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# **Utilization of Plant Genetic Resources at the Vegetable and Ornamental Plant Institute of the ARC**

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# Introduction

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- More than 9000 accessions of various vegetables, ornamentals and medicinal plants
  - Seed genebanks
  - *In vitro* genebanks (tissue culture)
  - *In vivo* genebanks (Plants in fields, greenhouses)



# Introduction

- Various commodities
  - Commercial vegetables
    - Potatoes
    - Sweet potatoes
    - Other
  - Indigenous and traditional vegetables
    - Leafy vegetables
    - Root crops
    - Others
  - Indigenous flower bulbs
  - Indigenous medicinal plants



# Utilization - Potatoes

- *In Vitro* potato gene bank is the only functional potato gene bank on the African continent
- Annually supplies the potato breeding program (only breeding program in Africa) with plants for evaluation trials (yield, quality, abiotic stress, disease resistance)
- Release of new potato cultivars that are adapted to SA conditions would not be possible without this genebank



# Utilization - Potatoes

- The **gross farm gate value** for the potato industry, is estimated at R4.5 **billion** – start of the potato certification scheme (supply disease free material for multiplication to the industry)
- Twenty-two (22) new potato varieties have been registered from this program of which Nine (9) are currently produced commercially in South Africa and neighboring SADC countries

# Utilization – Potato

## Germplasm characterisation

Field- and greenhouse plantings are used for the

characterisation of:

- Morphological characteristics (Descriptor lists)
- Disease- and pest tolerance
- Heat- and drought tolerance
- Tuber quality and keeping quality
- Yield potential



# Utilization – Sweet potato

- The basis of the ARC sweet potato breeding program
- Includes a disease-indexed scheme – only source of disease-indexed material to producers
- Healthy nucleus plants (2000-3000 bags annually) are supplied to vine growers & community-based nurseries to ensure good yields in various production areas

# Utilization – Sweet Potato

- Orange-fleshed sweet potato varieties developed are of national importance to address vitamin A deficiency,
- In addition, new cream-fleshed high dry matter, high yielding varieties can contribute significantly to food security considering that an estimated 14.3 million South Africans are vulnerable to food insecurity
- The drought tolerance of sweet potato, as compared to conventional vegetable crops, is also of importance as South Africa is a drought stricken country



# Utilization – Sweet Potato

- 2004-2009 released 12 new sweet potato varieties
- Orange-fleshed sweet potato disseminated to 100+ community projects
- Community-based nurseries established at 18 sites



# Utilization other vegetables

- The **South African garlic industry** is supplied by app. **350kg of virus free** garlic plants annually. Production of virus free garlic plants results in higher yields
- Seed from discontinued breeding programs

# Utilization indigenous vegetables

- *Characterization*
  - Descriptor lists (morphological characterization)
  - Pest and disease
  - Yield
  - Organoleptic
- ARC-Roodeplaat is the only seed-source of some indigenous and traditional vegetable species in South Africa.



# Utilization indigenous vegetables

- Help in commercialization
  - generating new knowledge
  - exposing some farmers to the different crops
- Issued seed of 366 accessions to 72 users during the last 6 years
- 35 the users external ranging from Universities to private farmers, community projects and home gardeners



# Utilization indigenous vegetables

- All ARC indigenous vegetable research rely on genebank:
  - Water use efficiency
  - Nutrient requirements (fertilizer recommendation)
  - Cultivation practices
  - Soil less culture (hydro-ponic)
  - Allelopathy
- External research that rely on seed:
  - Nutrient content analyses
  - Linking use of indigenous vegetables and community health
  - Home gardens

# Utilization indigenous flower bulbs

- Utilized for breeding and cultivation trials
- Since the start of research
  - Released 29 *Lachenalia* cultivars
  - Released 8 *Ornithogalum* cultivars
- Job creation through local production
- Numerous publications to address relationship and genetic characterization



# Utilization indigenous flower bulbs

- The release of new cultivars will also indirectly contribute towards the sustainability of the commercial *Lachenalia* growers in South Africa
- One of these growers is a community based project in the Northern Cape Province. Is currently exporting *Lachenalia* bulbs to Europe on a yearly basis.
- The release of new cultivars will impact on the sustainability and continued success of this community initiative



# Utilization Medicinal plants

- Material supplied for all cultivation trials
  - Multiplication methods, fertilization protocols and the effect of fertilization on the chemical compounds and bio-activity
- 2010/11– More than 15000 plants and more than 8000 seeds supplied for trials and community development projects





# Utilization Medicinal plants

- Over harvesting of medicinal plants are resulting in increased pressure on natural population and even the risk of possible extinction
- Cultivation can solve this problem, but all the information needs to be generated
- Genebank is the start of this research (maintaining collection, characterizing plants and supply of material)

# Utilization Medicinal plants

- Cultivation methods established to reduce harvesting pressure on the natural populations (some species almost extinct in the wild due to over harvesting)
- Establishment of nurseries contributes towards job-creation



# Increase utilization

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- Generate information on:
  - Characterization
  - Multiplication
  - Cultivation
  - Pest and diseases
  - Post harvest requirements
- Utilization of the information in breeding, cultivation and processing trials

# Thank You

My colleagues – for the supply of photos and information

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