



FruitGrowth

Novel organic solutions securing future growth

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Challenges for Danish organic apple production

- The production is small and unstable due to yield and quality loss from key pest and diseases
- Lack of suitable cultivars for producers
- Lack of suitable weed control strategies
- Lack of suitable storage strategies
- In market competition with imported organic apples



Aim and objectives

To increase the Danish production of high quality organic apples through delivering:

- New robust cultivars
- Storage solutions to extend seasonality
- Implement novel mechanical/biological technologies and compounds to optimally manage weed, diseases, pests and beneficials during production

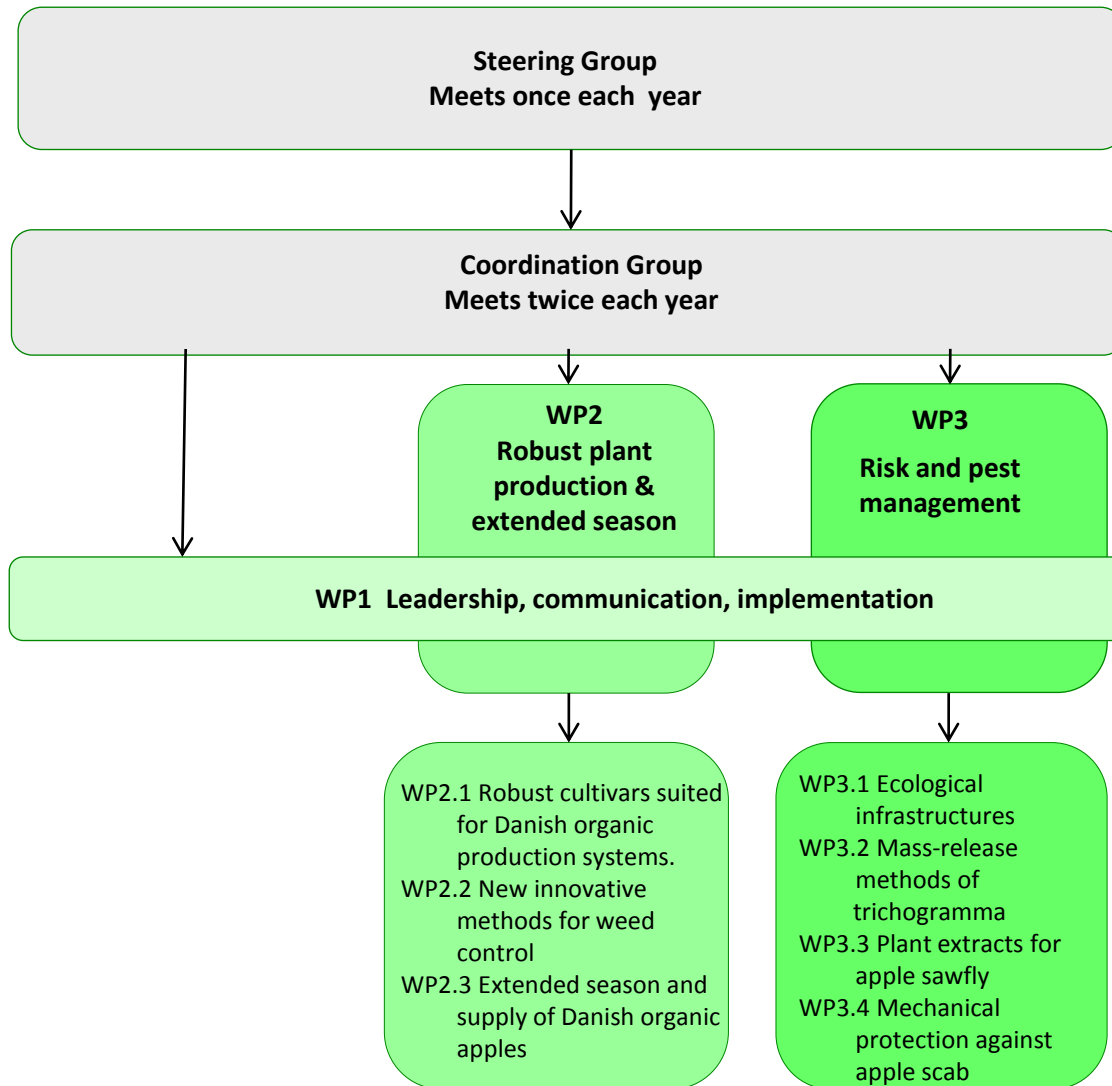


FruitGrowth partners

- **AU**, Department of Food Science and Department of Agroecology
- **KU-LIFE**, Department of Agriculture and Ecology
- **SDU**, Department of Chemical Engineering, Biotechnology and Environmental Technology
- **GartneriRådgivningen**
- **Landboforeningen Gefion**
- **ENVO-DAN**
- **Danske Frugtavlere**
- **Ventegodtgaard (organic grower)**
- **Strandegaard (organic grower)**



FruitGrowth organization



WP1 Leadership, communication, implementation

Steering group (annual meetings)

Michelle Williams, Project leader
Marianne Bertelsen, WP2 leader
Lene Sigsgaard, WP3 leader
Poul Rytter Larsen, Organic fruit grower
Jens Petersen, Organic Denmark
Jan Jensen Hass, GartneriRådgivningen

Coordination group (6 mo meetings)

Michelle Williams, Project leader
Marianne Bertelsen, WP2 leader
Lene Sigsgaard, WP3 leader
Jan Jensen Hass, GartneriRådgivningen

WP1 Leadership, communication, implementation

Plan:

Milestones and time schedule	2011 1.	2011 2.	2012 1.	2012 2.	2013 1.	2013 2.
First coordination meeting Project launch.	X					
Second coordination meeting Monitoring status, agreement on activities and deliverables. 6-12 month. (nov)		X				
First Steering group meeting Summary year 1. Activities, results, current status. Plan for year 2. (dec)		X				
Third coordination meeting. Monitoring status, Agreement on activities and deliverables. 12-18 month. (mar)			X			
Fourth coordination meeting. Monitoring status, Agreement on activities and deliverables. 18-24 month. (nov)				X		
Second Steering group meeting Summary year 2. Activities, results, current status. Plan for year 3. (dec)				X		
Fifth coordination meeting. Monitoring status, Agreement on activities and deliverables. 24-30 month. (mar)					X	
Sixth coordination meeting. Monitoring status, Agreement on activities and deliverables. 30-36 month. (nov)						X
Third Steering group meeting Summary year 3. Activities, results, status (dec)						X
Final project report (dec)						X

WP1 Leadership, communication, implementation

Outputs:

Outputs 2011

Article, ICROFS nyt. (FruitGrowth)
Klummer i Økologi & Erhverv (Organic research area)

Article, Frugt og Grønt (Fruit Growth)

Project web-site: *www.fruitgrowth.dk*

Machine Industry Open Day, AU-FOOD. June 2011
Industry Open Day on Apples, AU-FOOD. August 2011

Project brochure, ICROFS

WP2 Robust plant production and extended season

Participants

AU – Marianne Bertelsen

AU – Lillie Andersen

SDU – Rasmus N. Jørgensen

SDU – Keld B. Bertelsen

ENVO DAN – Ole Jensen



WP2 Robust plant production and extended season

WP2.1 Robust cultivars suited for Danish organic production systems

WP2.2 New innovative methods for weed control

WP2.3 Extended season and supply of Danish organic apples

WP2.1 Robust apple cultivars suited for Danish organic production systems

Plan and outputs

Milestones and time schedule	2011 1.	2011 2.	2012 1.	2012 2.	2013 1.	2013 2.
WP2.1 Robust apple cultivars suited for Danish organic production systems (Marianne Bertelsen, AU-FOOD)						
Planning and establishment of cultivar experiments (mar)	X					
Completion of cultivar trial experiments (oct)						X
Final report (dec)						X
2011 status: Planting new varieties (29 varieties) Evaluation of a mature planting (2000-02) consisting of more than 30 varieties. From 2009 trees have been left totally unsprayed and in 2011, as part of the present project 18 varieties have been evaluated both in terms of disease occurrence and fruit quality. The remaining 12 varieties were identified as being unsuitable for organic production.						
Outputs so far:						
Open Day on apple cultivars, August 2011						

WP2.2 Robust plant production and extended season supply

Plan and outputs

Milestones and time schedule	2011 1.	2011 2.	2012 1.	2012 2.	2013 1.	2013 2.
WP2.2 New innovative methods for weed control (Marianne Bertelsen, AU, Rasmus Jørgensen SDU, ENVO-DAN)						
Planning and establishment of weeding experiment (mar)	X					
ASuBot is capable of following the straight tree rows with a speed of 1 ½ m/s and an accuracy of +/- 0.1m (oct)				X		
ASuBot is capable of performing headland turns following several tree rows (as above) in a sequence (oct)				X		
2011: The trees for the weed experiment were planted, spring 2011. The experiment treatments will take place spring 2012 (8 treatments). Here ASuBot also is expected to be tested.						
No outputs so far						

WP2.3 Extended season and supply of Danish organic apples

Plan and outputs

Milestones and time schedule	2011 1.	2011 2.	2012 1.	2012 2.	2013 1.	2013 2.
WP2.3 Extended season and supply of Danish organic apples (Lillie Andersen, AU-FOOD)						
Storage research methods planned and evaluated, (aug)		X				
Storage data collected (dec)		X				
Storage methods evaluated on basis of results and modification (aug)				X		
Storage data collected (dec)				X		
Other cultivars (dec)						X
2011: Storage trial with DCA (dynamic controlled atmosphere) compared to control (2% oxygen) of organic sprayed apples (Elstar) compared to conventional apples initiated in Oct. Stress response to suboptimal oxygen determined by HarvestWatch; respiration from the apples monitored during the trial						
No outputs so far						

WP3 Risk and pest management

Participants

KU-LIFE – Lene Sigsgaard

Gefion – Maren Korsgaard

AU – Klaus Paaske

AU – Marianne Bertelsen

Strandegaard – Bent Jensen

Ventegodtgaard – Søren Thorsen



WP3 Risk and pest management

WP3.1 Ecological infrastructures

WP3.2 New mass-release methods of Trichogramma

WP3.3 Plant extracts for apple sawfly

WP3.4 Mechanical protection against apple scab

WP3.1 Ecological infrastructures

Plan and outputs

Milestones and time schedule	2011 1.	2011 2.	2012 1.	2012 2.	2013 1.	2013 2.
WP3.1 Ecological infrastructures (Lene Sigsgaard, KU-IJØ)						
Apple orchards characterized with respect to landscape and management practises			X			
Population densities of codling moth and beneficial, fruit yield assessed (2y study) (dec)						X
Orchard data analyzed and interpreted, identifying orchard and landscape factors with an impact on natural pest control (feb)			X			
Codling moth rearing established (mar)			X			
Distance effect trials for flower strips completed (1y)						X
Analysis and interpretation of results completed, providing recommendations for floral composition and distances between flower strips (nov)						X
<p>2011: 10 organic orchards, 5 with grass, 5 with flower strips identified. Composition of annual and perennial flora data collected for orchard characterization. Codling moth infestation in orchards assessed by fruit assessment. Laboratory analysis for natural enemies in process. Over 600 codling moths in rearing for experiments in 2012.</p>						
No outputs so far						

WP3.2 New mass-release methods of Trichogramma

Plan and outputs

Milestones and time schedule	2011 1.	2011 2.	2012 1.	2012 2.	2013 1.	2013 2.
WP3.2 New mass-release methods of Trichogramma (Lene Sigsgaard, KU-IJØ)						
Mass-release trials with Trichogramma against codling moth completed (sep)					X	
Analysis and interpretation of mass-release data completed						X
2011: Contact with biocontrol companies and JKI- Institut Darmstadt regarding rearing and mass release of Trichogramma						
No outputs so far						

WP3.3 Plant extracts for apple sawfly

Plan and outputs

Milestones and time schedule	2011 1.	2011 2.	2012 1.	2012 2.	2013 1.	2013 2.
WP3.3 Plant extracts for apple sawfly (Klaus Paaske, AU-IA)						
Trials with plant extracts for apple sawfly control finished and analysed (apr)					X	
2011: 3 trials (not 2) were established in spring. Infestation was registered in 2 trials and results are achieved according to plan.						
No outputs so far						

WP3.4 Mechanical protection of apples scab

Plan and outputs

Milestones and time schedule	2011 1.	2011 2.	2012 1.	2012 2.	2013 1.	2013 2.
WP3.4 Mechanical protection of apples scab (Maren Korsgaard KU-IJØ, Marianne Bertelsen AU-FOOD)						
Trial with mechanical protection against apple scab established (jun)	X					
Planning of research and establishing irrigation-systems (mar)			X			
Strategic irrigation trials with water amounts and sounds completed (2y) (sep)						X
3-years trial with mechanical protection against apple scab completed (oct)						X
2011: Preliminary test (AU), fenced production – the branches covered or wrapped in air permeable plastic bags. Irrigation trials were carried out to evaluate the effect on overwintering of the scab						
Pilot test (Gefion), established irrigations-systems and carried out strategic irrigation trials in 5 organic orchards						
No outputs so far						

Communication and implementation of FruitGrowth results

- Many of the research activities are being carried out at growers sites, and therefore will be directly implemented within the project period
- Communication to industry via Open days, talk at grower meetings, informed industry advisors, workshops, and articles for end users in industry journals, and popular press
- Communication to scientific audience via scientific peer-reviewed international journals and conferences
- Web-site (ICROFS and Project)



FruitGrowth results will be beneficial to:

- Primary producers – tools and technologies to deliver quality fruit and increasing profitability
- The processing industry – access to reliable volumes of quality organic fruit for processing and developing of new products
- Consumers – larger selection of quality, fresh Danish organic apples
- Society – environmental improvements
- Science – Denmark as a world leader wrt knowledge and new technologies within the area of organic apples

