Agro-Robot, High Tech Farming and Agro-Digital Connectivity: *Success Cases in Tuscany.*

Marco Vieri ... *on behalf of*

**Fausta Fabbri** – *Tuscany Region - innovation, training and consultancy in agriculture*

[fausta.fabbri@regione.Toscana.it](mailto:fausta.fabbri@regione.Toscana.it)
Tuscany Region’s Projects on PF and HTF

active PROJECTS – > 40 founded projects on 16.2 measure with more that 13 MIO € + same amount cofinancing

All Territory Communities of Products involved
- arable crops
- horticulture
- nursery
- viticulture oenology
- oil olive
- beekeeping

use cases - success cases

APPCoT - 2014 PIF FEASR FEAMP
IRRIGO 2013 PIF FEASR FEAMP
QUASAR 2013 PIF FEASR FEAMP
Ortorutta T Bio 2013 PIF FEASR FEAMP
OENOSMART 2017 PIF FEASR FEAMP
VELTHA 2017 PIF FEASR FEAMP
TINIA 2017 PIF FEASR FEAMP
SEMIA 2017 PIF FEASR FEAMP
SMASH 2018 POR FES
- 3 USE CASES + 1 educational project
  AgroRobot: **SMASH project**
  High TechFarming: **OENOSMART project**
  Agro Digital Connectivity: **AppAGO project**
  Educational system: the **SPARKLE ERASMUS+ project**
- the Tuscany Region approach to foster agri - innovation
SMASH project
Smart Machine for Agricultural Solutions Hightech

SMASH Partnership
EDI
YANMAR
DORIAN
SEINTECH
AvMAP
BASE
COPERNICO
Dr. Filippo Giuntini
UNIVERSITA’ DI FIRENZE – Dipartimento GESAAF
ISTITUTO ITALIANO DI TECNOLOGIA - IIT
SCUOLA SUPERIORE SANT’ANNA – Istituto di Bioroboti
Laboratori ARCHA
SMASH project
Smart Machine for Agricultural Solutions Hightech

SMASH for VITICULTURE

- Puntual detection and SPRAY
- Precise mechanical weed control on the row
- NonTermaPlasma treatment

AgroBot
SMASH project
Smart Machine for Agricultural Solutions Hightech

SMASH for HORTICULTURE

- Soil control by PLANTOID
- Precise mechanical weed control on the row
- NonTermalPlasma treatment
OENOSMART project
Territorial Digital Platform
Hub Ecosystem

High Tech Farming and AgroDigital Connectivity

<table>
<thead>
<tr>
<th>Farmers</th>
<th>Vineyards [ha]</th>
<th>Olive growing [ha]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Az. Agr. Casanova di Neri di Giacomo Neri</td>
<td>72,3</td>
<td>7,1</td>
</tr>
<tr>
<td>Az. Agr. Martoccia di Brunelli Luca</td>
<td>8,3</td>
<td>1,4</td>
</tr>
<tr>
<td>Az. Agr. Podere La Vigna di Rubegni Adriano</td>
<td>6,4</td>
<td>1,1</td>
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<tr>
<td>Az. Agr. San Filippo di R. Giannelli</td>
<td>9,4</td>
<td>0,7</td>
</tr>
<tr>
<td>Siro Pacenti Pacenti Giancarlo</td>
<td>23,1</td>
<td>3,6</td>
</tr>
<tr>
<td>Soc. Agr. Canalicchio di Sopra di Ripaccioli</td>
<td>19,1</td>
<td>2,3</td>
</tr>
<tr>
<td>Marco &amp; F.lli s.s.</td>
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</tr>
<tr>
<td>Talenti Riccardo</td>
<td>14,9</td>
<td>3,6</td>
</tr>
<tr>
<td>Tassi di Franci Franca</td>
<td>5,2</td>
<td>0,3</td>
</tr>
<tr>
<td>Tenuta di Sesta di Ciacci Giovanni</td>
<td>36,5</td>
<td>22,9</td>
</tr>
<tr>
<td>Tenuta Fanti di Fanti Baldassarre Filippo</td>
<td>51,4</td>
<td>36,4</td>
</tr>
</tbody>
</table>
High Tech Farming and AgroDigital Connectivity

OENOSMART project
Territorial Digital Platform
Hub Ecosystem
AgroDigital Connection for All Farms

AppAGO project
Innovation in Oil Olive farms in marginal areas

REGIONAL FARMING INNOVATION DIFFUSION and FARMERS / CORK 2.0 declaration

GLOCAL approach – Open to Global business but with concrete TERRITORIAL IMPACTS

sinergy with the new trend towards family and small farms
this is the main scope of the platform
knowledge and educational system networks .. the key?

Implement
Experiment
Listen
Design

System innovation - social innovation

The previous agricultural revolutions teach us that innovation it is vain without instruction and demonstration.
Sustainable Precision Agriculture: Research and Knowledge for Learning how to be an agri-Entrepreneur

**WHAT ARE WE TRYING TO DO?**

**Problems:**
- Lack of innovation potentiality self-awareness of farm companies
- Lack of knowledge transfer of SPA
- Lack of SPA knowledge and entrepreneurial skills of agricultural science students
- Lack of SPA and entrepreneurial educational offer of Universities

**Objectives**
- Fostering the introduction of the new paradigm in Agriculture: Sustainable precision agriculture
- Supporting the digitalization and High Tech Farming, providing new competencies as agro-electronics and agro-informatics.

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The Tuscany Region approach to foster agri - innovation

Technological evolution will be profitable with a balanced inclusive and deep rooted social evolution
... from 90% to 5% of agricultural employers.
... motorization was effective with the emergency of services and infrastructures

The new paradigm: from drawbar and manual labour to motorization and digitalization - connectivity
The Tuscany Region approach to foster agri-innovation

Needs:
- Biological, Eco-compatible, Profitable Processes
- Precision Agriculture
- Domain of large amounts of data
- Digitalizzazion

Features:
- Indoor
  - agro-industry, fixed farms, greenhouses
- Outdoor
  - Seasonality
  - Variability
  - Changeability
  - Timeliness

Cases of use and System of Services

- Farms
- Product & services suppliers
- Training system
  - Renewal in institutional education
  - Innovation Broker bottom up like itinerant professorships
  - Territorial farmlab

Territorial, regional, national, .. policy

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**TECHNIQUES**
- Technological Reliability & Suitebility
  - Sort
  - Set in order
  - Cluster technologies
  - Focus providers in identified technology cluster

**FARMERS**
- Users adsorbity capacity
  - Technologies suitable & comprehensive
  - Technology scalability
  - Inclusivity
  - Systemic approach
  - Territorial ecosystem
  - Educational system

**PROVIDERS**
- Business development approach
  - Technologies suitable & mature (TRL9)
  - Reciprocal stakeholders deontological respect
  - Farmers acceptance and effective domain
  - Territorial facilities minimal level
  - Conformity to territorial ecosystem
  - Linking with territorial educational system

**EXPERTS - CONSULTANTS**
- Innovation brockers
  - Have an overall vision
  - Must be Independent
  - Relieables & Skilled
  - Focus priority

**SOCIETY**
- Territorial productive Community
  - Providers
  - Services
  - Education
  - Sustainability
A COLLABORATIVE MULTIPLAYER DEVELOPMENT SYSTEM FOR INNOVATION

Collaboration opportunities for public and private organizations in a precision farming innovation system (Brackets relate to propositions P1-P7).
The evolution of agricultural mechanics has become profitable when:

- the machines have become appropriate and reliable (historic failures of the Borello tractor and Bonmartini tire tracks);
- retailer, motorist, mechanic and gum services have become present in the territory (within 100 km);
- training centers have been established Famous in Tuscany was the Agricultural Mechanization Training Center of Borgo a Mozzano (Lucca) financed by the Government and by the ESSO.

Tuscany first highlighted these needs and identified them as essential

- The territorial approach of the PRODUCTION ECOSYSTEM. This had already been defined in the regional ROADMAP for RIS3, defining the INNOVATION support PLATFORMS
- The BUSINES CASE in agriculture, which is a non-relocatable external rural activity, is the CASE OF TERRITORIAL USE and not the single product, service or activity.
Integrated multicompetencies multiactor approach in effective and profitable innovation development – COLLABORATIVE ECOSYSTEM

- Automatic guidance in tractors operating on open field: a mature integrated innovation system
- High technologies for farming: caotic scenario to be proper developed in actuating steps and appropriate competencies and actors.

Chain of technology development in High Tech Farming

<table>
<thead>
<tr>
<th>Element</th>
<th>Product type</th>
<th>Problems and needs</th>
<th>Who does what</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satellite, aerplane, drone, terrain station, onboard system</td>
<td>vector</td>
<td>Resolution, frequency</td>
<td>Engineerings competencies</td>
</tr>
<tr>
<td>FOTONICS</td>
<td>Sensors</td>
<td>Direct or Indirect measure – Real value or index</td>
<td>Phisics researchers</td>
</tr>
<tr>
<td>Digital Data</td>
<td>Raw Data</td>
<td>interconnettivity</td>
<td>Informatics competencies</td>
</tr>
<tr>
<td>Data Comunication</td>
<td>Telecomunicazioni</td>
<td>Broad Band</td>
<td>Engineers researchers</td>
</tr>
<tr>
<td>Data mining</td>
<td>dati normalizzati</td>
<td>App</td>
<td>Informatics competencies</td>
</tr>
<tr>
<td>Informative digital systems</td>
<td>GIS + Digital Hubs territoriali</td>
<td>Hubs and Services</td>
<td>Agro-informatic &amp; Informatics systems</td>
</tr>
<tr>
<td>Data analysis</td>
<td>Biological and environmental models</td>
<td></td>
<td>Agronomous researchers</td>
</tr>
<tr>
<td>Decision support systems</td>
<td>Manager interface</td>
<td>Development of effective Decision Support System</td>
<td>Agronomous Agroinformatic</td>
</tr>
<tr>
<td>Mission Plan for Variable Rate Treatment automatism</td>
<td>Data meaning and managing</td>
<td>Agro-electronics and agroinformatics training</td>
<td>Agricultural machinery engineers Agroinformatics &amp; agroelettronics</td>
</tr>
<tr>
<td>AVT machinery set up</td>
<td>Automation</td>
<td>Agro-electronics and agroinformatics training</td>
<td>Agricultural machinery engineers, Agroinformatics</td>
</tr>
</tbody>
</table>
The Tuscany Region approach to foster agri - innovation

We must think in terms of concrete BUSINESS MODEL

- **B2B for products and services development** -> Key Actors in the business model of Companies: Researcher, Engineers, Informatics, Agroengineers, Agroinformatics, Agroelectronics Engineers.

- **B2B for Farms** -> Key Actors in the business model for Farm: Consultants, Services Companies, Dealer Companies.
FINAL REMARKS

- fundamental to make order in the innovative proposed technologies.
- fundamental to be honest on the technological maturity in terms of TRL and multicompetencies integrazion.
- Foundamental to ensure inclusivity in the introduction of technologies and attention to the “adsorbtity capacity of the farmers”.

- common architectural approaches are especially needed for technologies and projects, which work in cross-sectorial and “horizontal” fashion,
- essential the development of ecosystems of actors and services
- Essential clearance on business model
FINAL REMARKS

Needs

- Repository of available technologies
- Catalogue of territorial competencies
- Map of multiactor-multicompetencies USE CASES (with IMPACT evaluation embedded in the projects)

The Tuscany Region approach to foster agri-innovation

use cases - success cases

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Fausta Fabbri – Tuscany Region - innovation, training and consultancy in agriculture - fausta.fabbri@regione.Toscana.it

Marco Vieri – Tuscany Region – University of Florence - marco.vieri@unifi.it

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