

Scanning report (EIP format for practice abstracts)

***Project title (native language):** EU FRUIT europæisk netværk

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

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Section A. Summary for EIP dissemination

***Keywords:** Stonefruit, variety

***Main geographical location:** [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)]

Other geographical locations: none

***Summary (native language):**

Udvikling af et nyt beskærings- og formningsssystem til super-høj-intensive-plantager i surkirsebær til høst med portal høster.

Målet hos AU FOOD er at udvikle plantagemodeller for en række industriafgrødearter, buske og træer, som kan høstes med den samme høstmaskine, en New Holland 9090X Dual harvester, og derved forbedre kost-effektiviteten af den relativt store investering i en portal høst maskine. I surkirsebær undersøger vi hvordan man kan transformere en eksisterende højtæthedspantage eller forme og beskære en nyplantet surkirsebær plantning så den passer til denne høstmaskine. Hovedmodellen vil være plantering på 1-1,5 m afstand i rækken og 3-3,5 m imellem rækker. Træerne vil blive formet med en hovedstamme og beskåret så der dannes mange horisontale tynde skud af op til ca. 4 års alder, der kan passere uskadt igennem høsttunnelen. Mekanisk beskæring af en del af skuddene vil blive gennemført årligt for at forny og sikre løbende blomstring. Grene tykkere end 1,5 cm ved stammen beskæres for at danne nye tynde skud. Stammehøjden er maksimalt 2,5-2,7 m for at kunne passere igennem høstmaskinen men tynde bøjelige topkud kan nå en højde på ca. 3 m. Metoder til beskæring og formning af nye træer og lidt ældre træer undersøges i øjeblikket på Stevnsbær og på enkelte andre sorter. Sorter der har egenskaber, der passer godt til den nye høstmaskine og plantagemodel vil blive testet.

Summary (english):

Development of a new pruning system for super-high-density-orchard systems in sour cherry for over the row harvesting.

The goal at AU FOOD is to develop orchard systems for several industry fruit shrubs and tree species that can all be harvested by the same machine, a New Holland 9090X Dual harvester, thus increasing use and cost-efficiency of such a big investment in a harvester. In sour cherry we are currently testing how to transform and create a super-high-density-orchard system adapted to harvest by this machine in the future. The overall model will be trees grafted on semi dwarf root stocks, planted in 1-1.5 m distance in the row and with 3 - 3.5 m distance between rows. Trees will have a straight vertical main trunk and pruned to establish many thin horizontal shoots from the trunk of up to 4 years of age adaptable to the passage between horizontal tunnel shakers. Mechanical pruning will be done to renew a portion of shoots every year. Branches thicker than about 1.5 cm will be pruned back to the trunk for creating new thin shoots. A maximum height of 2.5 - 2.7 m of the tree trunk is maintained to fit into the harvester but allowing thin shoots to reach up to 3 m height. Pruning and shaping methods how to create such a tree model from newly planted young trees or from an existing high density orchard is currently undertaken using Stevnsbær sour cherry cultivars and other international cultivars. Cultivars with characteristics adaptable to this new system will be sought.

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 (Leper), BE254 (Kortrijk), BE255 (Arr. Oostende), BE256 (Arr. Roeselare), BE257 (Tielt), BE258 (Veurne), BE310 (Nivelles-Nijvel), BE331 (Huy-Hoei), BE332 (Liège- Luik), BE334 (Wareme-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, NI322 Alkmaar en omgeving, NL338 oost Zuid-Holland, NL33A zuidoost Zuid-Holland, NL341 Zeeuws-Vlaanderen, NL342 overig Zeeland, NI411 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 Hampshire, 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 (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) • Pcfuit

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 report¹

Scanning report Martin Jensen, AU

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Country: Denmark

NUTS 3 region(s)²: [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)]

WP no. and title: WP5 Secure sustainable fruit production

Date: 03-05-2017

Source materials and methodology

Consultations with colleagues at Aarhus University, Dept. Food Science to identify staff involved in research on relevant topics. Then collection of publications and disseminations from the last approximately one year to provide a start for the state of art. The personal database over publications/disseminations (PURE database) for each scientist was used as basis.

For thinning and pruning this case was selected as of possible interest for innovation.

Best practice findings

Development of new pruning system for super-high-density-orchard systems in sour cherry for over the row harvesting.

Sour cherry production in Denmark is traditionally done using trees up to 4-6 m tall with planting distances about 4 - 5 in the row and 4 - 5 m between rows. Such trees are mechanically harvested with tree shaker machines - one tree at a time. In recent years interest in continuous running harvest machines, - over-the-row or portal harvesters – have increased due to about double the speed of harvesting and thus less cost in harvesting. In addition over-the-row harvesters may be more gentle to the trees and making less damage over time. The maximum size and width of such machines means that any tree harvested by these machines in future need to be smaller and more narrow in shape to fit the machine. Several models exist with each different details in shaking principle, fruit capture devices, size etc. In for example olives a new super-high-intensive orchard system has been developed adapted to harvesting with a New Holland grape harvester showing very high efficiency in harvesting and demonstrating that it is possible to transform a traditional crown tree orchard model into a super-high-density orchard system. A similar system may potentially be developed for sour cherry to make the harvest more efficient.

Our goal is to develop orchard systems for several fruit shrubs and tree species that can all be harvested by the same machine, a New Holland 9090X Dual harvester, thus increasing use and cost-efficiency of such a big investment in a harvester. In the DANBERRY project (DANBÆR, 2015-2019) we will test a number of tree and shrub crops if they can be adapted to a New Holland grape harvester.

In sour cherry we are currently testing how to transform and create a super-high-density-orchard system adapted to harvest by this machine in the future. The overall model will be trees grafted on semi dwarf root stocks, planted in 1-1.5 m distance in the row and with 3 - 3.5 m distance between rows. Trees will be shaped to have a straight vertical main trunk and pruned to establish many thin horizontal shoots from the trunk of 1-3-4 years of age, that will be soft and adaptable to the narrow passage of max 15 cm between horizontal shakers in the inside tunnel of the harvest machine. Pruning will be done mainly mechanically by machines to renew a portion of shoots every year to ensure a good fruit crop every year. A three-four year pruning schedule is anticipated. Branches thicker than about 1.5 cm will be pruned back to the trunk for creating new thin shoots. A maximum height of 2.5 - 2.7 m of the tree trunk is maintained to fit into the harvester but allowing thin shoots to reach up to 3 m height, being bend down below 1.8 m during harvest. Pruning and shaping methods how to create such a tree model from newly planted young trees (1.5 m distance in rows, 3.5 m between rows, grafts on Colt or Gisela 5, 3 cultivars) or from an existing high density orchard (1.2 m

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

distance in rows, 3.5 m between rows, grafts on Colt, 4 cultivars) is currently undertaken using Stevnsbær sour cherry varieties and few other international varieties as case cultivars. Transforming existing trees means pruning back all major side branches >1.5 cm thick at the base, or leaving side branches in the row as a trellis like system and or attempts to induce many new shoots directly from the main trunk by selective positioned girdling, then thinning these to the right density and position to avoid shade effects on fruits. A future challenge is to ensure continuous strong flowering and fruiting even following intensive pruning. Thinning for fruit size is not necessary for industry fruit but potentially important if fruits are marketed as fresh fruit. Thinning for avoiding shade has been shown in earlier studies to be important for obtaining high fruit quality. To keep trees small and branches thin for long time root pruning will be applied annually mainly in April before flowering, but potentially repeated in autumn to maximize effect. Sour cherry cultivars that fit this new system will be selected after testing, especially trees with thin hanging branches and with many fruits on spores are considered of interest, while vigorous cultivars with strong branches are of less interest.