Year 2013: Horticultural Research at MTT Agrifood Research Finland, Piikkiö

Saila Karhu
MTT Agrifood Research Finland

• MTT is a leading research institute developing sustainability and competitiveness of the food system

High-quality food, clean environment—well-being of people
Locations and personnel

- MTT has operations in 15 locations around Finland.
- The headquarters is located in Jokioinen, in South-West Häme region.
- MTT employs about 760 persons.
- Researchers and academic experts account for almost half of the personnel.
Solutions for customers in five research areas

MTT and the food system
MTT financial structure 2008-2012
Publications

- Publication channels are Finnish and foreign journals and publication series, independent publications and conference publications.

- MTT’s own publication series are MTT Growth, MTT Science and MTT Report.

- In 2011, MTT’s scientists published 184 peer-reviewed scientific articles and four doctoral dissertations.

- The impact of MTT’s publications is top-level in Finland*. 

*Sitaatioindeksityöryhmä II:n raportti: Suomalaisten tutkimusorganisaatioiden Web of Science - julkaisut ja niiden vaikuttavuus vuosina 1990–2009, Opetus- ja kulttuuriministeriön julkaisuja 2011:34
MTT offers variety of online services

www.mtt.fi/english
MTT parks

Piikkiö
Yltöinen Arboretum

Rovaniemi
Apukka Arboretum

Jokioinen
Ferrarian Rhine Park showcasing fruit trees and berry plants

Jokioinen
Exhibition gardens
Wendla Garden

Jokioinen
Elonkierto Agricultural Exhibition Park

Jokioinen
Cultural setting
Jokioinen Manor Park
Horticultural research is carried out at several locations of MTT
Goals

- To develop competitive and sustainable Finnish horticulture
- To improve the quality of products, methods and techniques of the sector

Customers

- Growers
- Horticultural trade
- Horticultural industry (R & D)
- Landscaping
- Policy making
- Consumers
<table>
<thead>
<tr>
<th>Research sector:</th>
<th>Names of Researchers:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor (Position vacant)</td>
<td></td>
</tr>
<tr>
<td>Greenhouse</td>
<td>Liisa Särkkä, Kari Jokinen, Juha Näkkilä</td>
</tr>
<tr>
<td>Berries and fruit</td>
<td>Saila Karhu, Tuuli Haikonen</td>
</tr>
<tr>
<td>Landscaping</td>
<td>Sirkka Juhanoja, Eeva Tuhkanen</td>
</tr>
<tr>
<td>Part-time researchers</td>
<td>Terhi Suojala-Ahlfors, Timo Kaukoranta, Risto Tahvonen</td>
</tr>
<tr>
<td>+ 13 Research technicians</td>
<td></td>
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</tbody>
</table>

**Field Crop Research:** Antti Laine + 3 technicians

**Supporting tasks:** 4 persons (administration, cleaning, IT)

**Unpaid labor:** students, trainees, subsidized employees

**Arable area:** 25 ha, **Greenhouse area:** 2500m²
Co-operation & funding:

- Ministries (Agriculture and Forestry)
- TEKES – Funding agency for technology
- EU projects, COST actions
- EAFRD and ERDF
- Universities, botanical gardens and Institutes
- Horticultural foundations
- Horticultural associations
- Enterprises (Kesko Oyj, Tuko Logistics Oy, Inex Partners Oy, Kekkilä Oy, Vapo Oy, Biolan Oy, )
- Towns and parishes
- Growers and nurseries
Improvement of Energy Efficiency in Greenhouses

• Measuring energy flows of production and modeling energy consumption
• Effects of LED lighting to plant growth and to energy use in greenhouses

MTT Plant Protection
LED Finland Oy
Philips Oy
Octoled
Novarbo Oy
Aalto University

¢: Rikala’s Horticulture Foundation,
Energy Efficiency in Production of Bedding Plants and Poinsettias

- To save energy with temperature control and to keep the good quality of plants
- Several plant species and varieties are tested

Kekkilä Oy
Huiskula Oy
Helle Oy
Finnish Greenhouse Growers’ Association

€: Borisoff’s Horticulture Foundation,
Glasshousegrowers Horticulture Foundation,
Use of Moss as a Growing Medium

- Suitability of moss as a growing medium
- To develop a growing medium that meets the EU standards of sustainable production

€: Rikala’s Horticulture Foundation, MMM, Vapo, Glasshousegrowers Association, Suoviljely-yhdistys; (TEKES)

Metla, Oksasen puutarha (grower), Novarbo Oy, (VTT)
• Method in which one half of the growing medium is applied with a high level of fertilizer (EC is high) and the other half is applied with a low level of fertilizer (EC is low).

Left side of the medium has received high amounts of fertilizer and right side low ones.

Cucumber yield increased significantly.

Co-operation, €: Kekkilä Oyj
LANDSCAPING

Introduction of the Best Perennial Plant Products of Finnish Nurseries to the End Users

- 150 recommended clones of the earlier Perennial flower project
- Mother plant material for MTT Laukaa and future FinE plants
- Botanical descriptions of the plants, online service
- Finnish plant genetic resources

Co-operation with MTT Laukaa, The Association of Nursery Growers and The Finnish Association of Landscape Industries

€: Ministry of Agriculture and Forestry, Borisoff’s Horticulture Foundation, cooperating towns and parish unions
Survey and prediction of potentially invasive perennial flower species
List of perennial flower species with low risk of invasiveness
Portal of invasive species

Survey of germination is a part of the risk analysis

MTT, Research centers and authorities for natural resources

€ Ministry of Agriculture and Forestry and Forestry
Open Genetic Resources
Plan of action for conservation of ornamentals

- Survey of collections: towns, parishes, arboretums, schools, private persons
- Set up of database
- Interview of collection owners
- Planning of a conservation net for ornamentals
Products and Services

Hardy, healthy and suitable plants for different purposes - FinE
FinE plants:
Almost 200 ornamental plants, fruit and berry varieties
Recommendations for production and use
Kasper – online database

Woody ornamentals
- Rosa ‘Juhannusmorsian’
- Salix x aurora ‘Tuhkimo’

Ground covering plants

Herbaceous perennials
- Hemerocallis fulva ‘Sirkku’
Strengthening the organic production in the Finnish horticulture

- Organic production is increasing steadily in the Finnish agriculture but not in horticulture
- There is an increasing market for organic products
- Project in 2013-2016, funded by the Ministry of Agriculture and Forestry
- Aims: to solve problems in
  - cultivation methods
  - profitability
  - marketing
Research topics in organic horticulture

- **Plant protection (MTT Jokioinen and Piikkiö)**
  - Mulches to control weeds in strawberry and vegetables
  - Diseases of onion (*Fusarium*)
  - Induced resistance in strawberry: biochar and its effects on grey mold

- **Nutrient supply in vegetable growing (MTT Mikkeli, University of Helsinki)**
  - Green manures
  - Catch crops

- **Profitability: effects of plant protection and fertilization methods on the economy of the production (MTT Helsinki)**
The Sustainable Improvement of European Berry Production - EUBerry

- Highbush blueberry: adaptation to climate change and tunnel production
- Development of frost protection equipment
- Microbial product for enhancing resistance against root diseases of strawberry
- Biological pest protection of raspberry
- Economical analyses of biocontrol methods

15 Partners in EU, MTT Plant Protection, MTT Laukaa, MTT Economics, Helsinki University, Biotus, Carbon Kick, Vapo Ltd, Stil-Aqua Ltd, Verdera Ltd

€ EU FP7, TEKES
Enhancing Finnish Berry Production: Cultivation in Tunnels

- Developing the production of Finnish long-cane plants of raspberry to provide healthy plant material
- Studying the self-fertility of strawberry varieties to ensure high yields

MTT Plant Protection, MTT Laukaa, MTT Economics, Univ. Helsinki, Univ. East-Finland, ProAgria, Berry Know-How Cetre

€: Ministry of Agriculture and Forestry
Growth and Added Value to Fresh Berry Networks

• To extend the marketing period of berries by using modified atmosphere storage

• To evaluate the profitability and functioning of the business networks of fresh berry products

• Consumer survey

MTT Economics, MTT Food Technology, AGA Ltd, Finnvacum Ltd

€ TEKES
Breeding Berry and Fruit Varieties

- The main breeding goals are improved winter hardiness and yield (quality and quantity)
- Strawberry breeding: early varieties with good storability, firmness and resistance to diseases; In addition: ever-bearing varieties
- Pear breeding program
- Final stages of apple and currant breeding programs
- Continuation of breeding is uncertain

HY, MTT Plant Protection, MTT Laukaa

€: Royalties

Variety trials: European varieties of black currant (COST 863)

11 European partners
Varieties of MTT

Over 30 berry varieties,
20 fruit varieties, 6 apple rootstocks

The newest varieties:
Strawberry: Kaunotar, Suvetar, Valotar, Lumotar
Red currant: Punahilkka
White currant: Lepaan Valkea, Piikkiön Helmi
Black currant: Marski, Mikael
Green currant: Venny, Vilma
Blueberry: Jorma, Saani
MTT Laukaa
Arto
€: Royalties
Conservation and Origin of Local Finnish Apple and Pear Varieties

- Collecting information of the origin and history of local varieties
- Creating DNA fingerprints
- Conservation of varieties
- Development of the model for conservation of European native germplasm

MTT Genetic Diversity, Turku University, Helsinki University, EU partners, Cities, Municipalities, Plant Nurseries, Horticultural Schools

€: Finnish Cultural Foundation, PGR Secure -program, EU FP 7
Conservation of Genetic Resources - Fruits, Berries and Vegetables

- Finnish National Programme for Plant Genetic Resources
- Apple, plum, cherry, currants, gooseberry, strawberry, rasberry, horseradish, shallot, garlic, rhubarb, turnip
- About 450 varieties in the field collections (MTT Piikkiö and Livia College)
- Renewal of the apple collection
- Core collection of currants selected, partly transferred to cryopreservation
- DNA-fingerprinting
- Cryopreservation at MTT Laukaa

MTT Jokioinen, MTT Laukaa, NordGen

€: Ministry of Agriculture & Forestry
Conservation of Genetic Resources of Landscaping Plants

- Finnish National Programme for Plant Genetic Resources
- Perennial flowers, shrubs, trees
- *Ex situ* collections:
  - Livia College: 300 clones
  - MTT Piikkiö park and field: 150 clones
  - Arboretum Yltöinen – several hundreds
- DNA-fingerprints for identification
- Conservation strategy is being made
- Conservation plan still lacking for most landscaping plants

€: Ministry of Agriculture and Forestry
Education of Growers, Theme and Open-doors Days
Arboretum Yltöinen and Park Yltöinen

Conservation of genetic resources of trees, rhododendrons and perennial flowers in Finnish National Plant Genetic Resources Programme

Arboretum Yltöinen
• 10 hectares
• more than 200 species or taxa
• founded in 1927

Open for visitors 15th May – 15th September
Research at MTT Piikkiö

• Is done in co-operation with national and international partners
• Aims at improving domestic production and breeding and preserving Finnish varieties
• Research benefits both professional farmers and consumers

Thank you - Kiitos!