Why is plant breeding important?

Office of the Union - UPOV

Train-the-Trainer Course on Plant Variety Protection under the UPOV Convention
UPOV Headquarters, Geneva - May 13, 2016
PLANT BREEDING IS IMPORTANT FOR:

- Farmer's needs & expectations
- Consumer's needs & expectations

Plant Breeding
Importance of Plant Variety Protection

Breeders

New Varieties

Farmers, Growers

Consumers

Plant breeding targets

Farmer

Agronomic characteristics: Yield
Pest & disease resistance
Abiotic stress resistance
Earliness
Harvestability
Market value

Logistics

Harvestability
Transportability

Distributor

Earliness
Storability
Appearance
Price

Consumer

Organoleptic (taste, sight, smell, touch)
Convenience
Nutritional value
Price
Dok-Ya-Cheong-Cheong
Resistant to phytophthora blight/virus
Phytophthora blight (Fungal disease):
- above: Resistant variety
- below: Susceptible variety
Chang Hyun Kim, Second World Seed Conference
Importance of Plant Breeding

Evolution of Wheat yield in France

FRANCE Wheat Yields (1815-2005)

- b = 0.00
- 1815-1945
- b = 0.052
- 1955-2005

Bernard Le Rusnic,
Second World Seed Conference (Rome, September 2009)

Impact on Agricultural Industry

- Increases in yields = better varieties
  - Wheat 21%
  - Canola 24%
  - Peas 32%
- Increases in area under cultivation
  - Canola 72%
  - Soybeans 94%
  - Peas 57%
- Increases in Investment
  - Canola 216%
  - Corn 107%
  - Soybeans 162
  - Pulse crops 130%

Canada
The economic, social and environmental value of plant breeding in the European Union

– Results achieved so far* –

Steffen Noleppa
HFFA Research GmbH

* This research has been initiated and financially supported by BTP. The results of the study are the sole responsibility of the author and have never been influenced by the initiator and supporter of the study.

EU: 2000-2013

Additional agricultural GDP amounts to EUR 8.5 billion:

- Wheat: EUR 3.1 billion
- Corn (Maize): EUR 0.9 billion
- Pulses: EUR 0.2 billion

Without plant breeding:

EU would have moved from being net **EXPORTER** to net **IMPORTER** in all major agricultural crops (including wheat and barley)
Without plant breeding:

An additional 18 million ha of arable land outside the EU would be needed: equivalent to the arable land of...
New Examples- World café outcome

- From Malaysia
  - Rice:
    - adaptation to humid conditions
    - Higher yield (from 3t to 10 tons/ha-Mu ?)
PLANT BREEDING IS IMPORTANT:

• To feed the people and the planet
• To adapt plant varieties to:
  – New needs:
    • Consumer’s taste (bitter, seedless...)
    • Food diversity
    • New consumption habits
    • Growing area (rural vs. urban)
    • Mechanization...
  – New uses:
    • Energy (Biofuel...)
    • Industry (e.g. sugar, oilseed rape...)
    • Environment (e.g. water efficiency, phytoremediation...)

Importance of Plant Breeding

Adaptation of Maize to Temperate Climate: the case of the Netherlands

Bernard Le Buanec, Second World Seed Conference (Rome, September 2009)
Glucosinolate content
from 100 µmoles (‘Jetneuf’) to 12 µmoles (‘Samouraï’)

LEAR: Low Erucic Acid
HOLLI: High Oleic and Low Linolenic

Canola

World Total Rapeseed Production
New Examples - World café outcome

• From Barbados:
  – Sugarcane:
    • Reduce fiber content

• From Kenya & Ghana:
  – Sorghum
    • Beer production

• From United Republic of Tanzania:
  – Cassava
    • Bitterfree

• Seedless fruits and vegetables:
  – Grapes, pepper, cucumber...
PLANT BREEDING IS IMPORTANT:

• To promote, encourage and protect innovation
  – Impact on breeder’s community (number – resident/non-resident, diversity, investment in R&D)

• Transfer technology and innovation to all (for the benefit of society)
  – Farmers (ensuring quality of the product)
  – Consumers (e.g. flower industry)
PVP provides a mechanism to facilitate dissemination of varieties to farmers:
open access does not ensure widespread dissemination or use

1. Lloyd Le Page, CGIAR
2. Ruaraidh Sackville Hamilton, IRRI
3. Ian Barker, Syngenta Foundation

International Research Centers
Chair: David Boreham Conclusions – Session 3

Plant Variety Protection: Improving Income for Farmers and Growers

variety **CHOICE**
+ **INFORMATION** on performance
+ **DELIVERY** of good quality planting material
= Opportunities for **ADDED VALUE**
(b) Improved Varieties

Argentina: Proportion of certified seed arising from new, protected varieties (wheat)

Argentina: Proportion of certified seed arising from new, protected varieties (soybean)

- Improved Varieties
- Plant Breeding
- Farmer's, consumer's needs & expectations
- Agro-related impact: Disease resistance, Yield, Crop harvestability
- Adaptation: Food security (climatic change), Taste
- Industrial uses (biofuel)
- Innovation, Technology transfer, access
- Impact on society (at large), Dev of agric. sector, Affordability & access

UPOV Membership

- other varieties
- new, protected varieties
PLANT BREEDING IS IMPORTANT:

• To develop the agricultural and rural sector
  – Public
  – Private
• To release healthy and affordable products to the market

The economic, social and environmental value of plant breeding in the European Union

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October 13th, 2015, Vienna
The benefits of plant breeding in the EU: results achieved so far

Concluding remarks:
Preliminary summary

- Modern plant breeding in the EU (and probably elsewhere) allows:
  → to essentially increase yields and overall agricultural productivity,
  → to enlarge agricultural crop supply.

- Based on this key result, it can also be concluded that plant breeding acts:
  → to increase rural welfare by generating additional income to farmers,
  → to increase social welfare by adding GDF up-/downstream the value chain,
  → to provide a greater quantity of less expensive food and raw material,
  → to enhance world food security,
  → to stabilise agricultural commodity markets.

- Furthermore, genetic crop improvements permit:
  → to preserve valuable natural resources such as land habitats and water,
  → to reduce GHG emissions from an expansion of the global agricultural land,
  → to protect and to enhance biodiversity around the globe.

The value of plant breeding since the turn of the millennium:
Socio-economic effects: Commodity prices

Avoided price increase due to plant breeding in the EU since the year 2000 (in %)

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Source: Own calculations and figure

- Agricultural market prices would be higher w/o genetic crop improvements.
- On average, approximately 6 % higher market prices.
- In addition, a price stabilization effect occurs:
  - higher production volumes allow for better stock management in times of ad-hoc market changes.
Task sharing and part of public and private funding of the Swiss wheat breeding program

Public funding (Agroscope)

- Variety development
- Final Evaluation
- Final Evaluation
- Maintenance breeding, Basic seed production, PVR protection, Variety representation in Switzerland, in Europe and worldwide

Private funding (DSP Ltd), source: Royalty fees from protected varieties

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**International Market Development**

**Export of Kenyan Cut Flowers**

- **Evans Sikinyi, Second World Seed Conference**

- **Value (Billion Kshs)**
  - **Volume (Tons)**

- **PVP Operational**
- **UPOV Membership**

- **Evans Sikinyi, Second World Seed Conference**

**HORTICULTURE: Generation of foreign exchange, employment, capture of new markets**
- Exports worth $216m in 2002, but $1b in 2008
- 2m employed, plus another 3.5 m indirectly
- Close to 45% Export EU market Cut-flowers
- Exports 4% of total production
International Market Development

10 Year Report (Canada)

Impact on Horticultural Industry

Floriculture (greenhouses)
- 1991 – 4.5 million sq. metres
- Net importer of flowers & nursery products
- $88 million imported
- 2008 – 8.9 million sq. metres
- Net exporter of flowers & nursery products
- $52 million exported

Nurseries and sod farms
- Employment increased by 50% from 1990 to 2000

Only a modest expansion in variety development

New Examples- World café outcome

- From Jamaica?
  - Resident/ non Resident applications
PLANT BREEDING IS IMPORTANT:

- To enrich, maintain and diversify Genetic Resources in a sustainable way
UPOV
THE BREEDING CYCLE OF PROGRESSION

PLANT BREEDING IS IMPORTANT FOR:

- Genetic Resources
- Tradition
- Diversity

- Farmer’s, consumer’s needs & expectations

- Plant Breeding

- Agro-related impact:
  - Disease resistance
  - Yield
  - Crop harvestability

- Adaptation:
  - Food security (climatic change)
  - Taste
  - Industrial uses (biofuel)

- Innovation
- Technology transfer access

- Impact on society (at large)
- Dev of agric. sector
- Affordability & access
PLANT BREEDING

Makes our life
– Easier
– Cheaper
– Better
For everyone
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