Scanning report (EIP format for practice abstracts)

***Project title (native language):** **EUFRUIT: Europäisches Obst-Netzwerk**

***Project title (English):** **EUFRUIT: European Fruit Network**

***Author/native language editor:** Dr. Markus Kelderer, Laimburg Research Centre, Laimburg 6, 39040 Post Auer, BZ-Italia, Markus.Kelderer@laimburg.it, +390471969662

Section A. Summary for EIP dissemination

***Keywords:** Thematic Network, Fruit Sector, EUFRUIT,
Organic Farming, Plant Protection, Fertilization, Biocontrol, Crop Regulation

***Main geographical location:** ITH10 Bolzano-Bozen

Other geographical locations: ITH10 Bolzano-Bozen

***Summary (native language):**

Fokus und einige der größten Herausforderungen in den Versuchen in der Biologischen Obstbau (BO):

- **Entwicklung von Sorten und Unterlagen für den BO**: Sorten sollen niedrige Anfälligkeit gegen die wichtigsten Krankheiten, Schädlinge und abiotischen Schäden aufweisen. Die Früchte sollen schmackhaft, bekömmlich, niedrig an Allergenen, mit gutem Shelf-life und Lagerfähigkeit sein. Genetisch modifizierende Züchtungsmethoden werden im BO nicht akzeptiert. Sie sind allerdings unverzichtbar um die genetische Basis für tolerante Pathogene zu erhöhen und ein resilientes, nachhaltiges System zu errichten. Probleme mit resistenten Sorten: andere Krankheiten nehmen zu, die Resistenz wird überwunden.
- **Verbesserung der Bodenfruchtbarkeit**: im BO sollen natürliche Ressourcen des eigenen Systems angewandt werden, während externe Inputs minimiert werden sollen. Neben der Erntemenge sollte der Effekt eines Düngemittels auch nach Fruchtqualität und Shelf-life bestimmt werden. Biologische Düngemittel deren Zusammensetzung ähnlich den Bedürfnissen der Bäume sind werden benötigt.
- **Pflanzenschutzstrategien**: Biodiversität wird mit direkten Applikationen von Pflanzenschutzmitteln kombiniert (natürliche oder von der Natur stammende Substanzen).
  Unkrautbekämpfung: Angewandte Strategie: Kombination von Bodenbearbeitung im Frühjahr gefolgt von leichter Bedeckung der Baumreihe mit geschnittener Vegetation, zusammen mit einer neuen Technologie, welche Unkraut durch Bürsten entfernt. Eine Gründünger-Periode vor der Neupflanzung wird empfohlen.
  Krankheitsbekämpfung: indirekte Methoden: weniger anfällige Sorten; für Schorf: Reduktion der Sporenkonzentration. Direkte Methoden: Kupfer, Schwefel, Schwefelkalk, Karbonate. 4 Säulen zur Kupferreduktion: weniger anfällige Sorten, Reduktion des Befallsrisikos, Vorhersagemodelle um die Anwendungen genau zu timen, neue Produkte, Regenabdeckungen. Gegen Lagerkrankheiten: Heißwasserbehandlungen.
  Schädlingsbekämpfung: funktionelle Biodiversität. Lücke: wenig Wissen über das Auftreten und die Biologie vieler Prädatoren. Die Apfelblattlaus bedarf direkte Kontrollmaßnahmen. Die Blattwespe wird mit Quassia amara-Extrakten bekämpft. Verwirrungsmethoden sowie Netze werden gegen den Apfelwickler eingesetzt. Neue exotische Schädlinge können jedoch jederzeit auftreten.
  Ausdünnung: u.a. werden Transpirationshemmer angewendet.
- **Ökosystemservice:** Life-cycle-assesment systeme werden benötigt (Energiekonum, ökologischer Fußabdruck verschiedener Produktionssysteme)!

Summary (english):

Focus and some key challenges in research on Organic Farming (OF):

- **Development of varieties and rootstocks suited to OF:** varieties should hold low susceptibility towards the most important diseases, pests and abiotic damages (frost, sunburn…). Fruits should be tasty, salubrious, low in allergens, with a good shelf-life and storage stability. Breeding techniques based on genetic modification are not accepted in OF. However, for a truly resilient sustainable system, it will be indispensable to broaden the genetic basis of the tolerance to pathogens. Problem with resistant varieties: other diseases become prominent, resistance breakdown.
- **Improving soil fertility management:** in OF natural resources internal to the system are applied and off-farm inputs are minimized. Next to the yield, evaluation of the effect of fertilization should consider the fruit quality and the shelf-life. Also, organic fertilizers are needed in OF that have a nutrient composition close to the needs of the fruit trees.
- **Strategies for plant health care:** Biodiversity is combined with the direct input of plant protection products (natural or naturally derived substances).
  Weed control: A spread practice: Combination strategies of tillage in spring followed by a light cover of the tree row with the cut vegetation, combined with a new machinery that removes weed by brushing. A green manure period before planting is advised.
  Disease control: indirect methods: less susceptible varieties; for apple scab: reduction of ascospore concentration. Direct methods: copper, sulphur, lime sulphur, carbonates. 4 pillars to reduce copper: less susceptible varieties, reduce infestation potential, forecasting models for precise timing of applications, new products, rain covers. For storage diseases: hot water treatments.
  Pest control: functional biodiversity. Gap: little knowledge about occurrence and biology of many natural predators. The rosy apple aphid requires direct control measures. Direct control of apple sawfly is managed with Quassia amara extracts. Codling moth is controlled through mating disruption and several measures (mainly C. pomonella gronulosis virus). The population of diapausing larvae can be reduced with entomophagous nematodes in autumn. The codling moth population is also reduced with netting. New exotic pests can appear any time.
  Thinning: rope thinners are tested and the application of transpiration inhibitors.
- **Ecosystem services:** Calculation systems that allow a fast check of the effect of intended changes in the production system on carbon footprint and energy consumption would be important!

Section B. Project information

***Project coordinator:** Michelle H. Williams; Aarhus University, Department of Food, Kirstinebjergvej 10, 5792 Aarslev, Denmark; mw@food.au.dk; +45 25170049

***Project period:** 2016 - 2019

***Project status:** Ongoing

***Funded by:** Horizon 2020

***Total budget:** €1.8m

***Geographical regions:** DK011 Copenhagen, DK012 Copenhagen and its environs, DK013 North Zealand, DK014 Bornholm, DK021 East Zealand, DK022 West- and South Zealand, DK031 Funen, DK032 South Jutland, DK041 West Jutland, DK042 East Jutland, DK050 North Jutland, BE211 (Arrondissement. Antwerpen), BE212 (Mechelen), BE213 (Turnhout), BE221 (Hasselt), BE222 (Arr. Maaseik), BE223 (Tongeren), BE231 (Aalst), BE232 (Dendermonde), BE233 (Eeklo), BE234 (Gent), BE235 (Oudenaarde), BE236 (Sint-Niklaas), BE241 (Halle-Vilvoorde), BE242 (Leuven), BE251 (Brugge), BE253 (Ieper), BE254 (Kortrijk), BE255 (Arr. Oostende), BE256 (Arr. Roeselare), BE257 (Tielt), BE258 (Veurne), BE310 (Nivelles-Nijvel), BE331 (Huy-Hoei), BE332 (Liège- Luik), BE334 (Waremme-Borgworm), BE335 (Verviers), FR8 Méditerranée; FR81 Languedoc-Roussillon, FR6 SUD-OUEST, FR512 Maine et Loire, FR611 Dordogne, FR812 Gard, DE6 (Hamburg), DE8 (Mecklenburg-Vorpommern), DE9 (Niedersachsen), DEF0 (Schleswig-Holstein), DEE0 (Sachsen-Anhalt), DEA (Nordrhein-Westfalen), DE111, DE112, DE113, DE114, DE115, DE116, DE117, DE118, DE119, E11A, DE11B , DE11C, DE11D, DE121, DE122, DE123, DE124, DE125, DE126, DE127,DE 128, DE129, DE12A, DE12B, DE12C, DE131, DE132, DE133, DE134, DE135, DE136, DE137, DE138, DE139, DE13A, DE141, DE142, DE143, DE144, DE145, DE146, DE147, DE148, DE149, DE600 Hamburg, DE932 Cuxhaven, DE933 Harburg, DE939 Stade, DEF09 Pinneberg, NL1-NL4 + NLZ Holland; NL 224 zuidwest Gelderland, NL 226 Arnhem/Nijmegen, NL230 Flevoland, NL310 Utrecht, NL321 Kop van Noord-Holland, Nl322 Alkmaar en omgeving, NL338 oost Zuid-Holland, NL33A zuidoost Zuid-Holland, NL341 Zeeuws-Vlaanderen, NL342 overig Zeeland, Nl411 west Noord-Brabant, NL413 noordoost Noord-Brabant, NL414 zuidoost Noord-Brabant, NL421 noord Limburg, NL422 Midden-Limburg, NL423 zuid Limburg, ES620 Murcia, UKG11 Herefordshire, UKG12, Worcestershire, UKH12 Cambridgeshire, UKH16 North and West Norfolk, UKH17 Breckland and

South Norfolk, UKJ22 East Sussex, UKJ35 South Hampshire, UKJ36 Central Hampshire, UKJ37 North Hamphshire, UKJ41 Medway, UKJ42 Kent, UKJ43 Kent Thames Gateway, UKJ44 East Kent, UKJ45 Mid Kent, UKJ46 West Kent, ES618 Sevilla, ES511 Barcelona, ES512 Gerona, ES513 Lérida, ES514 Tarragona, CH0 Schweiz/Suisse/Svizzera, ITH51-59 Emilia Romagna region, ITH10 Bolzano-Bozen, HU101 Budapest, HU102 Pest, RO111, RO112, RO113, RO114, RO115, RO121, RO122, RO123, RO124, RO125, RO126, RO211, RO212, RO213, RO214, RO215, RO216, RO221, RO222, RO223, RO224, RO225, RO226, RO311, RO312, RO313, RO314, RO315, RO316, RO317, RO321, RO322 RO411, RO412, RO413, RO414, RO415, RO421, RO422, RO423, RO424. HU101, HU102, LT001 Alytaus apskritis, LT002 Kauno apskritis, LT003 Klaipėdos apskritis, LT004 Marijampolės apskritis, LT005 Panevėžio apskritis, LT006 Šiaulių apskritis, LT007 Tauragės apskritis, LT008 Telšių apskritis, LT009 Utenos apskritis, LT00A Vilniaus apskritis.

Project web page: http://www.eufrin.org/index.php?id=55

***Project Objectives (native language):**

1. Errichtung eines europäischen Netzwerkes, welches sich auf den Obstsektor konzentriert
2. Entwicklung und Umsetzung einer systematischen Vorgehensweise zum Festhalten und Synthetisieren des bestehenden wissenschaftlichen und praktischen Wissens
3. Schaffen eines kontinuierlichen/anhaltenden Dialogs mit relevanten EU, nationalen, sowie regionalen politischen Körperschaften
4. Identifikation und Unterstützung von neuen prioritären Forschungsgebieten durch das kontinuierliche Monitoring und Analysieren von bestehender und aufkommender Forschung und Innovationsaktivitäten.

Project Objectives (English):

1. Establish a European network focused on the fruit sector.
2. Develop and implement a systematic approach for scanning and synthesizing existing scientific and practical knowledge.
3. Establish an ongoing dialogue with relevant EU, national and regional policy bodies.
4. Identify and support new priority areas of research by continually monitoring and analysing existing and upcoming research and innovation activities.

***Project partners:**

1. Aarhus University, Department of Food Science (Denmark) • AU
2. Research Station for Fruit npo (Belgium) • Pcfruit
3. Centre Technique Interprofessionnel des Fruits et Légumes (France) • CTIFL
4. Obstbauversuchsanstalt Jork (Germany) • OVA
5. Stichting Wageningen Research (Netherlands) • WR
6. ~~East Malling Research (United Kingdom) • EMR~~ (terminated 08-02-2016)
7. Institut de Recerca i Tecnologia Agroalimentàries (Spain) • IRTA
8. Federal Department of Economic Affairs, Education and Research (EAER), acting through Agroscope Institute of Plant Sciences (Switzerland) • Agroscope
9. Laimburg Research Centre for Agriculture and Forestry (Italy) • Laimburg
10. University of Agronomic Sciences and Veterinary Medicine of Bucharest (Romania) • USAMV
11. National Agricultural Research and Innovation Centre Fruitculture Research Institute (Hungary) • NARIC
12. Lithuanian Research Centre for Agriculture and Forestry (Lithuania) • LRCAF
13. Assemblée des Régions Européennes Fruitières, Légumières et Horticoles (France) • AREFHL
14. Variety Innovation Consortium South Tyrol (Italy) • SKST
15. Freshfel Europe (Belgium) • FRESHFEL
16. Elbe-Obst Erzeugerorganisation r.V. (Germany) • EO
17. Fruitconsult BV (Netherlands) • FC
18. University of Greenwich (United Kingdom) • UoG
19. University of Hohenheim (Germany) • UHOH
20. Università di Bologna (Italy) • UNIBO
21. Institut National de la Recherche Agronomique (France) • INRA
22. NIAB EMR (new 09-02-2016)

Section C. Annex: Scanning report[1]

Scanning report
Markus Kelderer, Laimburg

Author: Dr. Markus Kelderer, Laimburg Research Centre, Markus.Kelderer@laimburg.it, +390471969662

Country: Italy

NUTS 3 region(s)[2]: ITH10 Bolzano-Bozen

WP no. and title: WP3, Reduction in pesticide residues

Date: 20/04/2017

Source materials and methodology

J. Kienzle, Independent Researcer, M. Kelderer, Laimburg Research Centre, "Growing organic apples in Europe", in K. Evans (edt)., Washington State University, "Achieving sustainable cultivation of apples" (2017). ISBN-13: 9781786760326

Best practice findings

Def. Organic farming (OF): sustainable holistic farming system, including the whole food processing chain from farmer to consumer. Regarding research in OF, it is often characterized by a participatory and holistic approach.

The Council Regulation (EC) NO 834/2007 defines that natural resources internal to the system should be applied. External resources can be applied too, but they should derive from organic production or from products present in nature. The OF sector is constantly increasing and includes currently at least 10% of the fruit-growing area in important EU-fruit-growing regions. This was mainly possible due to the innovations in the plant health care strategy, the equipment for tree row tillage and the introduction of new robust varieties. However, there are still some key challenges for OF research to be faced:

- **Development of varieties and rootstocks suited to OF:** varieties should present a durable level of low susceptibility towards the most important diseases, pests and abiotic damages (frost, sunburn…). Fruits should be tasty, salubrious, low in allergens, with a good shelf-life and storage stability. Breeding techniques based on genetic modification are not accepted in OF. However, for a truly resilient sustainable system, it will be indispensable to broaden the genetic basis of the tolerance to pathogens.
  Recently, some EU research stations collaborated with organic farmers to establish special test systems under organic conditions.
  Once scab resistant varieties were introduced and organic farmers reduced the application of fungicides, other diseases became prominent, and a resistance breakdown is already observed frequently. Yet, the scab-resistant varieties still produce an interesting output (no fruit damaged by scab) with a lower input.
  New breeding approaches: Pyramiding of several scab resistances with powdery mildew resistance and fire blight tolerance; and quantitative tolerance on a genetical basis as broad as possible.
- **Improving soil fertility management:** in OF natural resources internal to the system are applied and off-farm inputs are minimized (i.e. through the on-farm production of fertilizers, cover crops in the alley can provide nitrogen fixation, biomass for mulch…). Next to the yield, evaluation of the effect of fertilization should consider the fruit quality and the shelf-life, using i.e. formulations based on rhizosphere microorganisms. Also, some researchers expressed the need to use organic fertilizers in OF that have a nutrient composition close to the needs of the fruit trees.
- **Strategies for plant health care:** Biodiversity is a central part of the plant health care strategies in OF and is combined with the direct input of plant protection products: these are natural or naturally derived substances. In future, quantitative and qualitative aspects of how these substances occur in nature will be more important. The registration of naturally occurring substances is difficult. Thus, the technical issues of the development of new substances are as important as the support for the registration of the substance.

[1] Equivalent to 'final report' in EIP-AGRI format.
[2] Please see ec.europa.eu/eurostat/ramon/nomenclatures/ for details on NUTS regions, level 3

Weed control: different tillage and mulching types for OF are studied. Combination strategies of tillage in spring for nitrogen mobilization followed by a light cover of the tree row with the cut vegetation, combined with a new machinery that removes weed by brushing is practised. A green manure period before planting is advised.

Disease control: indirect methods: less susceptible varieties; for apple scab: reduction of ascospore concentration (mechanical removal of leaves, accelerate decomposition, irrigation before rain to elicit the release of ascospores). Direct methods: copper (low amounts of copper with frequent applications), sulphur, lime sulphur, carbonates. BUT copper accumulates in the soil; 4 pillars to reduce copper: less susceptible varieties, reduce infestation potential, forecasting models for precise timing of applications (i.e. scab 'Stop applications'), new products (alternatives such as carbonate-formulations, Limonene, electrolyzed water, liquorice extract, thymol extract, cladosporium formulations, algae extracts and others are tested). Rain roofs seem attractive to prevent many diseases. For storage diseases: hot water treatments are tested.

Pest control: functional biodiversity (for enhancement of beneficials: flowering plant strips). Gap: little knowledge about occurrence and biology of many natural predators. The rosy apple aphid requires direct control measures. Direct control of apple sawfly is managed with Quassia amara extracts, and some tests are conducted to reduce the population by application of entomophagous nematodes in spring. Codling moth is controlled through mating disruption and several measures (mainly C. pomonella gronulosis virus). The population of diapausing larvae can be reduced with entomophagous nematodes in autumn. The codling moth population is also reduced with netting. New exotic pests can appear any time.

Thinning: rope thinners are tested and the application of transpiration inhibitors.

- **Ecosystem services:** Calculation systems that allow a fast check of the effect of intended changes in the production system on carbon footprint and energy consumption would be important!