



Introduction of Solynta Hybrid True
Potato Seed (HTPS) commercial
cultivars under sustainable agriculture
growing conditions using *Moringa
oleifera* for disease management and
Mycorrhizae and *Trichoderma* fungi for
plant development.

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Agenda

- ❖ Pioneering Hybrid True Potato Seeds for Innovative Food Production in Africa-by Solynta
- ❖ The importance of Sustainable Agriculture for small-scale farmers
- ❖ The use of Biostimulant in potato production
- ❖ Moringa oleifera plant as a biocontrol in agriculture
- ❖ Research Design and Methodology
- ❖ Summary

October, 2022



Introduction

The world is facing major challenges in agriculture

- We need (a lot) more food (+50% in the coming 20 years).
- Land is becoming increasingly scarce (*half of the habitable land is already in use for farming*).
- Water supply is reaching the limit (*>2/3 of available freshwater used in agriculture*)
- We need to reduce our carbon footprint (*Agriculture produces 20-25% of global GHG emissions*).
- Modern farming relies on pesticides (*Increased scrutiny from markets and regulators*)

Reduce
hunger



Reduce
pesticides



Reduce
climate
change





Pioneering Hybrid True Potato Seeds for Innovative Food Production in Africa

By Solynta

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What if... Solutions to these challenges came from this tiny seed?

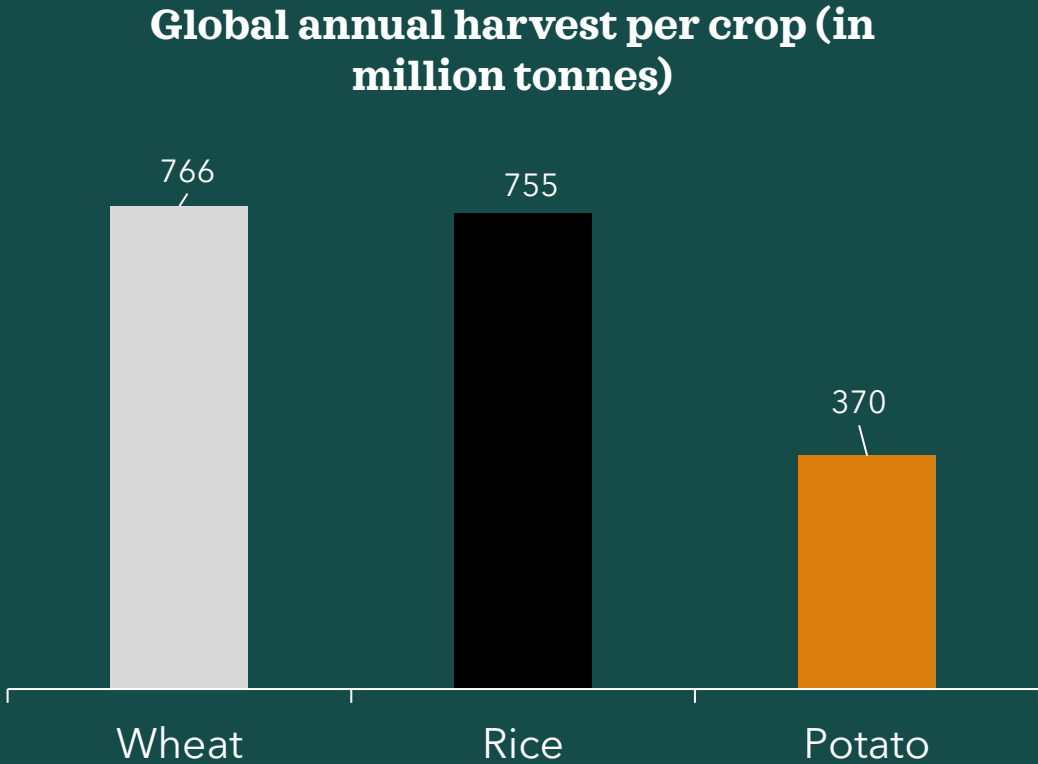


Since 2006, the Netherlands

"Potato produces **more nutritious** food on **less land** with **less water** in **harsher climates** than any other major food crop"

-FAO-

❖ Potato, the 3rd largest food crop, has a big role to play in addressing these challenges

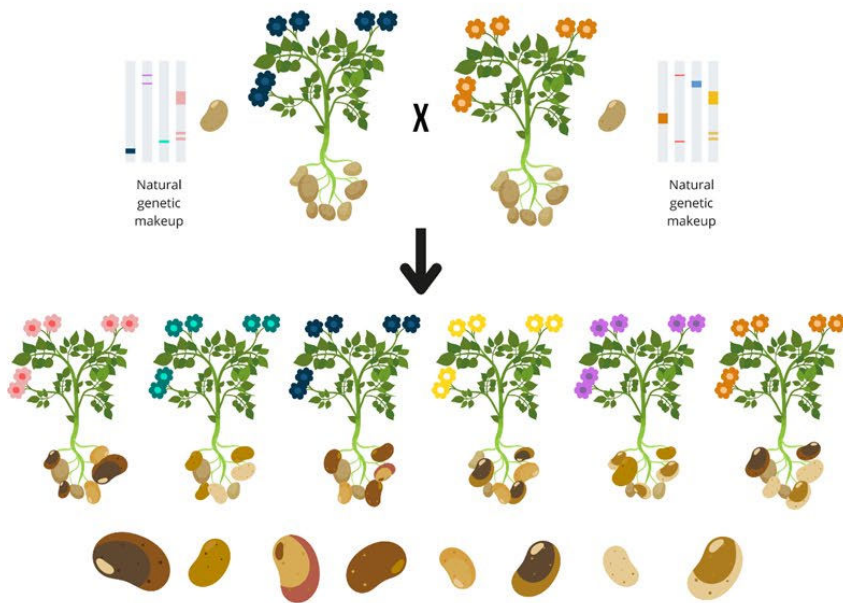


Hybrid breeding: unlocking the true potential of potato



TRADITIONAL POTATO BREEDING

Complex and unpredictable

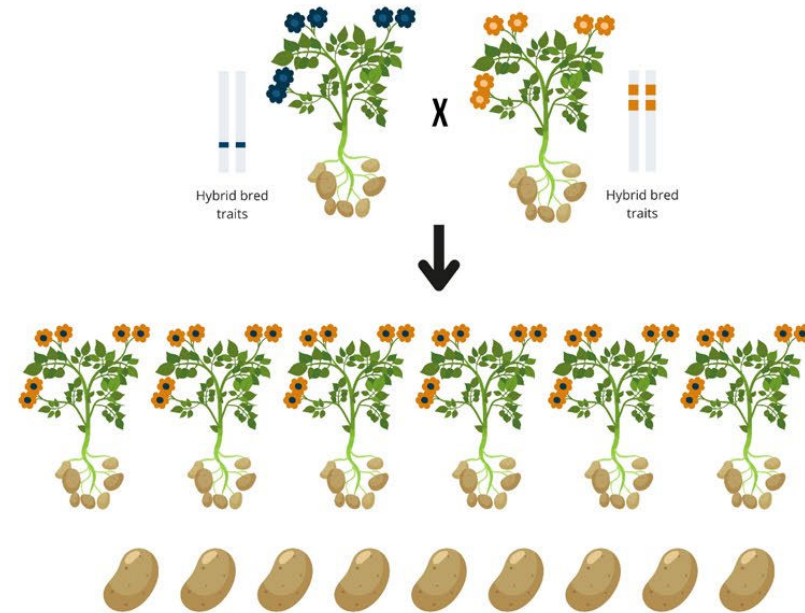


Outcomes are
RANDOM.

Targeted breeding for
selected traits can take
15-50 YEARS.

HYBRID POTATO BREEDING

Fast and predictable

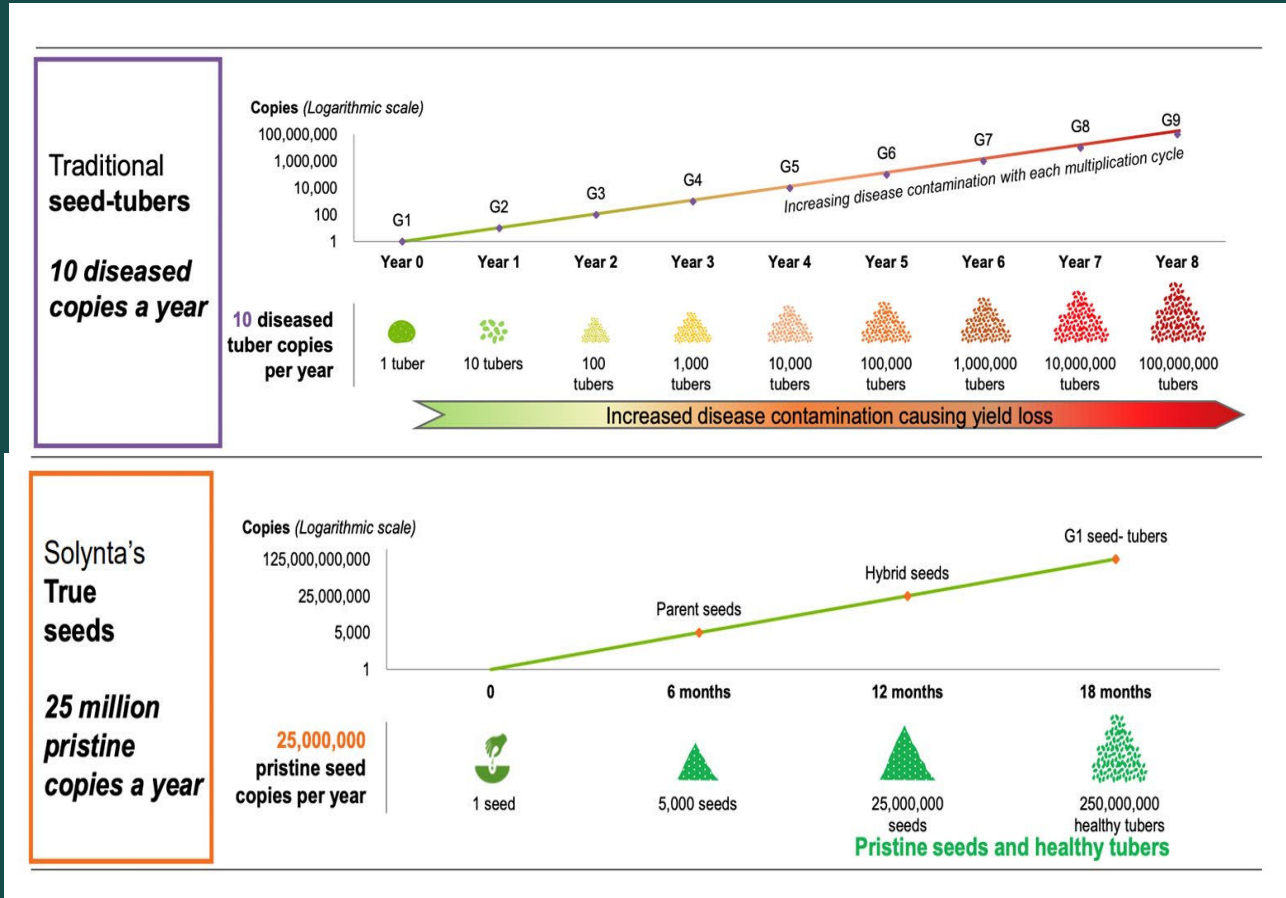


Offspring are
IDENTICAL.

Targeted breeding for
selected traits only takes
2-4 YEARS.

***Solynta**
hybrid potato breeding

Comparison: Traditional Seed Tubers vs. Solynta True Potato Seeds



Solynta (HTPS)

- Fast and efficient, and new traits can be rapidly be introduced
- Higher yielding
- Less crop protection chemicals due to disease resistance
- Better quality for processors and consumers

Traditional Seed Tubers

- Many years of selection and multiplication
- Low genetic gain
- Potato yield has not significantly improved over the past century.
- It takes years to build up sufficient quantities of seed tubers for commercial production

Hybrid True potato Seed technology provides CLEAN starting material



Pathogen Type	True Potato Seeds	Tissue Culture	Micro/Mini Tubers	Seed Tubers including soil
Bacteria	2	5	6	>5
Fungi	0	0	8	>7
Phytoplasma	0	7	7	>6
Viroids/viruses	7	35	35	>35
Nematodes	0	0	5	>5
Other	0	0	2	>2
Total	9	47	63	>62-200

- ❖ TPS is safer than Tissue Culture
- ❖ Final phytosanitary risks depend on further multiplication

Source: Australian Government, Department of Agriculture, Fisheries and Forestry, "Review of policy: Importation of Potato (*Solanum tuberosum*) propagative material into Australia" & EU PRA

- ❖ Easier logistics, as clean true seeds can easily be produced, transported, and stored.

What does the future of HTPS look like?



The importance of Sustainable Agriculture for small-scale farmers

In Africa



Sustainable agriculture is a combination of many aspects including soil use, livestock farming, nutrient flow, water use, energy & climate, biodiversity and plant protection, economic viability etc.



Sustainable Agriculture Practices

- ❖ Soil management: conservation agriculture (no-tillage, permanent mulching, and crop rotation)
- ❖ Organic farming: the use of manure, compost, and green manure.
- ❖ Good Agriculture Practices (GAP): which is a set of standards for safe and sustainable production of crops and livestock.
- ❖ Integrated pest management (IPM) concept.

Benefits

- ❖ Reduced soil susceptibility to wind and water erosion, soil structure improvement, and the number of soil organisms increase.
- ❖ Maximize yields and optimize business operations while minimizing production costs and environmental impact.

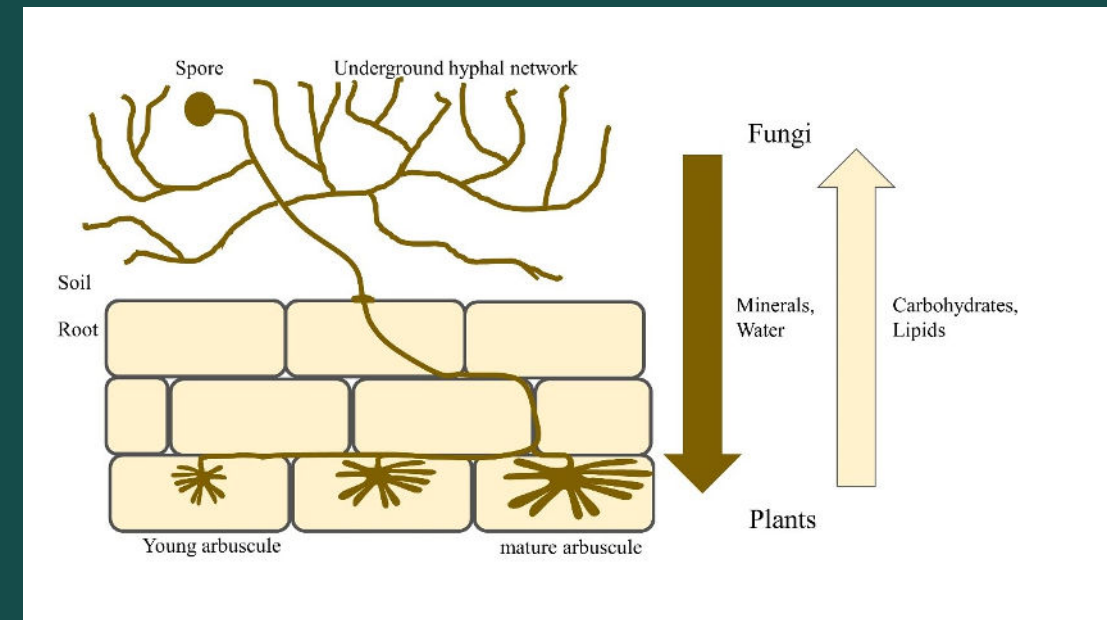
Future potential for a small-scale farmer

- ❖ Save money (reduce input costs) and generate income in rural areas.
- ❖ Create job opportunities.
- ❖ Contribute towards food security.

The use of Biostimulant in potato production (Mycorrhizae and *Trichoderma spp.* fungi)

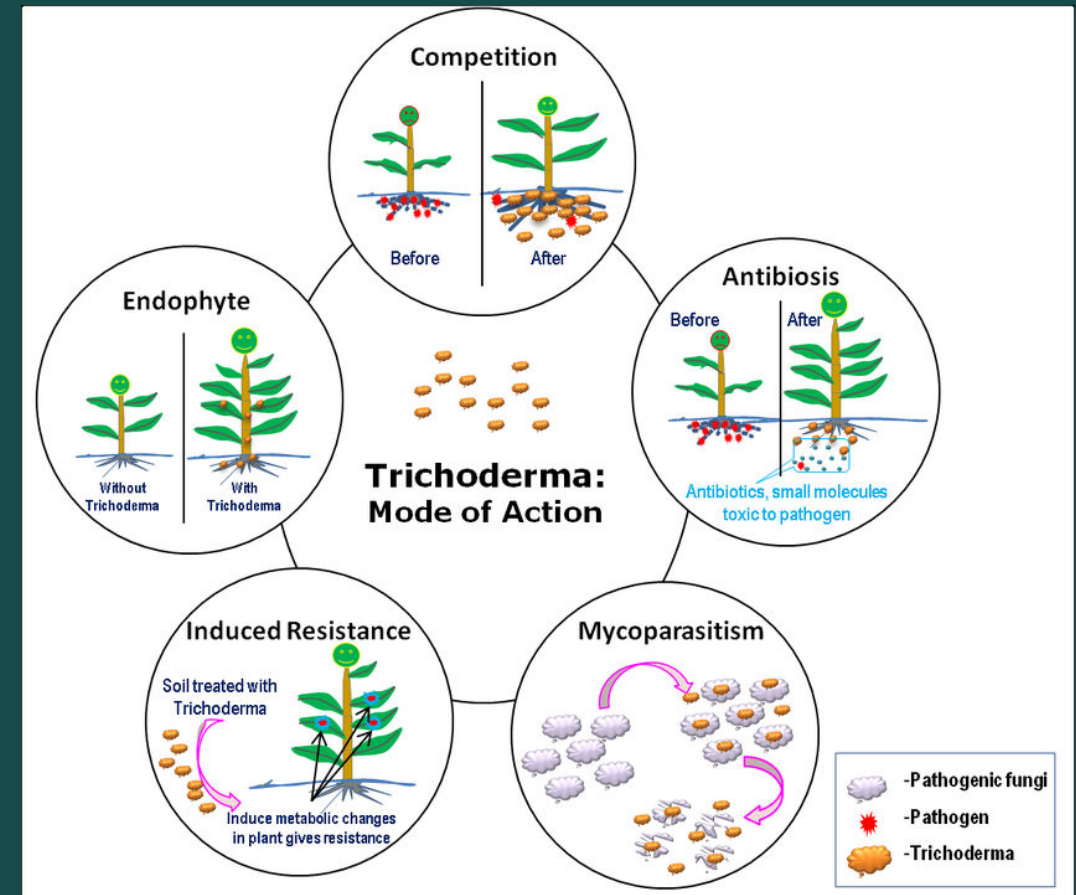
- ❖ The incline in agriculture yield over recent decades would have been impossible without mineral fertilizers; however, excessive application of these compounds to the soil has resulted in soil salinity, erosion, and soil micro-organism depletion (BMZ, 2015).
- ❖ Arbuscular mycorrhizal fungi (AMF) are popularly known for their symbiotic association with more than two-thirds of terrestrial plants.
 - During the symbiosis these fungi can exchange mineral nutrients, especially phosphorus (P), and Nitrogen (N) for carbon from the plant (Zhang et al., 2021). AMF also contributes toward tolerance of several abiotic stresses (i.e., drought).

Arbuscular mycorrhizal fungi



The use of Biostimulant in potato production (Mycorrhizae and *Trichoderma spp.* fungi)

- ❖ *Trichoderma spp.* colonizes the plant roots and produces substances beneficial to plant growth, is known to be an eco-friendly solution to contribute to high plant performance under various environmental conditions by sustaining crop production.
- *Trichoderma* fungi after colonizing the plant root can significantly improve plant metabolism by altering the plant's hormone content, soluble sugars, phenolic compounds, and amino acids, as well as its photosynthetic rate and transpiration (Lal Kashyap et al., 2017).



Moringa oleifera plant as a biocontrol in agriculture

- ❖ The intensive use of pesticides has resulted in many people, particularly in developing countries being victims of mycotoxins produced by heavy metals and chemicals.
- ❖ These chemicals (i.e. fungicides) can kill the fungi but also cause damage to the plant due to the excess pesticide applied (due to lack of knowledge by a small-scale farmer), resulting in the death of soil beneficial flora and fauna, leaching by rain and contaminate water sources (Mondal, 2011).
- ❖ Plant extracts containing various chemicals have been reported to exhibit antibacterial, antifungal, and insecticidal properties under laboratory trials (Adandonon et al., 2006; Talreja, 2010, Goss et al., 2017).
- ❖ *Moringa oleifera* is one of those higher plants, with antimicrobial properties against plant pathogens causing soil-borne diseases (Alagawany et al., 2018), it also enhances plant tolerance to abiotic stress, thus it is included in IPM.



Research design and Methodology

Objectives:

1. Measure disease rate on potato plant (leaves and tuber) treated with Moringa Leaf Powder (MLP)
2. Evaluate plant growth and development on potatoes treated with fungi-containing products.

Experiment units, SOLHY007 and SOLHY012-Solynta Cultivars

Mycorrhizae and Trichoderma Treatments

- Organic product-as a biostimulant (“Platform”); soil applied.

Treatments	Rates %	Replicates
Mycorrhizae	1.0, and 2.0	4
Trichoderma	1.0, and 2.0	4
Myco + Trich	1.0, and 2.0	4

Moringa Treatment

- As a biocontrol-Moringa leaf powder (MLP); Foliar applied.

Treatments	Rates (g)	Replicates
Aqueous	5, 10, 20	4
Ethanol	5, 10, 20	4

Research design and Methodology



Pot experiment

- ❖ Develop seedlings in a Glasshouse for 5 weeks, then transplant them into 20L pots
- ❖ Measure; chlorophyll content (SPAD), phenological evaluation (flowering, canopy, maturity)
- ❖ Yield (tuber no., tuber sizing, and tuber weight)

Field experiment

- Ukulinga farm experiment location
- 5 weeks old seedlings to be transplanted beginning of September
- Weather data (rainfall, temperature ranges)
- Phenological evaluation (plant vigor, canopy closure, flowering), chlorophyll content (SPAD)
- Yield (tuber no., tuber sizing, and tuber weight)

Post-harvest experiment

- Starch content
- Tuber dry matter
- Vitamin C
- Storage temperature
- Days to sprouting
- Disease rate under storage

Research Progress-2022 First year

Seedling development (5 weeks)



Seedling transplant-pot trial



HTPS potato plant development Field & Glasshouse



Summary

- ❖ Solynta aims to provide hybrid potato innovations to enhance the livelihood of producers around the globe which drive sustainable improvements in world food security.
- ❖ Sustainable agriculture has the potential to increase yields and feed the world's growing population without destroying the resources we need for our human survival.

