11th World Potato Congress 2021
31 May - 3 June 2021, Dublin, Ireland

Visit Ireland! Komm nach Irland!
Ven a Irlanda! 访问爱尔兰! Visitez l’Irlande!
Diversified use of apical cuttings to boost potato seed systems

Monica Parker
Senior Scientist
International Potato Center
Perennial challenge of availability of commercial seed for potato farmers

Limited choice of seed of new varieties

Conducted 1 trial in Kenya and private sector came on board

While project support drove initial technology use in Kenya, stakeholders and private sector are taking up the technology without influence from CIP

Apical cuttings provide an alternative to minitubers, not a replacement
Seed Systems in Africa

Protected
Early generation seed
TC, screenhouses
↓
minitubers, cuttings

National programs
↓
Private enterprises

Field
Production of basic seed
2 generations

Bulking, certified seed
further 2 generations

Same or different enterprises, public institutions
Differing entry and exit points

Onward multiplication ‘quality’ seed

Local seed multipliers

Commercial seed

Challenges: quality control, perishability, dormancy and land requirements
• Cuttings are produced from tissue culture plantlets in the screenhouse, rather than minitubers

• A cutting is a transplant produced in a screenhouse and handled the same way in the field as a nursery-grown seedling

• After rooting, the cuttings are planted in the field to produce seed tubers
Two stages of apical cutting seed systems

Production of cuttings in a screenhouse

Production of seed from cuttings in the field

Point of sale/change of hands

- Each cycle should last 4-6 months
- Efficiency based on number of cuttings produced and sold per TC plant
Benefits of Apical Cuttings in Field Seed Production

- High productivity
- Profitable after 2 seasons of multiplication
- Rapid maturity
- Suitable where limited land for multiple seasons of bulking commercial seed

Unica at 6 wks
Suitable where restricted land availability and saving seed on-farm

Working with units of 1,000 cuttings

**1st Season**
- Requires 10 x 12 m² land
- Produce 10,000 tubers

**2nd Season**
- Requires 0.25 ha land
- Produce 85 – 130+ (4.3 – 6.5+ t) 50 kg bags of seed

Farmers benefit by accessing early generation seed

Compatible with saving seed on-farm

Doesn’t consider production of minitubers from first season of multiplication
Benefits of Apical Cuttings – Farmers Access Cuttings Directly

Small-scale production of cuttings in rural areas

Smallholder farmer purchased cuttings from local nursery and planted to produce seed on-farm in small seed plot
Screenhouse Production of Cuttings

1 internode to whole tissue culture transplant

~ 2 months to produce pool of 5-20 mother plants per TC or internode

Shoots transferred to plugs

14 - 21 days to root and harden before ready for field

- Complete cycle 4 - 6 months
- Number of cuttings per initial TC plant is critical to efficiency
  - 1 initial TC should produce 50-200 cuttings

World Potato Congress
Screenhouse Production of Cuttings

- Originating from young apical tissue is the key to high productivity per cutting
- Key is keeping mother plants juvenile
  - maintain simple leaves
  - keep cutting shoots

6 month old sub mother plants, note juvenile state indicated by simple leaves
Apical versus Stem Cutting

- Produced from TC mother plant
- Yield potential 10-20+ tubers/cutting

- Produced from mature mother plant/sprouted tuber
- Yield potential 2-4 tubers/stem
Large-scale private sector production
Large-scale private sector production
Field production
Business models of cuttings through seed systems

- **Tissue culture plantlets**
  - **Starter material**
  - **Small-scale farmers** buy cuttings to produce seed on farm in nursery beds
  - **Large-scale farmers** plant seed produced on farm for ware production
  - **Assume all tubers of equal quality under GAP thus can select seed from harvest based on size**
  - **Small tubers**
  - **Large tubers**

- **Large-scale nurseries**
  - **Produce cuttings**
  - **Seed producers** buy commercial seed produced from cuttings
  - **Farmers** buy commercial seed produced from cuttings

- **Produce mother plants**
  - **Large-scale farmers** buy cuttings to produce seed on farm
  - **Large-scale farmers** plant seed produced on farm for ware production
  - **Provided GAP and sound crop rotation, can re-use seed 2-4 seasons until seed quality and yield decrease**

- **Satellite nurseries**
  - **Produce cuttings**
  - **Small-scale farmers** buy cuttings to produce seed on farm

- **Professional, few and central**
  - **Large-scale nurseries**
  - **Seed producers**
  - **Farmers**

- **Market**
  - **Farm produced seed**
  - **Large tubers**
  - **Small tubers**

- **Small-scale, several and scattered**
  - **Satellite nurseries**
  - **Small-scale farmers**

- **Farm produced seed**
  - **Market**
Considerations for cuttings

**Producing cuttings**
- Vegetative state: temp, day length
- Rooting medium: conical plugs
- Fertility
- Packaging/transportation

**Planting cuttings**
- Spacing in field
- Cutworms a problem?
- Watering until establishment

**Establish systems to deploy TPS**
- Nursery system in place for seedlings
- Behavior to use transplants
Acknowledgements

- Partners: private and public
- CGIAR Research Program on Roots, Tubers and Bananas
- USAID
- GIZ
- Syngenta Foundation for Sustainable Agriculture
- CIP Potato Team
- You for your keen ears

THANK YOU