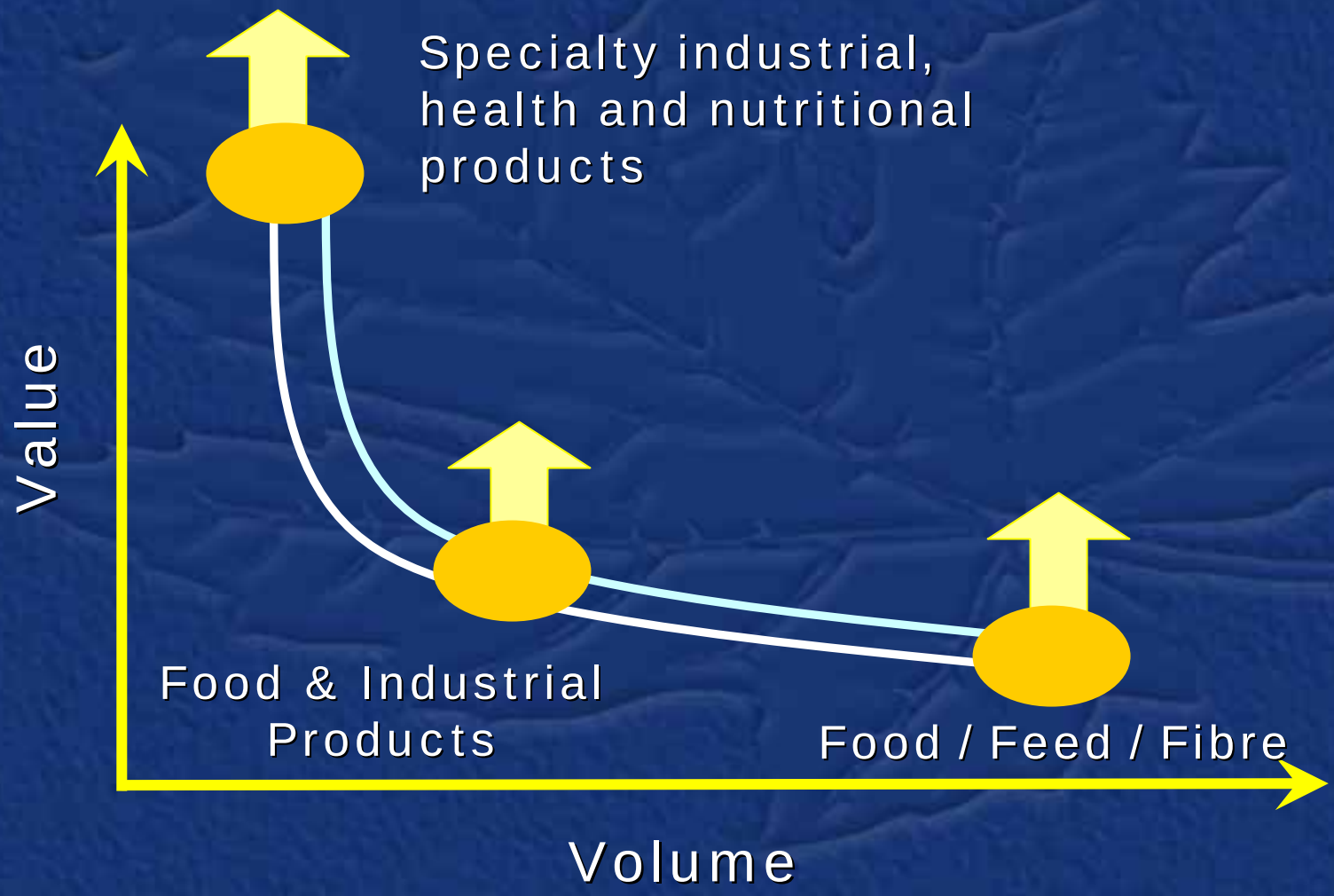
Growing the Market

Genetic Improvement for Total Utilization

Dr. Scott Duguid

Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada
Canada

Economic Value Proposition for Total Utilization of Flax



Role of Flax Genetic Improvement

Genomics, Genetic Characterization and Improvement

- There are a number of ways in which genetic improvement can and will play a role in developing high value products
  - Yield Improvements
  - Seed and Straw Composition
  - Yield and Quality Security
  - Support for Breeding

Priority Research for Seed/Straw Composition

- Develop improved germplasm and cultivars of flax for use in the functional food, feed and industrial utilization with:
  - Improved Oil Content
  - Improved Fatty Acid Composition
  - Improved Meal Quality
    - Protein – content
    - Mucilage – high and low
    - Lignans - SDG
    - Reduction in Anti-nutritional
      - Cyanogenic Glucoside, Cadmium
  - Improved Straw Quality – Fibre content
- Introgression with elite material

The Road Ahead: Disease Resistance

- Flax Rust
- Flax Wilt
- Pasmo
- Powdery Mildew

•To develop multi-disease resistant flax cultivars and and breeding lines to rust, fusarium wilt, powdery mildew, and pasmo to reduce the risk from the major diseases affecting flax in Canada

Flax Breeding And Production Enters A New Generation

- Flax Breeders Aim High on Yield
  - Plan to improve yield while maintaining steady improvements to full flax package
    - Major Challenge

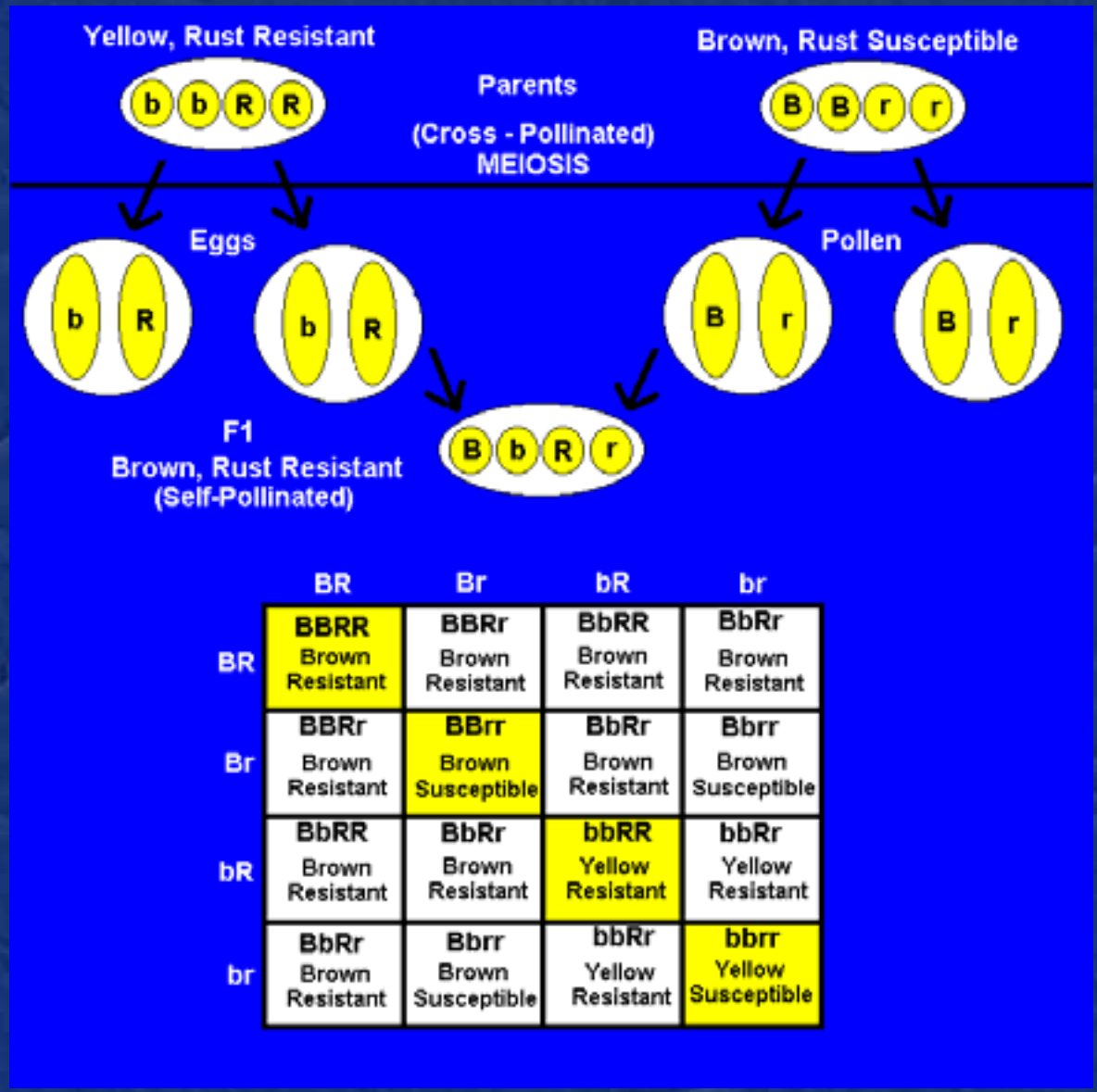
The 15 Chromosome Salute

Odds Get Tougher With Each Trait

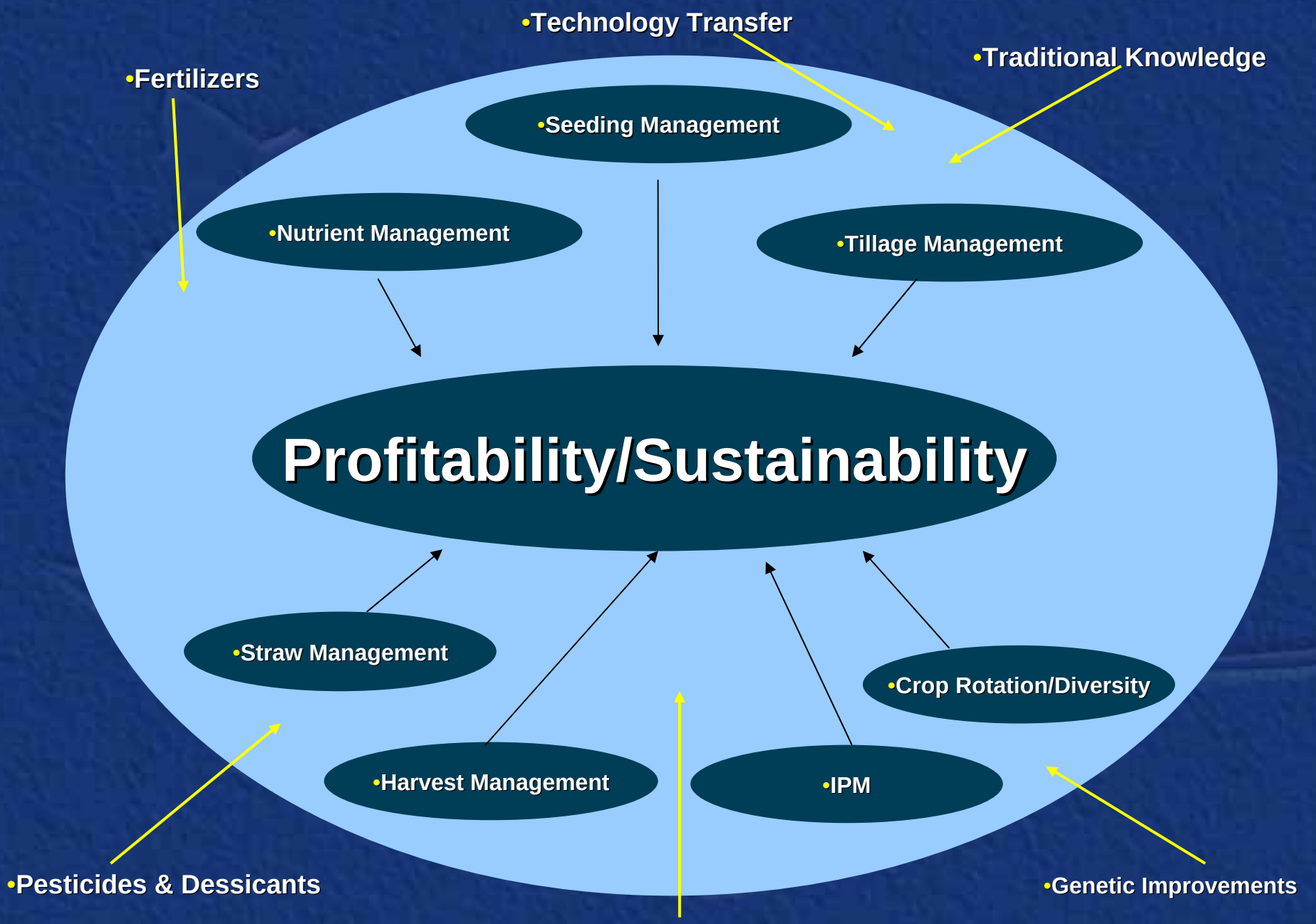
- Make A Cross
  - Odds: 1 in 32768
  - Perfect Population Size: 1,073,741,824
- To Get It Done
  - Make Large Number of Crosses
  - Selections – Culling the Worst; Keep the Best
  - Breeding Time – 7 to 12 years
- Not Genetically Mapped
  - More Than One Gene For Yield

The Road Ahead – Support for Breeding

- Molecular Genetics/Genomics
  - Understanding and using the Flax genome
    - Identify genes involved in oil and fatty acid synthesis
    - Identify factors that regulate metabolic pathways
  - Producing genetic markers to accelerate breeding and germplasm development
  - Identifying and using genes that control oil and meal quality, resistance to diseases and tolerance to drought, heat and cold



	BR	Br	bR	br
BR	**BBRR** Brown Resistant	BBRr Brown Resistant	BbRR Brown Resistant	BbRr Brown Resistant
Br	BBRr Brown Resistant	**BBrr** Brown Susceptible	BbRr Brown Resistant	Bbrr Brown Susceptible
bR	BbRR Brown Resistant	BbRr Brown Resistant	**bbRR** Yellow Resistant	bbRr Yellow Resistant
br	BbRr Brown Resistant	Bbrr Brown Susceptible	bbRr Yellow Resistant	**bbrr** Yellow Susceptible


•Technology Transfer
•Traditional Knowledge
•Fertilizers
•Seeding Management
•Nutrient Management
•Tillage Management
Profitability/Sustainability
•Straw Management
•Crop Rotation/Diversity
•Harvest Management
•IPM
•Pesticides & Dessicants
•Genetic Improvements
•Ecological Principles/Constraints

Growing the Market

Genetic Improvement for Total Utilization

Dr. Scott Duguid

Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada
Canada