Organic-PLUS - grant agreement No [774340]

Pathways to phase-out contentious inputs from organic agriculture in Europe

Deliverable 1.2:

Documentation of boards - Documentation of advice and discussion in the international academic board and the European industry board

31 October 2022

Funding

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No [774340 — Organic-PLUS]

Project Details:

Programme: **H2020, SUSTAINABLE FOOD SECURITY – RESILIENT AND RESOURCE- EFFICIENT VALUE CHAINS**

Call topic: **SFS-08-2017, (RIA) Organic inputs – contentious inputs in organic farming**

Project Title: **Pathways to phase-out contentious inputs from organic agriculture in Europe**

Project Acronym: **Organic-PLUS**

Proposal Number: **774340-2**

Lead Partner: **INRAe**

Time Frame: **01/05/2018 – 31/10/2022**

Authors:
Ulrich Schmutz, Adrian Evans, Rosa van Kesteren, Judith Conroy (Coventry University) and Sabine Zikeli (Hohenheim University) with input from all Organic-PLUS partners and advisory boards.

Deliverable Details:

WP: 1 LEAD

Involved Partners: CU (Coventry University, UK) and all Organic-PLUS partners and advisory boards.

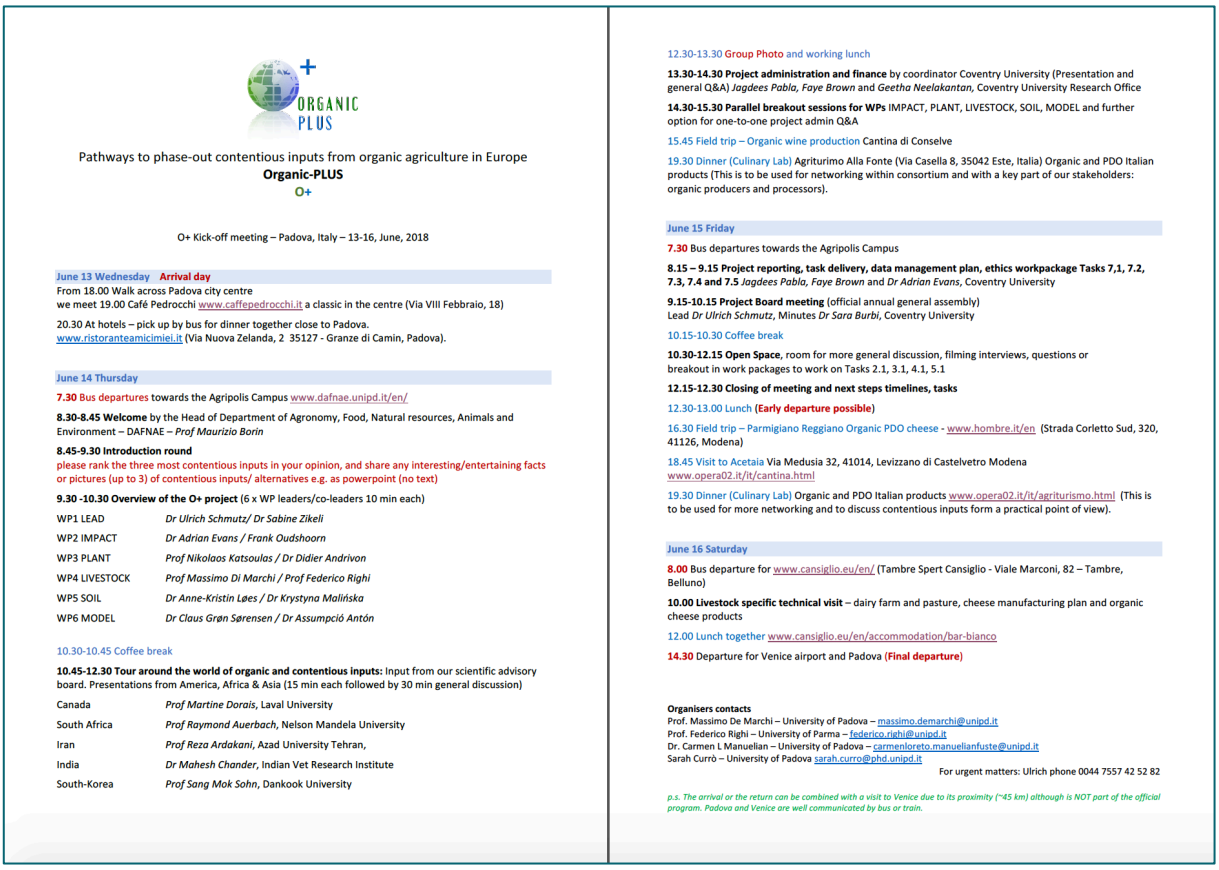
Deadline for delivery: Month 54

Date of delivery: 31/10/2022

Content

1 Documentation of 1st advisory board meeting - physical Padova, Italy 2018

The programme with old logo is show below. Selected details of presentations are shown in Appendix B.



Pathways to phase-out contentious inputs from organic agriculture in Europe
Organic-PLUS
O+

O+ Kick-off meeting – Padova, Italy – 13-16, June, 2018

June 13 Wednesday Arrival day
From 18.00 Walk across Padova city centre
we meet 19.00 Café Pedrocchi www.caffepedrocchi.it a classic in the centre (Via VIII Febbraio, 18)

20.30 At hotels – pick up by bus for dinner together close to Padova.
www.ristoranteamicimiei.it (Via Nuova Zelanda, 2 35127 - Granze di Camin, Padova).

June 14 Thursday

7.30 Bus departures towards the Agripolis Campus www.dafnae.unipd.it/en/

8.30-8.45 Welcome by the Head of Department of Agronomy, Food, Natural resources, Animals and Environment – DAFNAE – *Prof Maurizio Borin*

8.45-9.30 Introduction round
please rank the three most contentious inputs in your opinion, and share any interesting/entertaining facts or pictures (up to 3) of contentious inputs/ alternatives e.g. as powerpoint (no text)

9.30 -10.30 Overview of the O+ project (6 x WP leaders/co-leaders 10 min each)

WP1 LEAD	*Dr Ulrich Schmutz/ Dr Sabine Zikeli*
WP2 IMPACT	*Dr Adrian Evans / Frank Oudshoorn*
WP3 PLANT	*Prof Nikolaos Katsoulas / Dr Didier Andrivon*
WP4 LIVESTOCK	*Prof Massimo Di Marchi / Prof Federico Righi*
WP5 SOIL	*Dr Anne-Kristin Løes / Dr Krystyna Malińska*
WP6 MODEL	*Dr Claus Grøn Sørensen / Dr Assumpció Antón*

10.30-10.45 Coffee break

10.45-12.30 Tour around the world of organic and contentious inputs: Input from our scientific advisory board. Presentations from America, Africa & Asia (15 min each followed by 30 min general discussion)

Canada	*Prof Martine Dorais*, Laval University
South Africa	*Prof Raymond Auerbach*, Nelson Mandela University
Iran	*Prof Reza Ardakani*, Azad University Tehran,
India	*Dr Mahesh Chander*, Indian Vet Research Institute
South-Korea	*Prof Sang Mok Sohn*, Dankook University

12.30-13.30 Group Photo and working lunch

13.30-14.30 Project administration and finance by coordinator Coventry University (Presentation and general Q&A) *Jagdees Pabla, Faye Brown* and *Geetha Neelakantan*, Coventry University Research Office

14.30-15.30 Parallel breakout sessions for WPs IMPACT, PLANT, LIVESTOCK, SOIL, MODEL and further option for one-to-one project admin Q&A

15.45 Field trip – Organic wine production Cantina di Conselve

19.30 Dinner (Culinary Lab) Agriturimo Alla Fonte (Via Casella 8, 35042 Este, Italia) Organic and PDO Italian products (This is to be used for networking within consortium and with a key part of our stakeholders: organic producers and processors).

June 15 Friday

7.30 Bus departures towards the Agripolis Campus

8.15 – 9.15 Project reporting, task delivery, data management plan, ethics workpackage Tasks 7,1, 7.2, 7.3, 7.4 and 7.5 *Jagdees Pabla, Faye Brown* and *Dr Adrian Evans*, Coventry University

9.15-10.15 Project Board meeting (official annual general assembly)
Lead *Dr Ulrich Schmutz*, Minutes *Dr Sara Burbi*, Coventry University

10.15-10.30 Coffee break

10.30-12.15 Open Space, room for more general discussion, filming interviews, questions or breakout in work packages to work on Tasks 2.1, 3.1, 4.1, 5.1

12.15-12.30 Closing of meeting and next steps timelines, tasks

12.30-13.00 Lunch (**Early departure possible**)

16.30 Field trip – Parmigiano Reggiano Organic PDO cheese - www.hombre.it/en (Strada Corletto Sud, 320, 41126, Modena)

18.45 Visit to Acetaia Via Medusia 32, 41014, Levizzano di Castelvetro Modena
www.opera02.it/it/cantina.html

19.30 Dinner (Culinary Lab) Organic and PDO Italian products www.opera02.it/it/agriturismo.html (This is to be used for more networking and to discuss contentious inputs form a practical point of view).

June 16 Saturday

8.00 Bus departure for www.cansiglio.eu/en/ (Tambre Spert Cansiglio - Viale Marconi, 82 – Tambre, Belluno)

10.00 Livestock specific technical visit – dairy farm and pasture, cheese manufacturing plan and organic cheese products

12.00 Lunch together www.cansiglio.eu/en/accommodation/bar-bianco

14.30 Departure for Venice airport and Padova (**Final departure**)

Organisers contacts
Prof. Massimo De Marchi – University of Padova – massimo.demarchi@unipd.it
Prof. Federico Righi – University of Parma – federico.righi@unipd.it
Dr. Carmen L Manuelian – University of Padova – carmenloreto.manuelianfuste@unipd.it
Sarah Currò – University of Padova sarah.curro@phd.unipd.it

For urgent matters: Ulrich phone 0044 7557 42 52 82

p.s. The arrival or the return can be combined with a visit to Venice due to its proximity (~45 km) although is NOT part of the official program. Padova and Venice are well communicated by bus or train.

The O+ advisory board and O+ consortium in Padova, Italy, June 2018):

Source: www.organic-plus.net/organic-plus-team

1.1 Board videos interviews

All interviews form advisory board are on the website and show below:

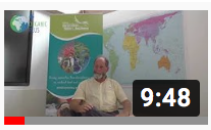
Canada (International Advisory Board): Prof Dr Martine Dorai...
CAWR Coventry University

Iran (International Advisory Board): Prof Dr Reza Ardakan...
CAWR Coventry University

India (International Advisory Board): Dr Mahesh Chander...
CAWR Coventry University

South-Korea (International Advisory Board): Prof Dr San...
CAWR Coventry University

An additional (longer interview) was made in Ryton Organic Gardens, Coventry University, UK as Prof Dr Raymond Auerbach had to leave the Padova meeting a day earlier:



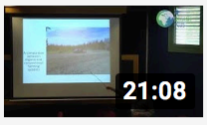
South-Africa (International Advisory Board): Prof Dr...
CAWR Coventry University

The Youtube link is given below and the link on the Organic-PLUS website is also shown.

- www.youtube.com/watch?v=EaiRGyXoKno&list=PLvjHiw2S9PdWjeuLopFvl47N-jrGZpDBf&index=1
- www.organic-plus.net/videos

1.2 Board presentations and video recordings at Padova conference

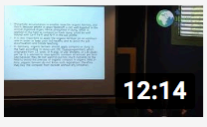
Canada: Prof Dr Martine Dorais (2018) Contentious inputs in...
CAWR Coventry University



South-Africa: Prof Dr Raymond Auerbach (2018) Contentious...
CAWR Coventry University

Iran: Prof Dr Reza Ardakani (2018) Contentious inputs in...
CAWR Coventry University

India: Dr Mahesh Chander (2018) Contentious inputs in...
CAWR Coventry University



South-Korea: Prof Dr Sang Mok Sohn (2018) Contentious...
CAWR Coventry University

This shows the full presentation of the issue of contentious inputs in relation to other issues within organic farming in the different parts of the world in 2018.
Links are www.youtube.com/watch?v=EaiRGyXoKno&list=PLvjHiw2S9PdWjeuLopFvl47N-jrGZpDBf&index=1 and www.organic-plus.net/videos

1.3 Our reflections and conclusions from 1st board meeting

It was evident from the presentations that contentious inputs are not high on the agenda in most parts of the world. Especially in **Asia** and **Africa** other issues are much more important like general knowledge about organic within farmers and consumers, establishing standards, fighting GMO and CRISPER and the 20th century narrative of industrialisation of agriculture as part of modernity, access to organic food, food safety, organic certification for wild collection, and adopting EU standards to export (see selected slides in Appendix B).
In South-Korea, as highly developed and populated country in Asia, organic farming is fast growing, however, non-organic seed is used and contentious as not allowed by IFOAM and EU standards. Another issue is nutrient oversupply and nitrogen leaching in intensive organic vegetable production. Similar increases are seen in China, India, Iran, however from a lower starting point.
The picture is different again for **America**, with Canada and United States in America (US), where similar issues as in Europe are discussed, and the organic standards are similar but still slightly different. It is not the case that they are always stricter or weaker than in Europe and the EU, it is just different. For contentious input is relevant that the US (and Canada) are further ahead in phasing-out **antibiotics** in organic as part of NOP. The National Organic Program, NOP, is a US federal regulatory program that develops and enforces consistent national standards for organically produced agricultural products sold in the US. In this regulation antibiotics are just not allowed and this is to contrast organic to the heavy use of antibiotics in conventional large scale livestock production in North America. Other issues like growing in **hydroponics**, not allowed under EU and Canadian organic standards, is however still acceptable in the US. Many issues are similar as sourcing nutrients from the **bio-economy** for use in organic farming, or the increase of **vegan organic** (veganic) in the USA and Canada.

In the US work on the reduction of plastic is ahead with the requirement to use **bio-degradable bio-based plastic** as part of the US NOP standards. The discussion among organic growers shows higher awareness then in Europe. The use of polyvinyl chloride (PVC) plastic mulch is banned and also other fossil-fuel plastic mulches, even if biodegradable are not allowed. Bio-degradable bio-based plastics are allowed but none are yet approved for use in certified organic. Non-synthetic, untreated materials such as wood chips, leaves, or straw are allowed and so are newspapers or other recycled paper, without glossy or colour inks.
For **copper**, **mineral oil, synthetic vitamins, peat** and other inputs, including parallel production rules it can be considered as largely similar between EU, US and Canada organic standards (at not identical and difference e.g. between US and Canada remain). Nevertheless the agreement is large enough for equivalence agreements having been reached.

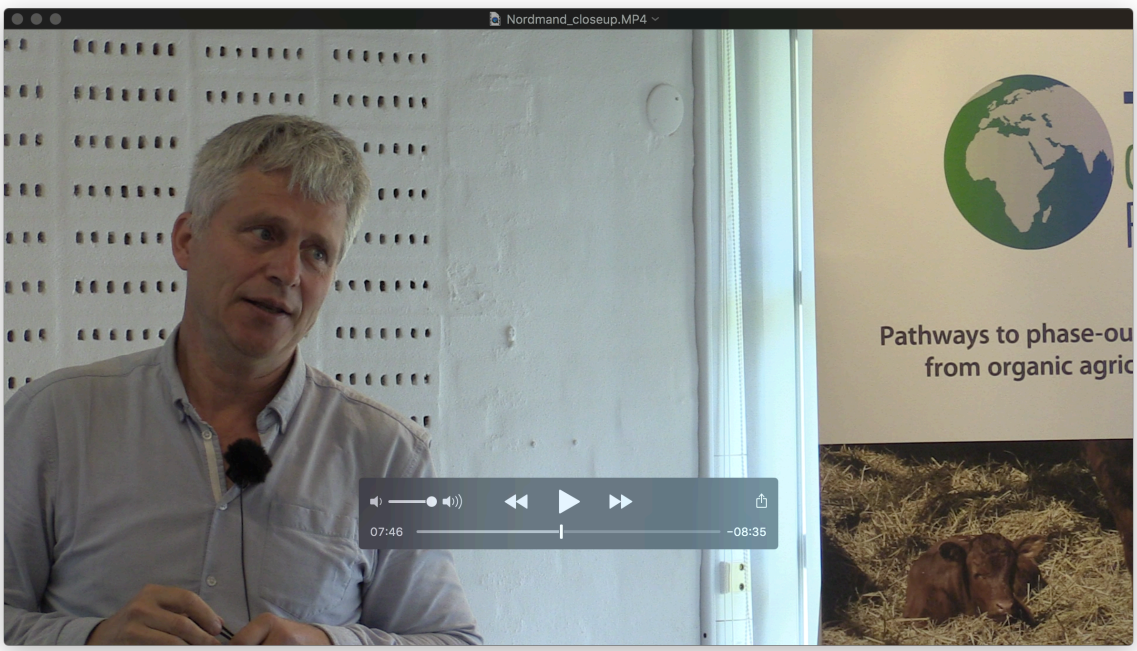
For Canada, eight specific contentious inputs/issue are reported and they are documented in the slides in Appendix B presented by Prof Dr Martine Dorais. Some overlap with EU issues, but others are different.

International advisors (South Korea, India, Africa, Iran) are also asking for support from the EU in terms of farmer training, advices and research co-operation. What is also clear is that any change to EU organic standards will have effects on all countries importing into the EU e.g. Turkiye, Egypt, Iran, India. Most, unlike India, have no extra organic standards for domestic production so the EU organic standard will also become their national standard.
Another contentious issue reported is the lack of knowledge about the IFOAM-organic standards family, the EU organic standard or the NOP. This is even the case for researchers working in organic agriculture and wanting to publish work for peer-reviewed ISOFAR (International Society of Organic Agricultural Research) journals. This lack of knowledge of the legal standards governing the practical farms they research or work with is shocking or labelled especially contentious. This was highlighted in the presentation of Professor Dr Reza Ardakani from Azad University, Karaj, Iran.
In conclusion, the concept of contentious inputs in organic agriculture, as defined in the EU call is important and relevant worldwide. It is however, certainly not the main priority of organic movements struggle and research in many countries.
The phase-out of contentious inputs It is currently mainly an issue for the discussion in Europe including Turkiye, the EU, the US and Canada. This may change in the future.

2 Documentation of advisory board meeting - physical Aarhus, Denmark 2019

2.1 Board video recordings at Aarhus conference - Denmark vs Norway

vs



Paul Holmbeck Political Director from 'Organic Denmark' (www.organicdenmark.com) and Børre Solberg from 'Organic Norway' (www.okologisknorge.no) went head-to-head in a friendly Nordic organic market competition which could not be more different: 'Organic Denmark' is an organisation with 60 employees and 20 advisors, 'Organic Norway' is barely

20% of this size and the difference are similar in the market. So what are the success factors of Denmark?

Paul presented Denmark as an example of higher organisation for organic in the society including organic farmers, organic food processers, charities, catering and policy development and consulting in other countries. Some is replicable in Europe and also worldwide and consulting is offered by 'Organic Denmark'.

ORGANIC DENMARK

vs

Økologisk Norge

Here we document key messages for organic and the issue of contentious inputs from his presentation. Denmark is at a tipping point 99% know the label, 80% buy organic food, over 50% buy organic every week, and the overall market share is **15%, the highest in the world**.

But still there is much potential to grow. In some products the market share it is even higher **90% in baby food**, **50% carrots** and some other stable like **42% oat meal**, **34% cooking oil** and **33% milk**, however other areas are still low e.g**. 3% in pork** and **4% in beer** and only **9% of all coffee** sold in Denmark is certified organic.

Paul introduced a detailed set of PUSH (production support) and PULL (market demand support) strategies to support this growth:

- Free whole day farm-conversion checks are offered.
- Free organic certification for farmers are available, too.
- 60% organic in all public kitchens.
- Financial support for cities and hospitals and for education in kitchens.
- Three labels with 30-60%, 60-90% and 90-100% organic ingredients in private and public kitchens.

2.2 Programme Aarhus, Denmark Conference and industry board presentations June 2019

Organic-PLUS, 2019 Consortium Meeting and Annual General Assembly
Aarhus, Denmark, Thursday 27th and Friday 28th June 2019
Programme

Venue: SEGES, Agro Food Park 15, 8200 Aarhus, Denmark and the nearby Horisont conference centre.

Wednesday 26th June - Arrival day
It is recommended that delegates arrive on Weds 26th ready for an 8am start on Thurs 27th.

18.00 City walk. Meet at Aarhus Central Station (rail) in front of the main entrance.

19.00 Dinner at organic restaurant, Langhoff & Juul in Aarhus.
Those arriving later, please join the group throughout the evening.
(The cost will not be covered as part of the consortium meeting so will need to come from your organisation's individual O+ budget or other budget)

Thursday 27th June
8:00 Arrival and coffee at SEGES Agro Food Park, AFP 15

8:30 Opening session
Chair, Judith Conroy:

- Welcome and introduction to consortium meeting - *Judith Conroy, Organic-PLUS Project Manager* (5 mins)
- Organic-PLUS project update report - *Ulrich Schmutz, Organic-PLUS Project Coordinator* (10 mins)
- Introduction to SEGES's and Denmark - *Kirsten Holst and Frank Oudshoorn, L&F/SEGES* (15 mins)
- The progression of Organic farming in Denmark - *Paul Holmbeck, Organic Denmark* (15 mins)
- Organic Norway - *Børre Solberg, Oikos* – Organic Norway (15 mins)
- Danish Farmer - *Esben Møller* of Rudholm (15 mins)
- ICROFS (International Centre for Research in Organic Food Systems) - *Jakob Sehested* (15 mins)

Questions (30 mins)

10:30 Coffee

11:00 Work Package updates – short presentations of work completed so far.
Chair, Frank Oudshoorn
WP leads/co-leads (10 mins each = 1 hour)

12:00 Field trip (including packed lunch) to two local farms:
- Arable farm with milking goats, Stenalt - https://stenalt.dk
- Dairy farm, Karensminde - http://www.karensminde.com/

17:15 Arrival at the European Diversity Cereal Festival at Kalø, 8410 Rønde. (Cerere EU www.edcf2019.com)

19:00 Cerere conference dinner
(Organised in advance and paid for by Organic-PLUS). Bus to depart by 11pm.

Friday 28th June
8:00 Arrival and coffee at SEGES, Agro Food Park - AFP15

8:30 General project session:
Chair, Frank Oudshoorn
- Ethics - *Adrian Evans* (10 mins)
- Organic Eprints - *Ilse Ankjær Rasmussen* (15 mins)
- Impact - *Adrian Evans* (30 mins, including questions)
- Project matters, incl. finance & reporting – *Judith Conroy & Ulrich Schmutz* (20 mins)

9:45 Annual General Assembly (45 mins)
Chair, Ulrich Schmutz. Agenda to include:
- Approval of minutes from Padova 2018
- Annual report
- Arrangements for next meeting
- AOB and questions

10:30 Coffee

11:00 Work package updates (in plenary). A series of short presentations of work that is currently in progress such as on-farm trials.

12:30 Lunch

13:30 WP breakout meetings (3 hours)
Including **15:00** Coffee break
WPs to decide beforehand their own agendas and those involved in multiple WPs to arrange which parts of which sessions they should attend.

16:30 Closing summary and actions - *Ulrich Schmutz* and *Judith Conroy* (30 mins)

19:00 Organic-PLUS project dinner at Madklubben, Aarhus.
(The cost will not be covered as part of the consortium meeting, so will need to come from your organisation's individual O+ budget or other budget)

Saturday 29th June
Departure day

10:00 city tour – begins at Aarhus Rådhus (Town Hall). Duration 1 hour.

--- Finish ---

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 774340

2.3 Reflections and conclusions from industry board meeting

Although Denmark is leading Organic in Europe not all other Nordic countries are similar. The contrast with Norway was stark, market share is only 2%, versus 15% in Denmark. This shows how important societal awareness and political campaigning is and how much work 'Organic

Denmark' and the whole organic movement in this country has achieved, going back to the first IFOAM world congress in Copenhagen in 1996.
The contrast with Norway is interesting, despite similar wealth and education of the population.
However, the main interest in both countries is on increasing the market and issues of contentious inputs are of low importance at least in communication with consumers. It is not mentioned maybe because it is perceived as a distraction from the main message. Also for the practical farmer, contentious inputs are no something of the daily concern, compared to other issues like getting enough hand labour for the organic sugar beet crops or milking the dairy cows. Only for Dr Jakob Sehested, Centre Director of ICROFS (International Centre for Research in Organic Food Systems, www.icrofs.org) contentious inputs was of importance and several research project related and high complementary to the work of Organic-PLUS were introduced. Jakob also emphasised that working on contentious inputs is important "for our (organic farming) trustworthiness to society and to consumers".

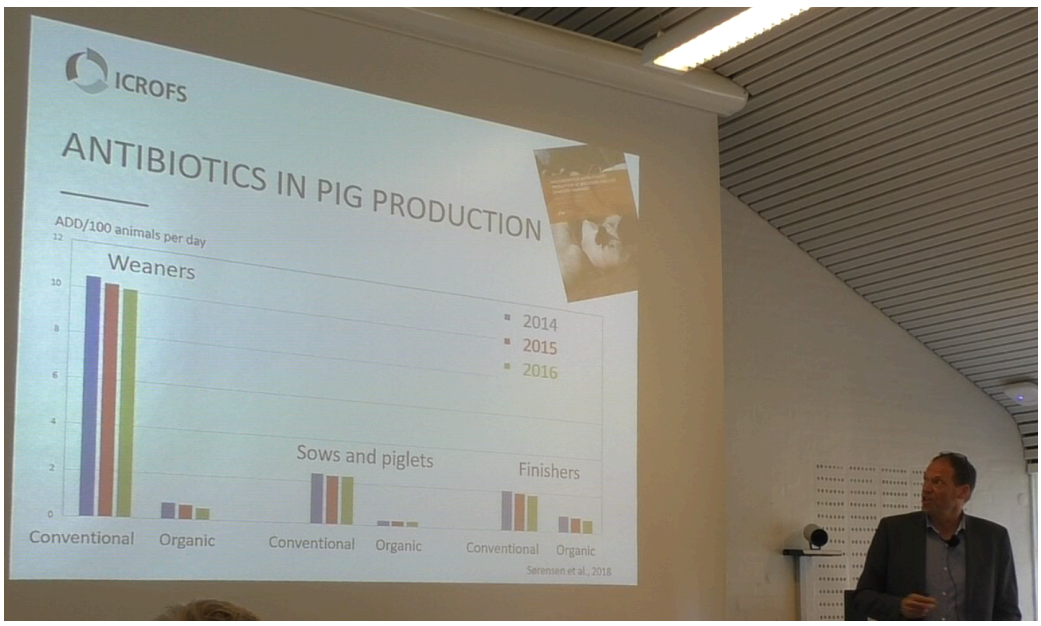
The projects relevant and influencing the work of Organic-PLUS (and RELACS) are:

- Antibiotics and Zinc in animal production
- Manure and nutrients from non-organic farms
- Pesticides in fruit production

They are further detailed below.

2.3.1 Antibiotics and Zinc in animal production

ICROFS research into antibiotic use in organic pig farming showed that organic farming is already very low in antibiotic use compared to conventional production, especially for weaners, and to a lesser degree for 'sows and piglets' and finishers. Antibiotic use, although below 10% of conventional inputs, shows no indication of under-treatment. However, it is also clear that it is not zero, despite a downward trend in 2014, 2015 and 2016.



Zinc is however used to a similar degree in conventional, free-range and organic (also has free-range mandatory) and hence the research done within Organic-PLUS is highly topical to contribute to the phase-out of Zinc, although this contentious input was not specially mentioned in the EU call text. Further ICROFS and CORE organic project to reduce the use of antibiotics and Zinc are:

- **ViOrCa** – Strong Management to reduce mortality among organic dairy calves
- **MAFFRA** – Antibacterial plants against diarrhoea in pig herds
- **VIPiglets** – Low mortality through birth of vital piglets
- **SOBcows** – Specialised organic breeding goals and breeding schemes of dairy cattle
- **FreeBirds** – Encouraging organic chickens and hens to be more outdoor

2.3.2 Manure and nutrients from non-organic farms

Projects to reduce the use of manure form non-organic farm are:

- **DOMINO** – Innovative orchard management enhances soil fertility, biodiversity and economic sustainability
- **SureVeg** – Strip-cropping and recycling of waste and plant biomass for biodiverse and resource-efficient intensive vegetable production
- **ClimOptic** – New climate-efficient fertilisers for organic plant production
- **NutHy** – Nutrients for higher organic crop yields

2.3.3 Pesticides in fruit production

For the past 15 years copper was not used in Danish organic fruit production and therefore projects to reduce all pesticides in fruit production are of particular interest, e.g. the first one to reduce the effects of high humidity in orchards (an issue in a northern climate):

- **PROTECFRUIT** – Protected production of organic apples and pears
- **FruitGrowth** – Novel organic solutions securing future growth
- **MothStop** – Wood ants can help improve organic apple production
- **EcoOrchard** – Pest management in organic apple orchards – increasing functional agricultural biodiversity

3 Documentation of other meetings relevant to boards and with participation of board members and sister project RELACS

In addition to the conference in Denmark in 2019 we planned one with a large Mediterranean focus in at the University of Thessaly (UTH), Department of Agriculture Crop Production and Rural Environment in Volos, Greece in April 2020.
However, although nearly fully organised and travel booked for April 2020 it was cut short due to COVID-19 pandemic lookdowns.

3.1 Programme Volos, Greece, Mediterranean Organic Crop Conference April 2020 (cancelled due to COVID-2019)

Organic-PLUS, 2020 Consortium Meeting and Annual General Assembly
Volos, Greece 1st – 3rd April 2020

Venues: Day 1 - University of Thessaly, Volos
Day 2 - Portaria Hotel, Portaria
Day 3 - Field trip departing from Portaria and Volos

Tuesday 31st March, arrival day
It is recommended that delegates arrive on 31st March to start promptly on 1st April.

16:00 Bus provided by UTH from Athens airport to Volos. Those arriving after this time or at Thessaloniki will need to organise their own transport to Volos – it is advised you check the registration form to arrange taxis with other people arriving at similar times.

18.30 City walk

19.30 Dinner in Volos – venue tba
Those arriving later, please join the group throughout the evening.
(The cost will not be covered as part of the consortium meeting so will need to come from your organisation's individual O+ budget or other budget)

Day 1, Wednesday 1st April - Mediterranean Crop Conference
Location - University of Thessaly amphitheatre

8:15 Bus will be provided to transport delegates from central Volos to the UTH campus

8:30 Arrival and coffee at University of Thessaly, Dept. of Agriculture

9:00 - Welcome and introduction - Judith Conroy, Organic-PLUS Project Manager and Professor Nikolaos Katsoulas, University of Thessaly (10 mins)

Organic-PLUS project update – Ulrich Schmutz, Organic-PLUS Principal Investigator (10 mins)

9:20 Presentations from Organic-PLUS partners and other experts, focusing on organic crop cultivation in the Mediterranean. Also open to staff and students of University of Thessaly:

- Survey of public opinion in Europe regarding contentious inputs - Gunnar Vittersø of OsloMet University.
- Title to be confirmed - Prof. Andreas Foscolos, University of Thessaly with Prof. Massimo De Marchi, University of Padova and Dr Federico Righi, University of Parma.
- Organic farming in Turkey - Dr Uygun Aksoy, Association of Ecological Agriculture
- Title to be confirmed - Dr Johannes Eisenbach, International Biocyclic Vegan Network

11.00 Coffee

11:30 continued

- Organic agriculture in Greece with a focus on olives - Prof. George Nanos, University of Thessaly
- Tomato growing in Spanish greenhouses - Dr Miguel de Cara, Food and Agricultural Research and Training Institute
- Copper alternatives in European potato production - Dr Didier Andrivon, INRAE
  Using ozonated water in plant protection - Dr Atle Wibe, NORSØK
- Organic citrus production - Dr Gabriella Cirvilleri, University of Catania

13:00 Lunch

14.30 Presentations from other Organic-PLUS Workpackages:
- WP5, SOIL
- WP6, MODEL
- WP4, LIVESTOCK
- WP2, IMPACT

Approx. 20 mins each plus 10 mins for questions
Part of the public conference so needs to be public/farmer facing (not internal project matters).

17:00 Bus leaves UTH campus to take us back to Volos for dinner.

19:30 Conference dinner (cost is included as part of the conference)

Day 2, Thursday 2nd April – Internal, Organic-PLUS project meeting
Location - Portaria Hotel

8:00 Bus from Volos to Portaria

8:30 Arrival and coffee

9:00 Work-package break out, part 1 – an opportunity for partners collaborating on common tasks to meet and discuss their work

10:00 Communication:
- Project communication and impact – Adrian Evans, Coventry University
- 'Communication, dissemination and barriers to uptake', collective presentation from leaders of tasks 3.7, 4.7 and 5.7
- Stéphane Bellon?

10:30 Coffee

11:00 Annual General Assembly
Chaired by Principal Investigator Ulrich Schmutz, Coventry University

11:45 Organic-PLUS presentations:
- Review of LCA, RISE and feasibility models. Strategy for data collection and case study examples - Claus Sørensen, Aarhus University and Assumpció Anton, Institute of Agrifood Research and Technology
- Ethics update - Adrian Evans, Coventry University
- Finances and reporting

12:30 Lunch (for those staying in Portaria hotel, check-in is available from 12pm)

14:00 Work-package break out, part 2

15:45 LIAISON – A session with 'LIAISON', a fellow H2020 project working with Organic-PLUS to investigate the design and implementation of agricultural innovations

17:00 Return bus to Volos

Free evening – delegates to organise their own dinner, either in Volos or Portaria
(The cost will not be covered as part of the consortium meeting so will need to come from your organisation's individual O+ budget or other budget)

Day 3, Friday 3rd April – Field trip
A visit to the University of Thessaly's experimental greenhouse, a local organic greenhouse and monastery farm. All transport provided by UTH, details of travel and venues to be added.

Provisional timetable:

8:00 depart Portaria
8:30 pick up from Volos
9:00 arrival at UTH experimental farm/greenhouse
10:00 depart UTH
10:45 arrival at organic greenhouse
11:45 depart organic greenhouse
12:45 arrival at monastery farm and lunch
16:00 depart monastery
17:00 drop-off at Volos
17:30 drop-off at Portaria

Saturday 4th April

Bus provided by UTH to Athens airport
Approx **7:30am** bus departs Volos, taking around 4.5 hours.
(Those needing to arrive earlier, taxi costs around €250 or train is available)

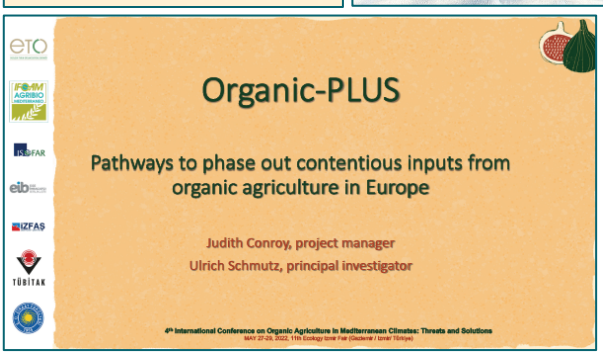
--- Finish ---

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 774340

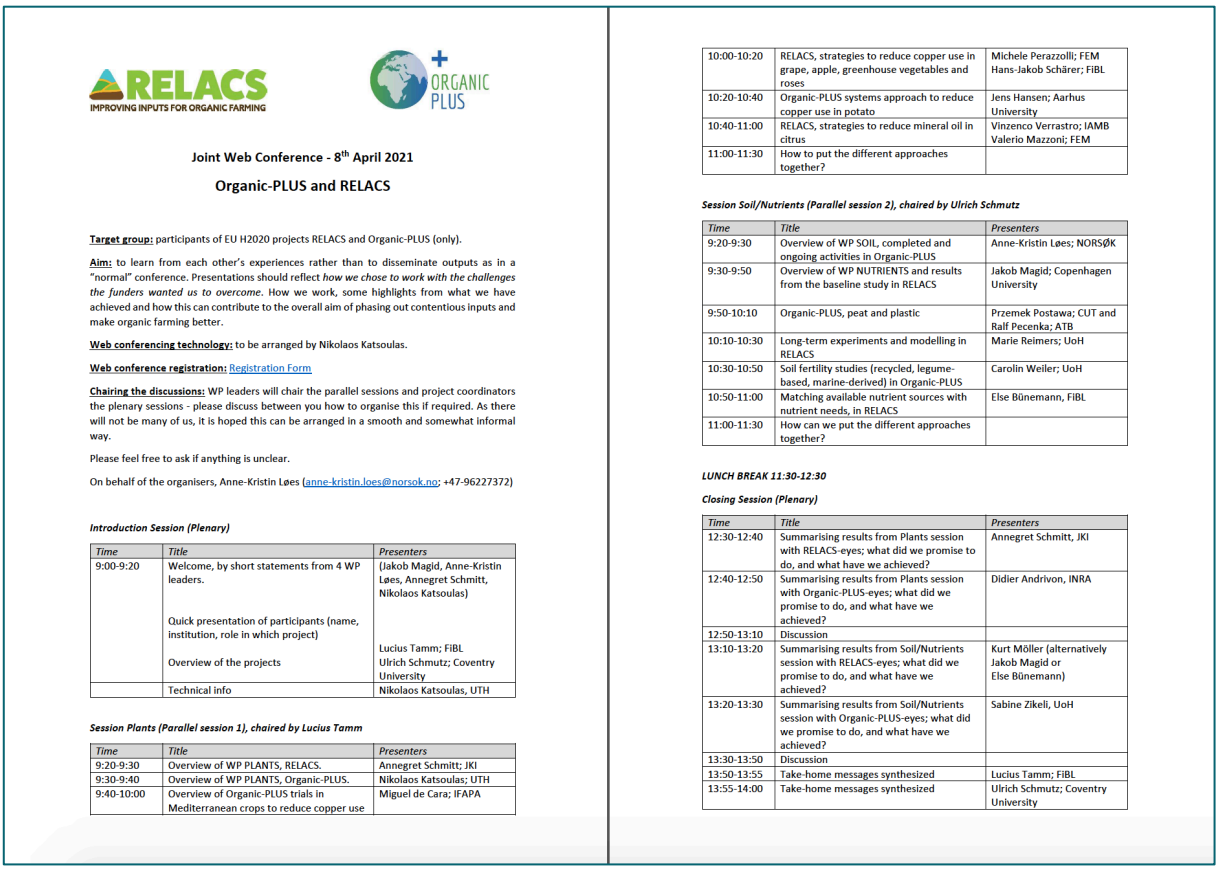
Instead an online consortium meeting and a joint further web conference with RELAS (our sister project) was organised. This meeting was project intern and also intended to prepare for the public scientific conference organised with the and together with TP Organic in 30 November - 1 December 2021 (Organic Innovation Days) and following the easing of lookdown and the delay of Biofach into July 2022, it was held at Biofach Nuremberg. These are documented below.

3.2 Programme Izmir International Conference on Organic Agriculture in Mediterranean Climates May 2022

An additional Mediterranean focus was achieved at International Conference on Organic Agriculture in Mediterranean Climates in May 2022 in Izmir, Turkiye. The programme is available here and it was attended by Organic-PLUS partners from Greece, Turkey, Norway United Kingdom and advisory board members:
https://ekolojiizmir.izfas.com.tr/images2/img/1801/File/Zoom%20links_Final_ABM42022_Programme_2.pdf



3.3 RELACS and Organic-PLUS joint internal Web Conference April 2021, with attendance of board members



RELACS
IMPROVING INPUTS FOR ORGANIC FARMING

ORGANIC PLUS

Joint Web Conference - 8th April 2021

Organic-PLUS and RELACS

Target group: participants of EU H2020 projects RELACS and Organic-PLUS (only).

Aim: to learn from each other's experiences rather than to disseminate outputs as in a "normal" conference. Presentations should reflect *how we chose to work with the challenges the funders wanted us to overcome*. How we work, some highlights from what we have achieved and how this can contribute to the overall aim of phasing out contentious inputs and make organic farming better.

Web conferencing technology: to be arranged by Nikolaos Katsoulas.

Web conference registration: Registration Form

Chairing the discussions: WP leaders will chair the parallel sessions and project coordinators the plenary sessions - please discuss between you how to organise this if required. As there will not be many of us, it is hoped this can be arranged in a smooth and somewhat informal way.

Please feel free to ask if anything is unclear.

On behalf of the organisers, Anne-Kristin Løes (anne-kristin.loes@norsok.no; +47-96227372)

Introduction Session (Plenary)

Time	*Title*	*Presenters*
9:00-9:20	Welcome, by short statements from 4 WP leaders. Quick presentation of participants (name, institution, role in which project) Overview of the projects	(Jakob Magid, Anne-Kristin Løes, Annegret Schmitt, Nikolaos Katsoulas) Lucius Tamm; FiBL Ulrich Schmutz; Coventry University
	Technical info	Nikolaos Katsoulas, UTH

Session Plants (Parallel session 1), chaired by Lucius Tamm

Time	*Title*	*Presenters*
9:20-9:30	Overview of WP PLANTS, RELACS.	Annegret Schmitt; JKI
9:30-9:40	Overview of WP PLANTS, Organic-PLUS.	Nikolaos Katsoulas; UTH
9:40-10:00	Overview of Organic-PLUS trials in Mediterranean crops to reduce copper use	Miguel de Cara; IFAPA
10:00-10:20	RELACS, strategies to reduce copper use in grape, apple, greenhouse vegetables and roses	Michele Perazzolli; FEM Hans-Jakob Schärer; FiBL
10:20-10:40	Organic-PLUS systems approach to reduce copper use in potato	Jens Hansen; Aarhus University
10:40-11:00	RELACS, strategies to reduce mineral oil in citrus	Vinzenco Verrastro; IAMB Valerio Mazzoni; FEM
11:00-11:30	How to put the different approaches together?	

Session Soil/Nutrients (Parallel session 2), chaired by Ulrich Schmutz

Time	*Title*	*Presenters*
9:20-9:30	Overview of WP SOIL, completed and ongoing activities in Organic-PLUS	Anne-Kristin Løes; NORSØK
9:30-9:50	Overview of WP NUTRIENTS and results from the baseline study in RELACS	Jakob Magid; Copenhagen University
9:50-10:10	Organic-PLUS, peat and plastic	Przemek Postawa; CUT and Ralf Pecenka; ATB
10:10-10:30	Long-term experiments and modelling in RELACS	Marie Reimers; UoH
10:30-10:50	Soil fertility studies (recycled, legume-based, marine-derived) in Organic-PLUS	Carolin Weiler; UoH
10:50-11:00	Matching available nutrient sources with nutrient needs, in RELACS	Else Bünemann, FiBL
11:00-11:30	How can we put the different approaches together?	

LUNCH BREAK 11:30-12:30

Closing Session (Plenary)

Time	*Title*	*Presenters*
12:30-12:40	Summarising results from Plants session with RELACS-eyes; what did we promise to do, and what have we achieved?	Annegret Schmitt, JKI
12:40-12:50	Summarising results from Plants session with Organic-PLUS-eyes; what did we promise to do, and what have we achieved?	Didier Andrivon, INRA
12:50-13:10	Discussion	
13:10-13:20	Summarising results from Soil/Nutrients session with RELACS-eyes; what did we promise to do, and what have we achieved?	Kurt Möller (alternatively Jakob Magid or Else Bünemann)
13:20-13:30	Summarising results from Soil/Nutrients session with Organic-PLUS-eyes; what did we promise to do, and what have we achieved?	Sabine Zikeli, UoH
13:30-13:50	Discussion	
13:50-13:55	Take-home messages synthesized	Lucius Tamm; FiBL
13:55-14:00	Take-home messages synthesized	Ulrich Schmutz; Coventry University

3.4 TP Organics, RELACS and Organic-PLUS Organic public conference as part of the Organic Innovation Days. "Better Inputs for Organic Farming" Brussels online - November 2021, with attendance of board members

TPorganics European Technology Platform

RELACS IMPROVING INPUTS FOR ORGANIC FARMING

ORGANIC PLUS

Organic Innovation Days

30 November - 1 December 2021 / Online

Organic Innovation Days 2021

"Better inputs for organic farming"

30 November – 1 December 2021

Day 1 – Alternatives to contentious inputs in organic agriculture

30 November 2021

Time	
08:30-09:00	Time for connecting and getting familiar with the online tool
09:00-09:15	**Welcome note** Lucius Tamm, FiBL, RELACS Project Coordinator Ulrich Schmutz, Coventry University, Organic-PLUS Project Coordinator
	Use of and alternatives for contentious inputs in organic farming
09:15-10:15	**Copper** Annegret Schmitt, Julius Kühn Institute (30 min) Nikolaos Katsoulas, UTH (30 min)
10:15-10:30	**Mineral oil** Vincenzo Verrastro, CIHEAM-IAMB (15 min)
10:30-11:00	**Discussion plant protection**
11:00-11:20	**Break**
11:20-12:20	**Soil & Nutrients** Jakob Magid, Copenhagen University (20 min) Anne-Kristin Løes, NORSØK (20 min) **Peat & plastic** Francis Rayns, Coventry University (20 min)
12:20-12:45	**Discussion Soil & Nutrients**
	Lunch break
14:00-14:40	**Antibiotics** Michael Walkenhorst, FiBL (20 min) Federico Righi, University of Parma (20 min)
14:40-15:10	**Anthelmintics** Spiridoula Athanasiadou, SRUC (15 min) Tove Serup, SEGES (15 min)
15:10-15:30	**Break**
15:30-15:50	**Vitamins** Florian Leiber, FiBL (20 min)
15.50-16:05	**Novel bedding materials** Federico Righi, University of Parma (15 min)
16:05-16:30	**Discussion livestock husbandry**
16:30-16:45	**Wrap up** Judith Conroy, Coventry University, Organic-PLUS Project Manager Lucius Tamm, FiBL, RELACS Project Coordinator

These sessions are financed by the Organic-PLUS and RELACS projects. Organic-PLUS has received funding under grant agreement No 774340 and RELACS has received funding under grant agreement No 77343, from the European Union's Horizon 2020 research and innovation programme.

Day 2 – Socio-economic aspects & the way forward for contentious inputs

1 December 2021

Time	
09:00-09:10	**Introduction and recap of day 1** Bram Moeskops, Senior Scientific Coordinator, TP Organics
09:10-09:30	**Consumer perspectives and citizen juries** Adrian Evans, Coventry University (20 min)
09:30-10:10	**Socio-economic and environmental impact of alternative tools and technologies** Lucius Tamm, FiBL (20 min) Assumpció Antón, IRTA (20 min)
10:10-10:30	**Towards a European roadmap for replacing contentious inputs** Mathilde Calmels, IFOAM Organics Europe (20 min)
10:30-11:00	**Break**
11:00-11:15	**Tackling contentious inputs in organic farming: what can the Organic Action Plan deliver?** Nathalie Sauze-Vandevyver, Director for Quality, Research & Innovation, DG AGRI
11:15-12:15	**Policy debate: tackling contentious inputs in organic farming** Nathalie Sauze-Vandevyver, Director for Quality, Research & Innovation, DG AGRI Werner Vogt-Kaute, Advisor and project coordinator, Naturland Fiona Marty, EU Affairs Officer, FNAB Faustine Bas-Defossez, External Impact Director, IEEP Moderator: Eduardo Cuoco, Head of Secretariat, TP Organics
12:15-12:30	**Conclusions and next steps** Lucius Tamm, FiBL, RELACS Project Coordinator Ulrich Schmutz, Coventry University, Organic-PLUS Project Coordinator

These sessions are financed by the Organic-PLUS and RELACS projects. Organic-PLUS has received funding under grant agreement No 774340 and RELACS has received funding under grant agreement No 77343, from the European Union's Horizon 2020 research and innovation programme.

3.5 Final Organic-PLUS conference at Hohenheim, Germany and joint RELACS Organic-PLUS seminar at Biofach Nuremberg, Germany, July 2022

ORGANIC PLUS

Programme

OrganicPlus, 2022 Consortium Meeting and Annual General Assembly

Nuremberg and Hohenheim, Germany

27th-30th Juli 2022

https://oeko.uni-hohenheim.de/en/organicplus_e

Program | **Biofach Nuremberg**
Tuesday | 26th July 2022

Arrival Day

16:45 **Arrival at Hohenheim University or at Nuremberg/Nürnberg**
For those arriving at Hohenheim University and joining the tour through the Botanical Garden: Meet at the entrance Botanical Garden.
Meeting point: Entrance, Ökozentrum, Garbenstr. 28

17:00 **Guided tour through the Botanical Garden of the University of Hohenheim**

19:30 **Dinner at Hohenheim – Restaurant Denkbar**
(on the premises of the university)
(costs on own budget)

Program | **Biofach Nuremberg**
Wednesday | 27th July 2022

Day 1 // Biofach Nuremberg

07:30 **Visit of Biofach, Departure from Hohenheim to Nuremberg Biofach, Nuremberg**
Departure from Hohenheim to Nuremberg.
Meeting point: Bus stop Heinrich-Pabst-Strasse / University of Hohenheim. Sharp! Be on time!

10:30 **Arrival at Biofach**
all go together to the project internal room (NCC Ost, Room RIGA)

Workshop at Biofach
11:00 **How to reach 30% Organic Farming in Bavaria?**
Holger Reising, Bavaria State Institute for Agricultural Research, Bavaria, Germany (with discussion)
11:30 **Research for organic and bio-dynamic farms with a focus on participatory, transdisciplinary projects**
Christopher Brock, Forschungsring e.V., Germany (with discussion)

Program | **Biofach Nuremberg**
Wednesday | 27th July 2022

Day 1 // Biofach Nuremberg

12:00 - 17:00 **Free time to visit Biofach**, first we go together to 'Demeter stand' and then disperse. Please consider attending our 1-hour joint public workshop:

14:30 - 15:30 **Organic-PLUS and RELACS Public forum science workshop** (NCC Ost, Room ISTANBUL)
Raising the bar for Organic: Input-substitution or system redesign? A tale of peat and copper with
Margi Lennartsson (RHS),
Bram Moeskops (IFOAM Europe),
Annegret Schmitt (Julius Kühn Institut),
Ulrich Schmutz (Coventry University)
Christopher Brock (Forschungsring),
www.vivaness.de/de/programm/uebersicht?lectureId=UfMZKFTlsZlyXIOdNvgRG

16:30 **Departure to Hohenheim**

20:00 **Dinner at the local beer garden** (costs on own budget)
Garbe Stuttgart-Hohenheim (close to the university)

Program | **Palace Balkonsaal**
Thursday | 28th July 2022

Day 2 // Conference Day: OrganicPlus (open for the public)

08:30 **Welcome and Registration – Coffee (Entrance Hall)**

09:00 **Opening addresses**
Prof. Dr. Stephan Dabbert, Rector of the University of Hohenheim
Prof. Dr. Ulrich Schmutz, Coordinator of Organic-PLUS

09:10 **Future of Organic Farming: Contentious Inputs – Challenges and Potentials Core Findings of OrganicPlus**
(5 minutes presentations of the WP leaders)

The view from the Organic Sector:
Perspectives of Farmers and Businesses
09:50 • **Biofa** on contentious fertilizers and contentious plant protection products
10:20 • **Jonas Klein** on the use of antibiotics in organic cattle husbandry (farmer, dairy cows & journalist)
10:50 • **Thomas Makary** on the use of contentious fertilisers (farmer and scientist)

11:20 **Coffee Break**

11:50 **Innovation - workshop together with practice**
Next steps and research needs from practice
Plant protection, veterinary medicine, fertilisation
moderated by the Workpackage Leads

12:50 **Presentation of the findings and final discussion**

13:00 **End of conference**

Program **Excursion & Dinner**
Thursday | 28th July 2022

Field Trip

13:15 **Departure for field trip**
Bus stop Heinrich-Pabst-Strasse/University of Hohenheim

1. **Organic plantlet nursery Natterer (Bioland)**
   www.natterer-bioland.de/
2. **Urban Vineyards of the City of Stuttgart**
   (in conversion to organic)
   www.weingutstuttgart.de/weingut

19:30 **Wine tasting and conference dinner at the vineyard of the City of Stuttgart**

Zoom-Link
https://uni-hohenheim.zoom.us/j/89801566731?pwd=UmdLVVJUT3o1eXRyRDRqYzc0ajBxdz09

Meeting-ID: 898 0156 6731
Password: Organic+22

Program **Palace Balkonsaal**
Friday | 29th July 2022

Day 3 // Conference Day: OrganicPlus (internal meeting)

09:00 **Start of conference**
Opening address:
Judith Conroy Project Manager of OrganicPlus

09:10 **WP meetings:** Possibility to discuss any remaining issues in person (5 parallel sessions WP2-WP6)

10:10 **Short WP reports:** Loose ends and future outlook form the different WPs (minutes each WP)

11:00 **Coffee break**

11:30 **Annual General Assembly of the Organic-PLUS project**

12:00 **Question and Answers:**
- Finances and preparation of 54-month report (final report)
- Dissemination of on-farm innovation and project legacy
- Further publication strategy
- Ideas for next projects
- Closing remarks: Ulrich, Sabine & Judith

13:00 **End of conference (early departure possible)**

Program **Excursion & Dinner**
Friday | 29th July 2022

Field Trip

13:30 **Departure for field trip**

1. **Farm: Michaelshof (Demeter)** Organic/bio-dynamic vegetables
   www.michaelshof.com/home
2. **Farm Die Käsmacher (Bioland)** Organic goats, on-farm dairy and compost
   www.die-kaesmacher.de/hofkaserei

19:30 **Dinner** (costs on own budget)

Program **Excursion & Dinner**
Saturday | 30th July 2022

Day 4 // All day: Field trip, lake constance region

07:30 **Grand Field excursion to Lake Constance region**
return Departure from bus stop Heinrich-Pabst-Strasse/
19:00 University of Hohenheim

1. **Farm Heggelbach (Demeter)**
   www.hofgemeinschaft-heggelbach.de
   Agrophotovoltaics, pigs, dairy cows, vegetable and arable production, cheese dairy (bio-dynamic), renewable energies

   Lunch Break in Friedrichshafen, short visit of the Kulturufer festival
   https://kulturufer.de

2. **Farm: Johannes Bentele (Demeter)**
   www.wir-bodensee.bio/hofportrais/demeterhof-bentele
   Hops, apples, apple juice, and beef cattle

19:30 **Dinner (costs on own budget)**

Program **Excursion & Dinner**
Saturday | 30th July 2022

Day 4 // All day: Field trip, lake constance region

07:30 return 19:00 — **Grand Field excursion to Lake Constance region**
Departure from bus stop Heinrich-Pabst-Strasse/
University of Hohenheim

1. **Farm Heggelbach (Demeter)**
www.hofgemeinschaft-heggelbach.de
Agrophotovoltaics, pigs, dairy cows, vegetable and arable production, cheese dairy (bio-dynamic), renewable energies

Lunch Break in Friedrichshafen, short visit of the Kulturufer festival
https://kulturufer.de

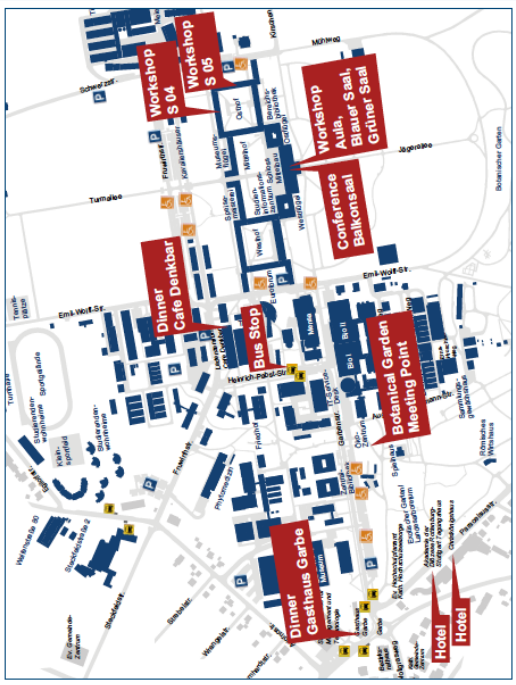
2. **Farm: Johannes Bentele (Demeter)**
www.wir-bodensee.bio/hofportrait/demeterhof-bentele
Hops, apples, apple juice, and beef cattle

19:30 — **Dinner (costs on own budget)**

Hofgemeinschaft Heggelbach GbR	
Owner	5 families as in a contract based partnership under Civil Law
Address	Heggelbach 8, 88634 Herdwangen
Region	Lake Constance hinterland
Farm existing	since 1986
Form of management	Biodynamic
Farming association	Demeter
Marketing	Direct marketing, wholesale, food retail, processors
Location characteristics	650 m altitude above sea level, 700 mm annual precipitation, soil: mainly sandy loam
Employees	11 family employees, 7 permanent employees, 5 seasonal employees, 5-6 apprentices and interns
Agricultural production	Vegetable production, fattening pigs and dairy (own cheese production), arable farming
Animals	45 dairy cows, 250 fattening pigs, sheep and poultry as a hobby
Products	Vegetables, cheese, pork, cereals
On-farm processing	Vegetable and potato preparation (also wage-based for other farmers), vegetable processing, partly packaging (e.g. beet root and corn)
Area	95 ha farmland, 60 ha grassland, 5ha forest, hedges, etc.
Buildings	Cubicle housing system for cows, deep litter, pig ports for fattening pigs, preparation and storage room for vegetables
Fertilization	Farmyard manure from the farm liming, sulphur, compost tea etc.
Machinery	7 tractors between 55-150 PS, machinery for vegetables cultivation, haymaking and tillage in arable farming
Special features	Various collaborations with other farms regarding machinery, organisational and marketing topics; production and research on renewable energies (carburator, agrivoltaics)

Overview Demeterhof Bentele GbR (Partnership under Civil Law)	
Owner	Peter, Monika and Johannes Bentele
Address	Wellmutsweiler 2, 88069 Tettnang
Region	Lake Constance district
Farm existing	Since 1806 as a family business
Form of management	Organic since 1984
Farming association	Demeter
Marketing	Direct marketing
Location characteristics	364 m altitude above sea level 1200 mm annual precipitation, soil: sandy loam
Areas of operation	Apple and hops
Area	16,8 ha apple orchard, 14,3 ha hops, 8 ha other area (yard, forest, compost, reed meadow, ...)
Employees	2,5 family members, 2 permanent employees, 1 apprentice, 12 employees for sorting of fruits, 15 seasonal employees
Fertilization	Compost, organic commercial fertilizers
Machinery	Apple sorting machine, flame weeder, string device for weed control, hoes and others
Processing	Storage in ULO-storage room
Special features	Feed-manure cooperation with neighbouring farm, 2.5 km hedges, own composting, flower strips in orchard to enhance beneficials, pond for frost irrigation

Site Map



4 Documentation of 2nd advisory board meeting - online 27 January 2022, 12-2 pm

The agenda of the meeting consisted of 1 hour Advisory Board member presentations. This was followed by break-out groups with 30 minutes discussions and then a concluding discussion of similar length.

Key points of the five presentations from Africa (South-Africa), Asia (India, Iran), Europe (Denmark) and America (Canada) are given first. Then the break-out group discussions are reflected using a SWOT (Strength Weakness Opportunities Threats) methodology to guide the discussion. This is followed by a documentation of the final discussion and section on further reflections when writing this deliverable in October 2022.

4.1 Key points in presentations from International Advisory Board

General point for organic background are mentioned first then a focus on contentious input is given in **green.**

Africa (Prof Dr Raymond Auerbach)

- 4 'advanced Organic agriculture countries' in Africa
- Kenya and Zambia going backwards
- African Union has agreed to Agroecology and has an Organic Agriculture initiative
- 6 million to self-claim farming organic in Africa (non-certified organic or agroecological farming)
- Southern Africa with GTZ support (German Federal Technical Development Agency)
- South African Network of organic farming is devolving
- Impressed Europe is tightening up – they are currently looking for alternatives to copper, sulphur, etc.
- Use of **peat** is a major issue in southern Africa
- African response to Organic-PLUS: '***it's hard enough to conform to Organic regulations as it is – don't make it even harder!'***

Asia - India (Dr Mahesh Chander)

- Organic exports from India have increased by 51% (in 2020-21 c.f. 2019-20)
- **Copper** will be an issue in India soon
- Indian cattle are well suited to Organic agriculture **– lower producing but disease tolerant – use and need less antibiotics**
- Help developing a project with developing countries on contentious input free low-input organic plant and animal husbandry, so knowledge can be shared

Asia - Iran (Prof Dr Reza Ardakani)

- Overall aim review, detail well organised, what could be stronger: Like to see alternatives more clearly in WP3 with alternatives for **copper, plant defence, varieties,** potassium zeolite
- DSS more discussed, **limits of the tools**
- Special regulation of farmer organisations (**private certification bodies**) not so much mentioned
- Impact on **policy makers and IFOAM world standards** is important to take notice of contentious inputs
- Animal manure must be provided **locally**
- WP4 Visibility study of medicinal forage (fennel and sainfoin) with demonstration farms for farmers
- Invited Organic-PLUS members to **IFOAM/ISFOR climate smart Organic Agriculture conference** in Korea

America – Canada (Prof Dr Martine Dorais)

- Very wide projects - 16 million in funding for their Organic research consortium
- 66% of Canadians are weekly Organic consumers; $8.1 billion/3.3% market share
- New 'Green Agriculture Plan' will include working with farmers to reduce **methane and fertiliser emissions**, as well as increasing Organic production and consumption
- Can't imagine phasing **peat** out. In greenhouses in Canada are permitted to grow out of the soil => a lot of peat consumption => work on alternatives very important here
- how to use **waste energy** key issue (e.g. for greenhouse facilities)
- The Canadian market and competition is the USA - although they might want to be more Organic, possibilities are limited by this (e.g. pressures to include **hydroponic**, etc)

Europe - Denmark (Prof Dr Jakob Sehested)

- Significantly **reducing use of conventional slurry** (more through bio-gasification)
- Keen on improving **recycling of nutrients** from industry and society
- Phasing-out **fossil-based plastic**
- Phasing-out **conventional seeds** (OrganicXseeds)
- Phased out **non-EU soya** (to increase circularity of system
- **Zinc** issues
- ICROFS research includes specialised **breeding of cows** for Organic (SOBcows)

4.2 Break out groups

SWOT: Strength Weakness Opportunities Threats

What is strong in Organic-PLUS?

- Lots of WPs, cover lots of areas, cover whole system, seems well integrated
- **Peat** a good focus within Organic-PLUS area where we can influence policy – influence on standards. When the project was planned it was envisaged that the UK peat story could act as a **'pathfinder'** to show how new practices could be effectively introduced by working in close collaboration with the horticultural industry and other stakeholders.
- Phasing out Peat will be **particularly useful in Canada** – but we have plenty and people don't see it as a priority at the moment. It will be hard for Spanish producers to find good alternatives to peat at the moment, and there is like political push-back to a ban on peat as first witnessed in the UK as well.

What is weak in Organic-PLUS?

- Less on **precision agriculture** and how that could be integrated with Organic farming.
- Also how to make the most of '**energy waste'** is really crucial in Canada (e.g. to heat greenhouses)
- **Labour issues in agriculture are a key aspect**, how does this fit within organic farming? This was not in the call but came up in the social science work as a highly contentious issue, e.g. in Canada workers come for 6 months from all over the world, flying in and not treated so well potentially – doesn't fit with Organic farming to import labour in this way (rather than domestic agricultural workers)
- **More work on nutrients needed** – different interpretations across Europe with regard to what is acceptable for organic producers (e.g. with respect to **animal by-products**)

Further opportunities

- For future policy what are the key findings and how can they influence future policy (legislation, organic standards) what can we **learn from other countries**?
- For stakeholder interaction and practice - what should happen to enable?
- For **future research topics** – what should happen to develop?
- How can organic **help the conventional sector?**
- How can we strengthen our international commonalities in ambition and scientific research to have **more of an influence on policy?** Science will lead and policy will follow – science must show that it's possible for policy to shift
- **More global Organic research collaboration**. How can we collaborate better as an international Organic research community?
- Opportunity within Organic-PLUS exploring why **peat** is important issue, especially in other countries. In the UK there has been a long history of **anti-peat campaigns,** initially driven by concerns over habitat loss. This is not the case in many other countries. Peat as an input is at very different stages across EU and worldwide, need

to work closely with growers – why it's needed to phase it out and what the barriers are – discussion groups with growers?

- **Contentious Innovations.** How we can/should integrate new tools while respecting Organic principles will be a big question in the coming years – e.g. will be some pressure for updated types of 'Gene Manipulation' like 'Gene Editing'. **CRISPR** is currently pushed by big agro-tech companies, it is of course also illegal in organic, but pressure to sell it with climate change as an argument to great need is like to come into non-organic and regenerative agriculture. It will be interesting opportunity for organic to resist this second wave of Gene Manipulation and grow the market for alternative on the back of it. New biopesticides are different, if they are nature-based and biodegradable they can replace copper in organic and also synthetic pesticides in conventional agriculture. Further issues discussed are:
    - **mRNA 'vaccine treatments'** to improve or intervene (depending in point of view) in health of plants and animals are developed. Many are opposing mRNA techniques in vaccines for agriculture and they are part of the Organic Movements. In addition, it is, currently, illegal to use mRNA in Organic certified food and fibres.
    - There is also a broader **discussion about new technologies in organic: precision farming, smart agriculture, robots.** Need more research into the broader understanding of technology in Organic farming
    - The **Organic consumer also has to be on board** – a lot of them buy Organic for perceptions of naturalness/not technological etc. – if they are not on board there is a limit to where we can go.

Further threats

- For organic farming and further phase-outs (**phase-out of fossil fuels**), the sector may not be prepared very well. Tractors with solar power or bio-gas, bio-fuels existed but they are very rare. The use of horsepower is low in organic, at least in the Global North, but it is not extinct.
- **System redesign and more agroecology,** can be a threat as organic is often focussed on production also in research, and although this is important the system redesign and higher levels of food system transformation are important.
- **Producer margins** and capability are key in developing the Organic markets with high standards: how many producers will last if we improve organic in these ways of phasing-out contentious inputs? Many farmers need support as they are under economic pressure, it is not easy to increase the standards, if it will put additional pressure on farmers, without consumers understanding the 'value' of the improvements made.
- Danger of phasing out **peat** by regulation rather than co-development. There is a particular **risk** that general rules governing peat use will become more stringent than the organic regulations **- the organic movement should be seen to be a sustainability leader rather than a follower.** Losing this position is a major threat for organic.

4.3 Final closing session

The questions discussed were:
How can researchers work better together with farmers and growers?
How to overcome farmer and growers barriers to phase-out contentious inputs?

Insights form the final closing discussion:

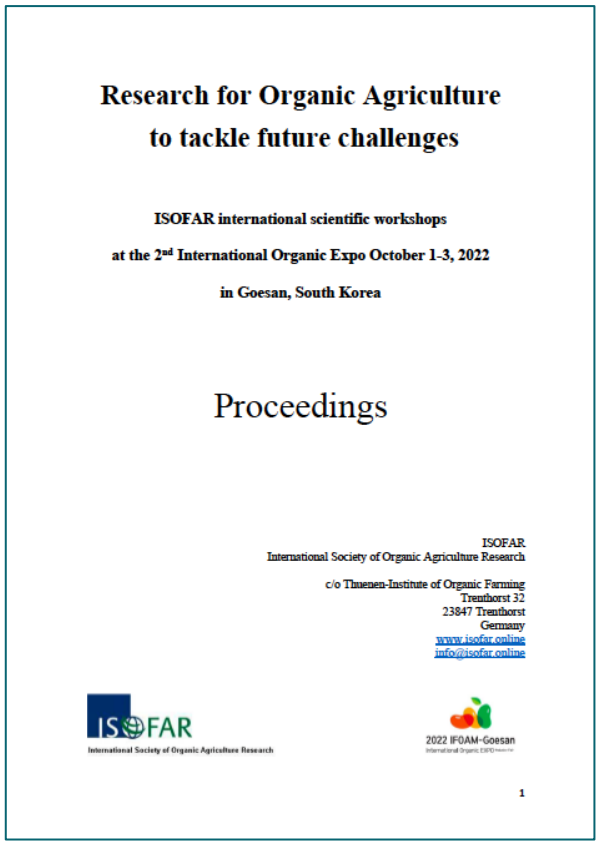
- Equal playing field with **different ways of knowledge**
- Ensure relevant and beneficial to farmers – especially with pioneers in the Organic movement who are researched often and fatigued
    - E.g. **'Innovative farmers':** farmers drive the interest and experimentation and matched with academic partners to support (and analyse?). But this is time consuming
- Importance of whole spectrum of engagement: from dissemination of materials to very **collaborative approaches** with a more equal playing field between scientists and other forms of knowledge (transdisciplinary science)
- Direct discussion, more fruitful discussion
    - We have to find time to **visit farmers** and for farmers to visit us – we need to have much closer contact. Working together makes much more fruitful dialogue
    - Not underestimating how much time it takes to really engage with farmers
- Sharing experience and disseminating better among ourselves as **an International Organic Research Community** (e.g. ISOFAR, IFOAM, Agroecology Europe) so that those who have contact can provide the best resources (e.g. other countries just starting to engage with **peat** phase-out might not realise that the UK has already a long history of engaging with this).
- Farmers always under economic pressure so need some kind of **financial support/subsidies to engage in scientific experiments (Innovation action with farmer as multi-actors).**
- If farmers can avoid doing it, they will not do it, because of competitive pressures
- **The IFOAM (International Federation of Organic Agricultural Movements)** is as important as ever – results are delivered to the IFOAM Europe (including EU) group and IFOAM worldwide and hence impact will be very high. This is done with RELACS having IFOAM EU as partner and Organic-PLUS close cooperation with RELACS IFOAM EU and IFOAM and ISOFAR worldwide – see section on 50-year celebration event of IFOAM world in South Korea in October 2022, next chapter.

5 Documentation of IFOAM and ISOFAR conference in Korea and relevance to Organic-PLUS and contentious input discussion

5.1 General Background

This documentation is added, although this was not a specific event organised as part of the project Organic-PLUS. However, the relevance to climate mitigation of the Organic-PLUS project is high and we see it as important to reflect on the project finding in a wider, global context. Within the ISOFAR international scientific conference at the 2nd International Organic Expo October 2022, five workshops were organised. The specific workshop on *"Climate smart Organic Agriculture"* was co-organised by Prof Dr Reza Ardakani, Iran (member of the Organic-PLUS international advisory board) and by Dr Sabine Zikeli (co-lead of Workpackage 1, Hohenheim University, Germany). Also presenting were Prof Dr Ulrich Schmutz (coordinator of Organic-PLUS, Coventry University, United Kingdom), and representatives of further project partners Prof Dr Uygun Aksoy form the Association of Ecological Agriculture (Ekolojik Tarım Organizasyonu Derneği - ETO), Türkiye, Soil Association, United Kingdom, and Dr Mahesh Chander, India (also member of the O+ international advisory board).

The main purpose of the meeting was to celebrate 50 years of international organic agricultural movements and reflect on "Organics for all" for the future. IFOAM was founded 1972 in Paris, France and ISOAR in 2003 at Humboldt University Berlin, Germany.



Research for Organic Agriculture to tackle future challenges

ISOFAR international scientific workshops

at the 2nd International Organic Expo October 1-3, 2022

in Goesan, South Korea

Proceedings

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2022 IFOAM-Goesan

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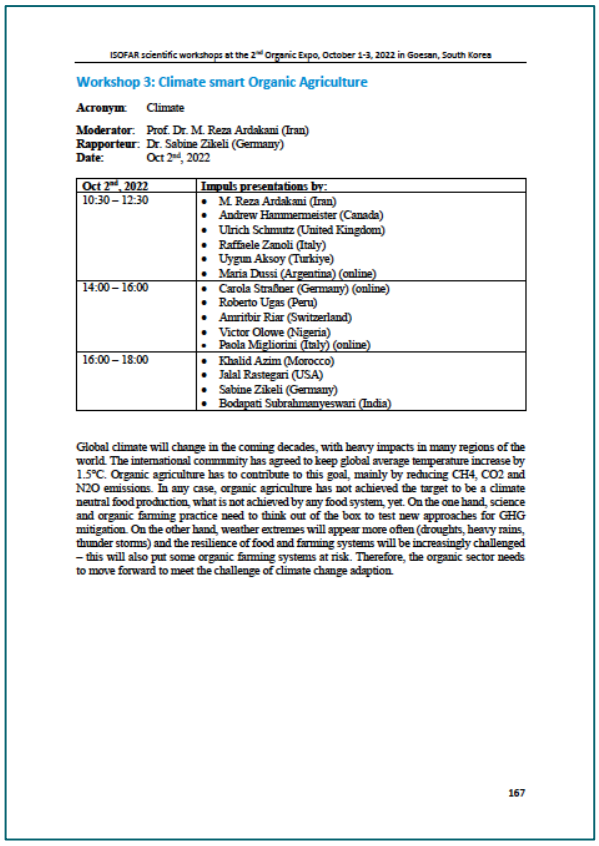

ISOFAR scientific workshops at the 2nd Organic Expo, October 1-3, 2022 in Goesan, South Korea

Workshop 3: Climate smart Organic Agriculture

Acronym: Climate

Moderator: Prof. Dr. M. Reza Ardakani (Iran)
Rapporteur: Dr. Sabine Zikeli (Germany)
Date: Oct 2nd, 2022

Oct 2nd, 2022	Impuls presentations by:
10:30 – 12:30	• M. Reza Ardakani (Iran) • Andrew Hammermeister (Canada) • Ulrich Schmutz (United Kingdom) • Raffaele Zanoli (Italy) • Uygun Aksoy (Turkiye) • Maria Dussi (Argentina) (online)
14:00 – 16:00	• Carola Straßner (Germany) (online) • Roberto Ugas (Peru) • Amritbir Riar (Switzerland) • Victor Olowe (Nigeria) • Paola Migliorini (Italy) (online)
16:00 – 18:00	• Khalid Azim (Morocco) • Jalal Rastegari (USA) • Sabine Zikeli (Germany) • Bodapati Subrahmanyeswari (India)

Global climate will change in the coming decades, with heavy impacts in many regions of the world. The international community has agreed to keep global average temperature increase by 1.5°C. Organic agriculture has to contribute to this goal, mainly by reducing CH4, CO2 and N2O emissions. In any case, organic agriculture has not achieved the target to be a climate neutral food production, what is not achieved by any food system, yet. On the one hand, science and organic farming practice need to think out of the box to test new approaches for GHG mitigation. On the other hand, weather extremes will appear more often (droughts, heavy rains, thunder storms) and the resilience of food and farming systems will be increasingly challenged – this will also put some organic farming systems at risk. Therefore, the organic sector needs to move forward to meet the challenge of climate change adaption.

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5.2 Specific insights from the discussion on contentious inputs in relation to climate change

The details of the workshop report are shown below.

ISOFAR
International Society of Organic Agriculture Research

2022 IFOAM-Goesan

ISOFAR scientific workshop on "Climate Smart Organic Agriculture" at the 2nd International Organic Expo October 2-3, 2022, Korea-Goesan

ISOFAR was the International partner of the 1st International Expo 2015 and is proud to be also the partner of the 2nd International Expo 2022, again. ISOFAR, as global and independent network of Organic Farming scientists, has organized the scientific workshops at the IFOAM Organic conference - who is celebration their 50th anniversary with the Expo – from October 1-3, 2022 in Goesan, Korea.

The 15 participating scientists from 13 countries were invited to contribute to the conceptional discussion of Organic Agriculture in the future. Our specific goal is to have a healthy, affordable, sufficient, efficient and environmentally found food system for everyone on earth within the context of significant global climate change impacts now and in the future.

The international community has agreed to keep global average temperature increases limited to 1.5°C. Organic agriculture has to contribute to this goal, mainly by reducing CH_4, CO_2, and N_2O emissions, but also to CO_2 sequestration with healthy soils. Organic agriculture has not achieved the target to be a climate-neutral or even net carbon sink food production system. This is not achieved by any food system, yet. On the one hand, science and organic farming practice need to think out of the box to test new approaches for GHG mitigation. On the other hand, weather extremes will appear more often (droughts, heavy rains, thunderstorms) and the resilience of food and farming systems will be increasingly challenged – this will also put some organic farming systems at risk. Therefore, the organic sector needs to move forward and diversify to meet the challenge of climate change adaptation. Organically managed systems emphasize soil and plant health and increase resilience to the impacts of climate change by offering alternatives to an external input-reliant farming system.

The workshop participants discussed the following issues; papers are available in the conference proceedings:

1. How do organic philosophy and regulations deal with climate change currently?
2. Organic agroforestry systems in Europe - a tool to make Organic Farming more climate-smart and circular?
3. How can organic agriculture (and agroecology) contribute to solving the climate crisis in a healthy world?
4. Enhancing resilience in Mediterranean perennial agroecosystems under organic management
5. Crop rotation and use of early warning system (EWS) in climate-smart organic agriculture
6. Scaling up, out, and deep: involving citizens in more agroecological food systems
7. Balancing multifunctionality with climate-focused performance in organic agriculture
8. Enhanced diversity of local production systems through participatory approaches is key for climate-resilient organic farming
9. Increasing energy efficiency in Organic Agriculture to offset climate change
10. Is it possible to construct a sustainable agrifood system as a resilience strategy to climate change?
11. The need for the reduction of emissions and the limits of carbon farming in EU CAP: a holistic perspective
12. Translating organic agriculture through the food system into human diets – vegan, vegetarian, and omnivore contributions to GHG emissions
13. Sustainability and resilience of Organic and non-organic farming systems: a holistic assessment framework
14. Climate friendly organic livestock farming by tribal communities in India: The way forward
15. Towards novel slow release biofertilizers as a resilient strategy to increasing fertilizer cost in organic vegetable production in arid regions

Summary of the Workshop (update with Sabine final)

- A wide range of concepts, organic solutions, and challenges in relation to climate change mitigation and adaption within organic were discussed
- Specific practices can be identified where environmental performance of organic agriculture can be improved; these could be systematically and strategically addressed
- There are different perspectives and needs in the global North and in the global South; new initiatives must be adapted to the local conditions
- Different practices in organic food systems exist that mitigate GHGs and help with climate change adaptation and are yet to be considered in the true value & cost accounting for their ecosystemic role (Organic 3.0)
- Growth of organic agriculture with a climate change focus must consider the social dimension of organic;
- upscaling organic can result in lower environmental performance
- Participatory approaches to research and sector development are critical for organic agriculture to remain socially and environmentally responsible
- Organic agriculture cannot make climate mitigation/adaptation/resiliency the singular focus; organic must be considered as a multifunctional system with services often (but no always) supporting each other
- Complex farming systems can be a solution to climate issues, but can also create challenges with management and market access; producers end up dealing with these challenges
- Different aspects like the use of fossil fuels, energy consumption, and energy efficiency are not covered in the current organic guidelines leading to the fact that little attention is given to them at the moment
- Organic livestock production can be inefficient, especially in small-holder and developing countries where livestock efficiency/productivity would reduce environmental performance (ex. methane produced per kg of meat or milk).
- But still more strategies on a FOOD SYSTEM level must be explored to improve the current situation

Conclusions and recommendations

- We need to integrate topics like energy use and saving practices, carbon capturing etc. in the further development of organic food systems but they should not be explicitly included in the standards, these aspects should be included on a conceptual level when developing farms and enterprises (e.g. development of scenarios on how energy could be saved throughout the value chain) to increase awareness and transformation
- We need to increase the South-North dialogue within the organic movement and identify best practices to tackle the global climate challenges
- We need to address the climate challenges on a food system level to increase diversity within the system starting at the farm level and going up to the consumption habits to strengthen climate resilience
- We need farmers' and civil society participation as well as other actors of the value chain to reduce the reaction time toward the global climate challenges
- Crop livestock mixed systems and reduced animal intensities based on grazing can help in mitigating adverse climate impacts due to circulatory agriculture

As documented above, two insights are specifically important:

"*The organic sector needs to move forward and diversify to meet the challenge of climate change adaptation"*

and

"Organically managed systems emphasize soil and plant health and increase resilience to the impacts of climate change by offering alternatives to an external input-reliant farming system"

This shows the importance of phasing-out contentious inputs in a wider context, not only to reduce the pollution caused by a specific contentious inputs (e.g. pesticide residues in conventional straw used as bedding material, conventional manure, fertilisers made from conventional plant residues, antibiotics, mineral oils and copper residues in the soil), but also for climate change mitigation.

Therefore, there is a further rational to reduce external inputs and to focus even more on regenerating soil health and maintain and increase the carbon storage in organic farmed land worldwide. A vision paper relating to contentious inputs and agroecology discussing further phase-outs and phase-ins is available in Appendix C (Schmutz, 2022). This builds on previous work on agroecology, agroforestry and climate change (Wibbelmann et al. 2013, Wezel et al. 2014, Altieri et al. 2015, Hernández-Morcillo et al. 2018, Aguilera et al., 2020) contributing to the work of the EU's partnership on agroecology living labs and research infrastructures (European Commission, 2022).

What was also clear from the summary of the workshop is that there are different perspectives and needs in the 'Global South' and 'Global North' and solutions.

Different practices in organic food systems exist that mitigate GHGs and help with climate change adaptation, but they are yet to be considered in the true value & cost accounting for their ecosystem value (Organic 3.0, Rahmann et al. 2017).

As Organic-PLUS found, the growth of organic agriculture with a climate change focus must consider the social dimension of organic, including consumers and farmer welfare.

A further insight is that, although climate mitigation/adaptation/resiliency are of utmost importance, organic agriculture cannot make climate the singular focus, as it is a multifunctional system with services supporting each other.

However, needed are more strategies on a food system level to increase diversity and transform consumption habits, energy use, market power and increase farmers' and civil society's participation. This is to reduce the currently too slow reaction time towards the global climate challenges.

All strategies for mitigation and adaption need to be localised and contextualised including indigenous knowledge and culture, small-scale farmers and other marginalised actors in the food system.

6 Conclusions for policy

As part of the 18-month and 36-month reviews, the project executive board held already two confidential policy meetings with our sister project RELACS and senior policy officers in Brussels. Internal recommendations were made. Here we also include feedback from the Organic-PLUS dissemination and discussion events at the **Organic World Congress in Rennes**, France August 2021, **TP Organic Innovation conference in Brussels** (online) November 2021, **Organic World Fair at Biofach, Nuremberg**, Germany in July 2022 and **IFOAM/ISOFAR 50 year celebration at Goesan,** South-Korea October 2022 (referenced already before).

Key policy messages for the various contentious inputs are summarised here and in the paper attached in Annex C (Schmutz, 2022):

6.1 Copper and Sulphur (for plant protection)

- Minimising Copper further is feasible.
- For vegetable crops outdoor and in greenhouses a significant reduction of around 90% can be achieved.
- For grapes and perennial crops a significant reduction (50% or more) can be achieved.
- Potato production with zero copper is feasible in northern European countries.
- Phasing out sulphur is feasible.
- Use as fertiliser should depend on soil analysis a proven need (deficiency)

6.2 Mineral oils

- Phasing out Mineral oils as pesticides is feasible.
- They can be phased out by input substitution with plant oils now, alternatives are feasible, at no or minimal extra costs.

6.3 Plastic mulch

- Phasing out the fossil-fuel derived plastic foil/mulch for weed control is feasible.
- They can be phased out by input substitution (bio-based bio-degradable alternative) and further system re-design (using other mulch like straw, paper bio-based).
- Innovation action type research is needed to develop and continuously improve alternatives.

6.4 Antibiotics and anthelmintics

- Organic is a certified system that already explicitly **limits farm antibiotic use** (e.g. extended withdrawal periods, and no repeated treatment) and requires farmers to use other methods to prevent and treat diseases.
- However, a complete phase out of antibiotics is currently not feasible.
- The rise of vegan (plant based “milk”-alternatives, like products based on oats, coconut, almonds etc.) which are antibiotic free, but not necessarily organic, could push organic milk further towards antibiotic free.
- Antibiotic free milk production has been shown feasible with the appropriate breeds and systems in certain conditions. The demand is increasing and exports to the US which requires antibiotic free organic milk (USDA-NOP certification) are expanding especially in the United Kingdom. In the UK, because of these exports 100% antibiotic free products called ‘PWAB ‘(Produced Without Anti-Biotics) is becoming more familiar for organic farmers, and this triggers local demand for this type of milk production, too. This shift towards milk produced without antibiotic is ongoing and it is currently market driven, with a premium price for the milk produced.
- In organic pig production, a zero or very low input of antibiotics is feasible. The same is the case for anthelmintics. Zinc is different and all this need further research.
- Re-designing animal rearing systems to prioritise animal welfare further and include beneficial plants/agroforestry in the free-range areas could result in no antibiotic use, all this requires further research.

6.5 Conventional manure and conventional straw

- Removing conventional manure and only allowing manure from certified organic sources is feasible.
- Removing conventional straw and only allowing bedding material from certified organic or untreated source (wood and agroforestry products) is feasible.
- Both would promote more converting more organic farm land, mixed farming and agroforestry.

6.6 Further innovation and research needs

- Further, ideally 7 years long, Horizon Europe **Innovation Action (IA)** type research is needed to develop and continuously improve alternatives. Alternatives like organic straw are available, however not in sufficient quantality and mixed farming is not a legal requirement in organic (e.g. for free-range pig and poultry farms it is only in private certification bodies like Bioland and Demeter), therefore they have no straw as feed is sourced off-farm.

- Agroforestry is also not yet legally required, although many organic farms have adopted this and included further measures from agroecology. Organic certification plus agroecology re-design at the food and farming transition of the 'Gliessman levels' 3, 4 and 5 can raise the bar further for organic innovations (Gliessman, 2015).
- System re-design will reduce the need of any contentious inputs even further and fully phase-out all contentious input in a 0-30 year range (depending on the contentious input type).

6.7 Thank you

A **Big Thank You** – to all for such and enjoyable and, hopefully, very impact-full project – Organic-PLUS team and summer BIOFACH in Nuremberg, Germany, July 2022.

7 References

Aguilera, E., Díaz-Gaona, C., García-Laureano, R., Reyes-Palomo, C., Guzmán, G. I., Ortolani, L., Rodríguez- Estévez, V. (2020). Agroecology for adaptation to climate change and resource depletion in the Mediterranean region. A review. Agricultural Systems, 181 (August 2019), 102809. https://doi.org/10.1016/j.agsy.2020.102809

Altieri M.A, Nicholls C., Henao A., Lana M. (2015). Agroecology and the design of climate change-resilient farming system. Review article. Agron. Sustain. Dev. 35:869–890 DOI 10.1007/s13593-015-0285-2

European Commission (2022) A partnership on agroecology living labs and research infrastructures. https://ec.europa.eu/info/research-and-innovation/research-area/agriculture-and-forestry/ecological-approaches-and-organic-farming/partnership-agroecology_en

Hernández-Morcillo, M., Burgess, P., Mirck, J., Pantera, A., & Plieninger, T. (2018). Scanning agroforestry-based solutions for climate change mitigation and adaptation in Europe. Environmental Science and Policy, 80 (November 2017), 44–52. https://doi.org/10.1016/j.envsci.2017.11.013

Gliessman, S. R., (2015) Agroecology: The Ecology of Sustainable Food Systems. 3rd edition. ed. by Engles, E. W., Boca Raton: CRC Press

Rahmann, G., Reza Ardakani, M., Bàrberi, P. et al. (2017) Organic Agriculture 3.0 is innovation with research. Springer Organic Agriculture 7, 169–197 https://doi.org/10.1007/s13165-016-0171-5

Schmutz, U. (2022) How can organic agriculture & agroecology contribute solving the climate crisis in a healthy world? 181-185. Proceedings ISOFAR international scientific workshops at the 2nd International Organic Expo in Goesan, South Korea. www.isofar.org/Events/2022-ISOFAR-workshops-for-2nd-Organic-Expo-in-Korea-in-Sep-2022

Wezel A., Casagrande M., Celette F., Vian J.-F., Ferrer A., Peigné J., 2014. Agroecological practices for sustainable agriculture. A review. Agron. Sustain. Dev. 34:1–2 DOI 10.1007/s13593-013-0180-7

Wibbelmann, M., Schmutz, U., Wright, J., Udall, D., Rayns, F., Kneafsey, M., Trenchard, L., Bennett, J., & Lennartsson Turner, M. (2013). *Mainstreaming Agroecology: Implications for Global Food and Farming Systems*. Centre for Agroecology and Food Security, Coventry University. www.fao.org/agroecology/database/detail/en/c/455332/

8 Appendix A - project results presented to advisory boards to feed into their discussion

8.1 WP1 – LEAD Key scientific findings

This workpackage has limited research activities, however there are 11 important new insights and learnings from the last 4 years:

1. Although severely disrupted by COVID-19, the project was resilient and risks could be managed. With the extension granted, trials will be finished in 2022 and all work that was initially planned, is on track to be delivered. There have also been additional, unplanned activities and cooperation.
2. The project, although designed in 2017 before the EU Green Deal with the 25% organic land use target and Glasgow's 2021 COP26, has fed into the wider political aim of increasing organic, whilst also improving it = Organic +: phasing out fossil-fuel dependency, zero pollution and antibiotic free livestock husbandry.
3. Phase-outs, e.g. peat, work only to a certain degree when voluntary. They set the scene, involve early adopters and generate innovation within early adopters. However, at a certain point, legally binding regulation (the ban of certain contentious inputs) is needed to drive this further. Any ban should be forward-looking, with enough time for the industry to adopt, make early innovations more mainstream and reduce costs. However, if the contentious input is not eventually banned the "alternative industry" and the investments made do not pay off. Regulatory certainty looking ahead 5 to 10 years is needed.
4. The contentious inputs researched have different phase-out trajectories. Some can be phased out immediately: conventional straw, conventional manure and mineral oils as plant protection products.
5. Some phase-outs require not only input substitution (e.g. conventional straw replaced by organic straw or agroforestry/woody material) they require system re-design.
6. System re-design is needed in intensive organic orchards, intensive organic dairy and pig systems, intensive crop rotations with potatoes and also in intensive organic greenhouses.
7. Vegan organic is a potential example of a system re-design, changing the role livestock and livestock inputs had traditionally in organic farming. System re-design may however create its own problems and more research with longer timeframes (also necessary for including more agroforestry) is needed to make re-design a 'multi-functional' success within organic production.
8. More knowledge per ha is needed. This could be innovative farmers, peer-to-peer learning, DSS (Decision Support Systems), satellite data etc. to manage more complex re-designed systems in an equally professional way. This could work on any scale but is most likely better on a smaller scale.

9. Several members of the consortium have collaborated to apply for new funding and have been successful in securing smaller follow-on projects. E.g. FOODIVERS a 1 million Susfood Core Organic project. The O+ network (including RELACS) has very much helped participants work together on further project ideas.
10. Working together with the sister project RELACS and several other EU projects as been hugely beneficial to co-develop new knowledge together.
11. Further research is needed and this could be in the form of novel Innovation Actions (longer timescales than the present 4 years, with the option of adding new partners every year (as is possible in EU-COST actions) and with many micro-enterprises as partners (farmers in transition who give 30% in-kind contribution in-kind can be farmer time, farm trial site):

8.2 WP2 – IMPACT

This workpackage focuses on disseminating results from the Organic-PLUS project and ensuring a good dialogue between scientists and a range of stakeholders about contentious inputs in organic agriculture. In addition to dissemination, training and education work, WP2 also undertook novel social-scientific research regarding citizen and farmer views of contentious inputs in organic agriculture. For the purpose of this overview, we focus attention on two original and significant pieces of social scientific research that were conducted in the Organic-PLUS project.
The first consisted of the largest ever representative survey of consumer views of contentious inputs in organic agriculture (15,000 respondents in 7 European countries), the second consisted of more in-depth, qualitative citizen and farmer 'juries', in which groups met over a period of 4-6 weeks to discuss contentious issues in organic agriculture in 3 European countries (the UK, Norway and Italy). Results from the international survey show that consumers believed that it was important to reduce a range of different contentious inputs in organic agriculture

8.2.1 Results from citizen survey across Europe

- Reducing antibiotics, avoiding plastic packaging and avoiding the use of copper were considered to be the most important topics to address on average across the 7 European countries studied.
- Regular consumers of organic food rated all contentious inputs as more important than non-regular consumers of organic food.
- Results also showed a high level of consumer uncertainty about contentious inputs, especially regarding issues of peat reduction and vegan organic, indicating that broader public engagement and dialogue is needed in relation to these issues.
- Regular consumers of organic food emphasised the importance of phasing out contentious inputs, they want stricter regulations and are more willing to pay for organic products that are produced without the use of contentious inputs.

8.2.2 Results from the citizen and farmer juries

- Gaining knowledge about contentious inputs tended to assert the importance of addressing these issues in both organic and conventional agriculture. This could indicate that, if done in a careful and considered way, opening-up some of the contentious details of organic farming to broader public scrutiny could, in the long term, increase the credibility of organic assurance and promote broader sustainable purchasing behaviours.
- Instead of introducing new organic labels to address contentious inputs (e.g. Organic-PLUS or copper-free organic), there was support for improving the standards of existing organic labels.
- Improving and expanding organic agriculture entails focusing on the sustainability of the whole system beyond the substitution of particular inputs at the farm level. When asked what they thought the problems were around organic agriculture, the participants were focused much more on the whole
- picture of production rather than on isolated on-farm inputs. For example, participants were concerned about the well-being of organic farmers, the use of plastics in food packaging and the importance of shortening food chains.
- Participants expressed a deep-seated wish to improve the economics of organic food. Participants in the UK stressed the importance of improving the affordability of organic food for consumers and participants from all three countries were united on their concern about the economic precarity of sustainable producers (particularly small-scale) and that any improvements in organic standards which make compliance harder for farmers must also be coupled with measures to increase their financial stability.
- Improving awareness among consumers was a substantial focus of discussion in all the groups, with participants from every country independently advocating that greater attention should be given to sustainable agriculture as part of formal education.
- During the sessions a range of additional contentious issues in organic farming were raised. In the UK these included: damaging cultivation techniques, animal welfare and a lack of consideration of GHG emissions. In Italy they included: having inadequate measures to fight against invasive species, a lack of trust in the certification system (especially with regards to the authenticity of imported organic foods) and perceptions that on-farm inspections are often inadequate. In Norway they included: concerns about the rigidity of organic certification and concerns about the yields of organic farms and whether they could provide enough food to feed a growing global population.

8.2.3 Future research needs

- Additional social-science research is needed to expand the survey research into other European countries (such as Denmark) and to countries outside of Europe. This will enable us to have a better understanding of the perception and relative importance of contentious inputs across a broader geographical area.
- Additional, in-depth qualitative research is also needed with a range of stakeholders, members of the public and especially farmers, to gain further insights into contentious inputs and the barriers to adopting alternatives.

8.2.4 Recommendations for stakeholders

- Organic certification bodies should be open and transparent about the contentious issues that they face and the measures they are taking to continually raise standards. This will help to improve public debate more generally about sustainable agriculture. This information sharing will have to be conducted in a careful and considered manner, placing contentious inputs in organic agriculture in the broader context of the state of agriculture more generally.
- Efforts to improve standards in organic agriculture should go beyond the farm to consider the importance of the whole organic food supply chain and to address issues such as local and seasonal food provisioning, sustainable packaging and farmer well-being.
- Policy makers should further recognise organic farming as a key route to sustainability and adopt appropriate measures to promote and financially subsidise organic farming, particularly in the UK.

8.3 WP3 – PLANT

Copper (also mineral oil and sulphur):

8.3.1 Key scientific findings

Three main advances:

- A comprehensive mapping of Cu use in organic horticulture in Europe (Katsoulas et al., 2020)
- New **designs for protection systems in potato, olive, tomato and citrus** > under assessment in the field
- New tools and options: **DSS for potato** and **DSS greenhouse crops** (Katsoulas et al., 2021), alternative products (Aiello et al., 2019, Restuccia et al., 2020), assessment methods

8.3.2 Future research needs

- Experimental assessments of the medium/long term performances of the newly designed prototype systems
- Acceptance measures by all key actors: industry adjustments, economic models to foster adoption, regulatory measures

8.3.3 Recommendations for stakeholders

- Demonstration networks
- To strengthen communication between all parties

8.4 WP4 – LIVESTOCK

8.4.1 Key scientific findings

Oregano EO as it presents the best antimicrobial effect is a good candidate, followed by Thymus oil and Tea tree. Cinnamic aldehyde showed the best results for S. aureus, and carvacrol, cinnamic aldehyde, and thymol were the best ones for the other bacteria. In addition to test the MIC of essential oils (EO) and natural identical compounds (NIC), it would be necessary to test the cytotoxicity to adjust the adequate dose to be administered.

Alternatives to conventional straw bedding from woody materials including processing residues and agroforestry products. Using existing technology, the properties of bedding pellets can be improved if processed from lignocellulosic material in a twin-screw extruder and pelletising plant at exact settings.

The **anthelmintic properties** of three different plant extracts (Malva sylvestris, Chamomilla recutita and Althaea officinalis) were assessed through in-vitro evaluation. We used Haemonchus contortus since it is one of the best-known nematodes affecting grazing livestock and therefore can represent a good model for similar parasites (like the cattle nematode Ostertagia ostertagi).

Scutellaria baicallensis contains bioactive compounds with anti-inflammatory and antioxidant properties. The supplementation with 20g SB/animal per day during 4 months in Charolaise did not impair feed intake or digestibility. It did not have a detrimental or a beneficial impact on growth performance. It did not modify plasmatic Vit E or impact on the metabolic profile.

Herbs containing bioactive compounds in Holstein-Frisian dairy cows. They received 3 boluses between calving and 30 DIM. Plasmatic samples taken at T30 and fertility traits also recorded. The treatment did not impact milk production and composition, nor the plasmatic parameters or fertility traits when cows presented a low or high SCC in the precedent lactation.

The use of **bark extract** or green tea + grape extract as a substitute for Vit E in Ross 308 line broilers. We reached a successful substitution of Vit E by plant extract. We obtained a similar feed conversion of bark extract than Vit E. Green tea and grape extract has the best protective effect on the kidneys, and bark extract on the liver. Preliminary results show that there is potential for other advantages for the animals besides the primary function of bedding, but more work is now required to determine the most suitable sources. Different settings of the extruder combined with properties of the raw material have an influence on the fibre and pellets that are produced. This means there is a large number of tests required to adjust the twin-screw extruder and ring-die-press to specific settings.

The use of **water extracted bark from Norway spruce (*Picea abies*)** against Eimeria spp. in young lambs. Our results showed that the bark extract affected the development of ovine *Eimeria* spp. in the intestines of the lambs. We found that infected lambs treated with bark extract had a lower oocyst count per gram of faeces compared to the untreated control animals. Moreover, we found that animals treated with bark extract had a higher faecal consistency score (softer faeces) than the untreated infected control group during the

treatment period (day 0-11), but that the treated lambs had firmer faeces than the untreated control animals after discontinuation of treatment (day 11-22).

The use of **p-phenol and seaweed (*Saccharina latissimi, Ulva lactuca* and *Ascophyllum nodosum*)** as a substitute for medicinal zinc to avoid diarrhoea in pigs. During testing, it became obvious that it is difficult to perform diagnostics in outdoor conditions because the diarrhoea faeces disappear very easily. Likewise, seaweed showed only a tendency to decrease post-weaning diarrhoea. As demonstrated in the studies conducted, infection pressure is high and varies very much when in the farrowing outdoor pen. Even if the infection is not directly related to diarrhoea (e.g. in the case of lung disease), it can cause poor health, which in turn may be partly responsible for the diarrhoea. A 7-week-old piglet must have a generally high level of health in order to manage the weaning period. In many cases, the piglets looked very fit before weaning but they quickly developed serious health problems. The high number of potential infection agents means that it is not realistic to expect one specific additive to be the solution to all problems.

The use of *Artemisia absinthium* in weaned piglets to prevent intestinal worms such as Ascaris suum and Oesophagostomum dentatum infestation which are common in organic pig production. The result does not allow us to highlight the synthetic anthelmintic over the Artemisia absinthium. On the other hand, the result may give rise to considerations regarding the need for deworming, unless the infection pressure is significantly higher. Among other things, there is a lack of knowledge of what is an acceptable infection pressure, whether the number of worm eggs is the best indicator of a strain and what measures the farmer can take to reduce the infection pressure when it comes to outdoor herds. Differences in growth figures, repetitions in between, cannot be immediately linked to the treatments. Experiences from herds that offer new pens for each farrowing confirm that it provides better health/robustness and better productivity.

To **discriminate Organic vs Conventional bulk milk**. Samples (n = 225) from 24 farms (organic = 12; conventional = 12) located in the same area, mainly rearing Holstein-Friesian cows under similar management conditions, except for organic livestock spending a period of time on pasture, were collected from September 2019 to August 2020. Organic milk had lower protein and casein content, although these differences were not observed for any of the individual amino acids, lower C16:1n9 content, which was not reflected in the total fat content, lower S content, which has not impact on ash content, and greater somatic cells than conventional milk. Moreover, the PCA was not able to discriminate Midinfrared (MIR; 5,000-900 cm-1) and vis/near-infrared (Vis/NIR, 400-2,500 nm) spectra from both groups. The PLS-DA revealed an accuracy of the model in the test set of 54.1% and 62.9%, for MIR and Vis/NIR, respectively. The lack of differences between **Organic** and **Conventional** milk could be related to the similarity of the selected farms in both categories and that organic systems are still very similar to conventional, especially regarding the reduced availability of free-range grazing land in lowland Italy.

8.4.2 Future research needs

- Regarding antiparasitics, we need in vivo validation studies on sheep and potentially in cattle, in order to translate these extracts into new products available to the farmers. Until

that, under an animal welfare perspective it is not acceptable to use products that are not efficacious and that therefore cannot fully protect animal health in field conditions.

- It will be interesting to test different doses of *Scutellaria baicalensis*, and to evaluate the effect on the animals' products.
- It will be interesting to test different doses of herbs and evaluate cows with high levels of SCC, fertility problems or under stress conditions in the current lactation.
- Evaluate the effect of the rumen microbiota on the degradation of plant feed additives.
- Evaluate the effect of the extracts on the meat products.
- Although Bark extract from *Picea abies* may be a potential useful anticoccidium in young lambs we need more research to see if this effect is due to CT or other biological components in the bark and to see if the effect is permanent and how this influences the performance of the lambs at a longer time frame. If this is to be transferred into practical use for the farmers, we need to find a simple and secure method for application and a practically, technically, and economically viable method for extract production.

8.4.3 Recommendations for stakeholders

- Management practices are really important to keep animals healthy in organic production.
- There are still few approved herbal products against livestock diseases
- Results have to be carefully interpreted to see the efficacy of the products

8.5 WP5 – SOIL

8.5.1 Peat in growing media

Completely mature compost may function well for seed germination and growth of seedlings. Such compost may be produced using locally available, selected materials. MFAL and IRTA have worked with chopped pruning material from olive trees, leaves, grass clippings, horse manure, sheep manure, separated cattle slurry and chopped forest biomass. The effects of applying beneficial organisms were tested (MFAL) and deserve further study. It remains unclear how (by which characteristics) a satisfactory compost quality for growing of perennials (e.g., olive saplings, medicinal plants) can be measured efficiently, and this should be researched. For raising of vegetable transplants, poor growth may be a challenge because of low N availability of compost.

Woody material and other plant residues may be treated mechanically (ATB) or biologically (CU) to replace peat in growing media; mechanical treatment may reduce the time required for decomposition/composting under farm conditions (IRTA). In the UK, composted chipped wood has been used for several years as an alternative to peat in both commercially available and on-farm produced growing media. CU have been working with an industry partner, a UK grower who raises all vegetable transplants on farm using composted wood but also significant proportion of vermiculite – trials are ongoing to reduce or replace the vermiculite.

Appropriate application of organic fertilisers during production of plants in growing media is a challenge especially for vegetables. For perennials, the growing media may well be completely peat-free (MFAL, EAM), whereas for germination and early growth of vegetables,

growing media may be significantly peat-reduced (EAM). Appropriate fertilisation with organic fertilisers of various peat-free and peat-reduced growing media requires further study.

Growing media rich in nutrients e.g., composts from animal manure, may lead to leaching of excess nutrients especially N and K but also P (IRTA). This calls for research to optimise water and nutrient management, but also for studies to gain deeper insight into microbiological activity in growing media and the effects of such activity on plant growth.

8.5.2 Plastic for soil cover

Completely biodegradable non-fossil derived mulching foils may be produced from lactic acid polymers produced from potato starch (CUT; 2 patents filed). In northern Europe, the foils need to be a dark colour to avoid weed growth underneath. In southern Europe, the foils may well be white to avoid too high soil temperature. Degradation is highly dependent on local growing conditions; in southern Europe foils degraded too quickly, but thickness is not the only factor affecting decomposition rate, so further studies are required. In spite of rapid decomposition of the foil, it significantly reduced weed growth in field vegetables under Mediterranean climate conditions.

The biodegradable biopolymer may be mixed with other organic materials such as extruded wood fibre or biochar to reduce consumption of polymer, in products such as horticultural accessories such as tomato plant supports, clips and pots.

This research topic is a good example of technology and agronomy coming together and further research can proceed in many directions; non-degradable plastic products pose a significant problem in horticulture and agriculture.

8.5.3 Fertilisers derived from conventional livestock farming

NB, animal-derived products from organically managed animals are not widely seen as contentious.

Several materials have been tested for nutrient availability in field experiments (SEGES, CU, UoH, NORSØK), searching for locally available materials in line with the principles of organic farming (organic materials, self-sufficiency in nutrients; recycling resources; low environmental impact). The tested materials were categorised in three groups:

- URBAN fertilisers (anaerobically digested household waste; struvite)
- VEGAN (legume materials and grass materials (solid, liquid, composted); plant extracts e.g., comfrey, nettle)
- RESIDUAL (fish pond sediments; cuttings from pruned trees; marine-derived fertilisers e.g. seaweed, fishbones, tofu whey)

The materials were compared with contentious controls: Farmyard manure, poultry manure, horn grit. Overall, most of the materials tested gave yields comparable with control treatments when equal amounts of N were applied. However, the N availability is highly

variable, hence a fine tuning of application rates and amounts is still needed to match crop demand and deserves further study.

Some materials are (regionally) available in significant amounts, but infrastructure and regulations hamper utilisation. New fertilisers will most likely be more costly compared with currently applied alternatives (but fertiliser prices are changing).

We must be aware of nutrient imbalances; alternative fertilisers as well as the current contentious inputs are multi-element fertilisers with a nutrient composition that differs from that of harvested products; this may result in nutrient imbalances. Hence, soil testing is required and new fertilisation strategies with combinations of different fertilisers, or combinations of materials into complete fertilisers, needs to be developed. We should also be aware of potentially toxic elements and pollution (microplastic). The development of value chains for new fertilisers will become much more challenging if/when industries start to compete for materials.

Further research should combine «top-down» approaches such as nutrient budgets for various productions (RELACS) and «bottom-up» approaches such as innovative fertilisers (O+). In RELACS, studies showed that many (arable) organic farms need inputs of P and K, whereas some (horticultural) farms require N fertilisers with low P. In O+, we have seen that several materials can substitute the current contentious fertiliser inputs. When the number of farmed animals is reduced to decrease consumption of meat, efforts to recycle more nutrients from fork to field (e.g. by anaerobic digestion of food waste) will create new links between consumers and farmers, but this new situation also faces multiple administrative and societal challenges. Organic agriculture needs up to date and dynamic regulations to support the recycling of nutrients while maintaining high food quality standards.

8.6 WP6 – MODEL

WP6 employs a number of assessment methods at different levels, namely feasibility (Task 6.2) and sustainability (Task 6.4) at the farm level, whereas environmental impact (Task 6.3) will be assessed by using life cycle assessment (LCA) at product level. This has involved 1) evaluating the feasibility and operational management options for different pathways and methods of using alternative external inputs (for targeted aspects of horticulture, plant and animal production); 2) conducting an environmental assessment and a sustainability assessment for representative farming systems to test and validate the proposed methodologies in comparison with traditional systems and methods.

8.6.1 Feasibility studies

This has involved finding and describing the factors that effects the production in terms of operational feasibility, usability, practicability, etc. compared to the standard methods when a contentious input is phased out or reduced to very low input. The studies are based on information gathered from case farms. So far, 8 case farms have been involved. Recommendation regarding feasibility and key findings are outlined below:

8.6.1.1 Fossil fuel derived Plastic foil

Phasing out the fossil-fuel derived plastic foil for weed control (plastic mulch) is feasible when alternative products as non-fossil bioplastic and paper mulching are used. However, the alternative foils are more expensive. On the other hand, the alternative foils are degradable and do not need to be collected and disposed of after use, thereby reducing workload.

8.6.1.2 Copper

In vegetable production, phasing out copper 100% is difficult, but a significant reduction of around 90% can be achieved using a combination of management measures, selection of healthy varieties and use of potassium bicarbonate as alternative fungicide.

In grapes for wine, significant reduction (50% or more) can be achieved. Fungus resistant varieties are available and advanced spray technique can improve efficiency and avoid losses to the environment.

Potato production with zero copper is feasible in northern European countries. Blight can be a challenge and some years results in reduced yields. With optimal strategy and good management, reasonable outcomes can be achieved. Extra labour, decision support systems and machine inputs may be required but standard machinery and techniques can be used.

8.6.1.3 Sulphur (apple production)

Phasing out sulphur is feasible but may result in increased occurrence of apple scab. However, there are alternative organic approved fungicides on the market. No significant increase in machine and energy input are seen. In general, labour inputs on studied farms were high because much work was done by hand. Yield and sales prices were as for common organic apples although no spraying with S and Cu was used.

8.6.1.4 Antibiotics and anthelminthics

A complete phasing out antibiotic is not feasible in most countries due to animal welfare legislation; a sick animal must be treated. However, the studies have shown that pig production with very low input of antibiotics and anthelminthic are feasible, as the production output can be in line with standard production outputs. Key factors are late weaning of piglets, quality feed and management. No significant change in machinery, energy and labour input were reported.

8.6.1.5 Conventional manure

Removing conventional manure and only allowing manure from certified organic sources is feasible. However, the feasibility for phasing out conventional manure in organic plant production strongly depends on the availability of alternative fertilisers. Digitates from e.g. biogas production, green waste compost and other organic bio fertilisers are used. The phasing out will require a crop rotation with legumes and increased use of green manure. If alternative organic fertiliser are available, yields can be maintained. Change in crop rotation and use of green manure may increase labour and machine input.

8.6.2 Future research needs

Elaborations have shown that it was necessary to change the original plan for conducting the feasibility studies. Initially, the intention was to conduct the studies based on documented reference data for the various organic production systems compared to current data from selected case-farms where the proposed solutions without contentious input is implemented. However, there have been unexpected problems in finding sufficient and relevant reference data. Furthermore, it has proven difficult to identify suitable case farms to be included in the feasibility studies for both before and after changes to the contentious inputs. The conclusion was to look at different cases and register/evaluate the changes both in a quantitative way (if possible) and also in a more qualitative way. In this way, we will have a description of a before and after situation for case farm and a specific contentious input and alternative. Following this qualitative description, the feasibility is modelled based on the basic data collected for the case farms.

Future research would entail a more comprehensive acquisition of reference data before and after contentious input changes with all else being held constant. This would require enhanced direct contact to potential case over an extended period of time.

8.6.3 Additional results on Environmental Life Cycle Assessment

Environmental assessment is conducted following a life cycle perspective, specifically using the Life Cycle Assessment (LCA) tools recommended by the European Commission and the United Nations Environmental Programme in the frame of the Environment Footprint and Life Cycle Initiatives. This tool was selected due to its holistic vision, including both the whole production chain concept and multi criteria environmental indicators, as well as its quantitative, scientific approach to estimating environmental impacts. However, being aware of the limitations of LCA tools in its ability to assess the comprehensive sustainability of organic production systems, assessment has been complemented by the Response Inducing Sustainability Evaluation (RISE) tool). In addition, it is the ambition of the Organic-PLUS project to contribute to improving the LCA methodology to make it more suitable for organic production systems.

8.6.3.1 Key Scientific findings

1) From a holistic environmental perspective, it can be stated that there are other environmental hotspot aspects, which may have major importance than those being focussed in the Organic-PLUS project. We would highlight fossil fuel-based energy consumption such as diesel for labour operations, electricity consumption, and transport. Additionally, water consumption, in particular, for dry Mediterranean regions could be an input with negative environmental implications, and hence should be seen as a contentious input. These issues are relevant for organic and conventional agriculture.

2) When alternatives to contentious inputs developed and studied in the Organic-PLUS project were considered, e.g. compost for peat in growing media, degradable plastic from potato starch for covering of soil, these products presented an improvement for some environmental aspects, but showed a worse behaviour for others. From the revealed “hot-spots”, it can be

derived where efforts can be put if the goal is to develop alternatives which score better in LCA.

3) LCA methodology may be useful to assess environmental effects of agricultural production, but requires more development to better grasp the particularities of organic production systems. Hence, additional sustainability assessment tools (e.g., RISE) will be applied to account for other aspects of organic agriculture at the farm-level.

4) The main critical aspects found within the life cycle inventory (LCI) of organic crop and livestock products include the lack of manufacturing datasets for inputs used in organic production systems. There were no available manufacturing datasets for biological control agents (BCAs), plant-derived essential oils (thymol, carvacrol, neem), mineral oil, pyrethrin, Spinosad and copper oxychloride. Several proposals to improve datasets for organic production have been presented (Montemayor et al 2022, under revision).

5) We have contributed to the development of characterisation factors for biodiversity indicators in agricultural production following the work initiated by Knudsen et al (2017). These authors developed characterisation factors (CFs) to include biodiversity impacts for organic and conventional agricultural production, based on standardised sampling of plant species richness in organic and conventional farms across six countries in Europe within the temperate broadleaf and mixed forest biome. However, in the context of Organic-PLUS and for agriculture in Europe, one limitation of this model is that it does not have CFs for the Mediterranean biome, one of the most agriculturally productive areas in Europe. Therefore, we have developed CFs for the Mediterranean biome using the methods described in Knudsen et al. (2017) and secondary plant richness data from organic grape, olive and arable crop farms in Spain, Italy, France and Greece (Montemayor et al., 2022 submitted).

6) Proposals for further research to improve the environmental assessment of organic production systems were made, emphasising that the current dominating impact categories are not well suited to discriminate between various farming practices.

8.6.3.2 Further research needs

1) Implementation of specific organic production datasets through local databases, which can catch the variability of products and production systems.
2) Improvement of emissions factors related to organic residue treatments (i.e. composting, anaerobic digestion, etc)
3) Accounting for biological pest control technologies (all methods of plant protection using natural mechanisms): Organic "natural" compounds, new upcoming application technologies, dissemination and effects of "natural enemies", etc.
4) Implementing new models to deal with the issues of formulation (adjuvants and surfactants, nanoparticles, etc.) and potential metabolites
5) Better adjustment of emissions modelling and characterisation factors for toxicity of inorganic compounds (metals, sulphur, etc.)
6) Enhancing LCA through biodiversity and ecosystem services indicator models to include different agronomic and livestock practices.
7) Development of more precise soil quality indicators.
8) Inclusion of antimicrobial resistance indicator.
9) Extension of assessment to processing, logistics and use phases

8.6.3.3 Recommendations for stakeholders

Comparisons between contentious and alternatives show that alternatives may present a clear improvement for some environmental aspects, but a worse behaviour for others. Whole chain perspective and multicriteria environmental assessment is crucial. In addition to contentious inputs, there are other environmental hotspots, which shall be improved, including infrastructures such as greenhouse, photovoltaic panel, machinery, fossil fuel based energy consumption, diesel for labour operations, electricity consumption, transport, water consumption, in particular, for dry Mediterranean. LCA tools are useful but they need improvements. ORG+ has made suggestions how to advance on them.

8.6.4 Additional results on overall sustainability and RISE assessment tool

This sustainability report is based on the sustainability evaluation of 10 case farms, using the RISE (response inducing sustainability evaluation), designed by School of Agricultural, Forest and Food Sciences, HAFL. The case farms represent a wide range of organic farms in Europe, experimenting with alternatives to contentious inputs.

Results of the case farm reports were discussed with experts, who have been working with the topical WP of Organic-PLUS, WP SOIL, PLANT and LIVESTOCK. Work in progress and results from these WP's have given rise to discussions, which are reflected in this report. Specifically, alternatives for conventional manure, copper and antibiotics were identified.

Regardless of case farm, biodiversity scored in a lower range, but this was not specifically linked to any of the contentious inputs. The lack of nutrients on some of the case farms was more a conscious choice, than supply problem. Farms owned by community shares had less

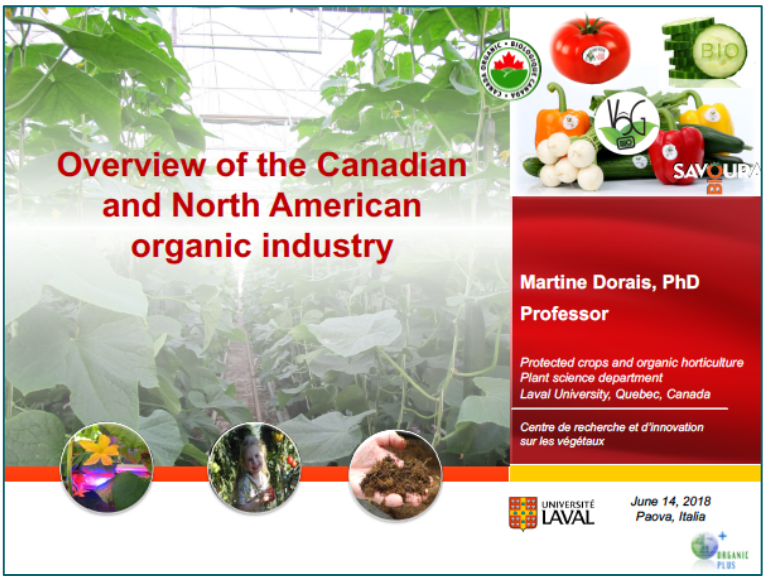
pressure on income, in other cases the premium for selling organic was high enough to compensate for the lower yields. Some farms were in the process of replacement, by using composted biogas digestate.

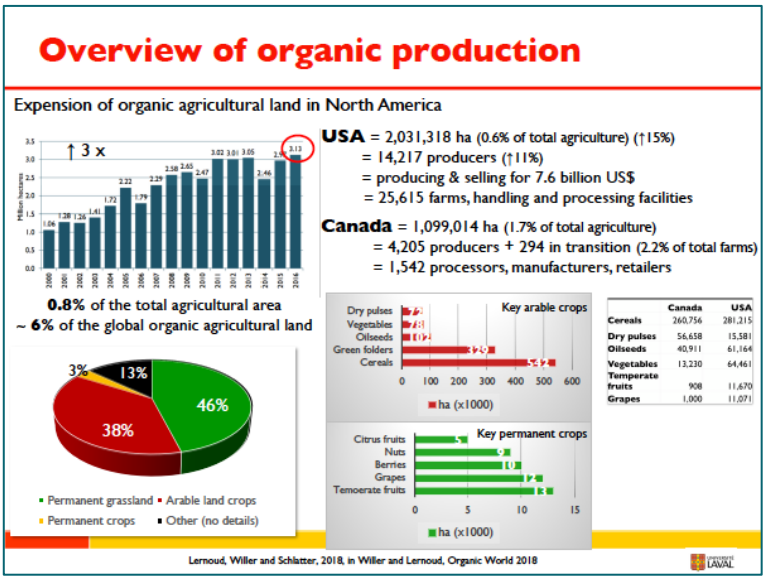
Replacement of copper by substitution with alternative treatments was not found to be the solution. A set of preventive measures was noticed, including more resistant varieties, management, combinations of natural repellents, but also the acceptance of lower yields to guarantee alignment to the organic principles and not create debatable products towards the consumer.

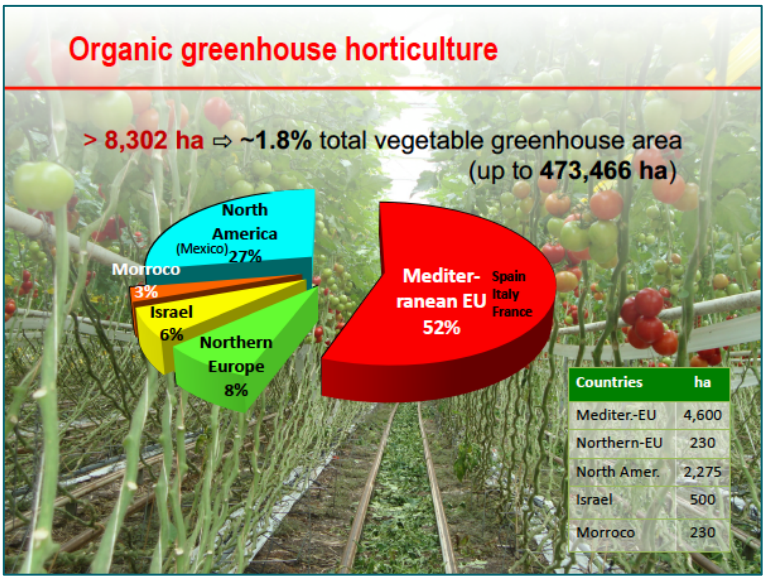
Antibiotic use in organic livestock was identified as being reduced, but not completely gone. Organic livestock farmers increase vaccination, preventive measures and alternative treatments, using the farmer schools for gain and exchange of experiences. Ultimately, avoidance of animal cruelty by treating sick animals, is thought to be more ethical than culling or selling to conventional farms, where animals would potentially live in poorer or even industrial conditions.

9 Appendix B selected PDFs from all five presentations Padova, Italy 2018

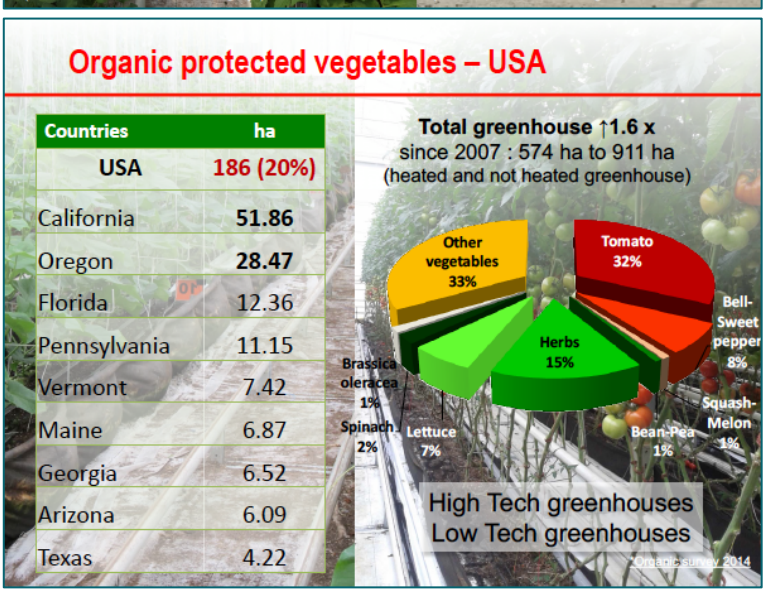
9.1 Professor Dr Martine Dorais, America (Canada)

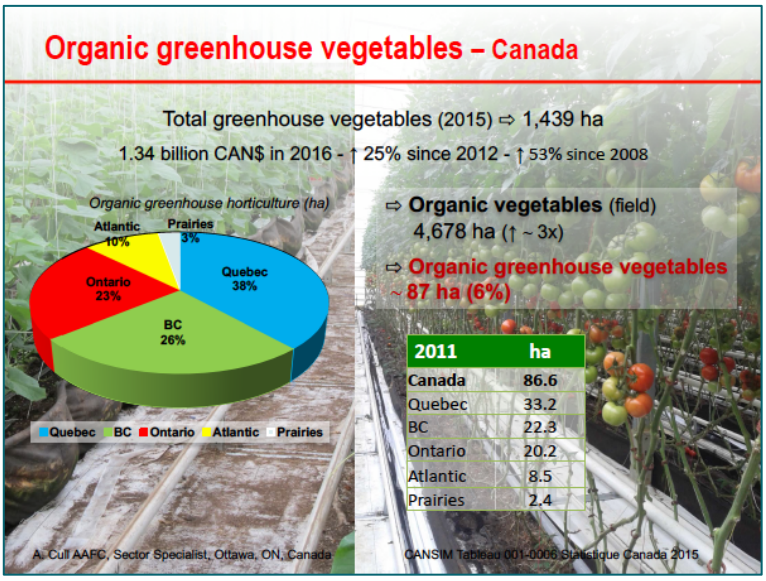


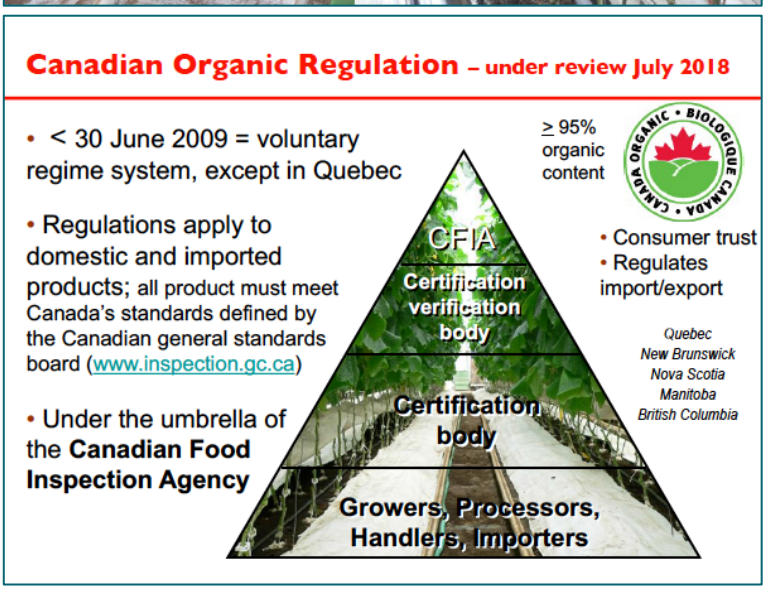


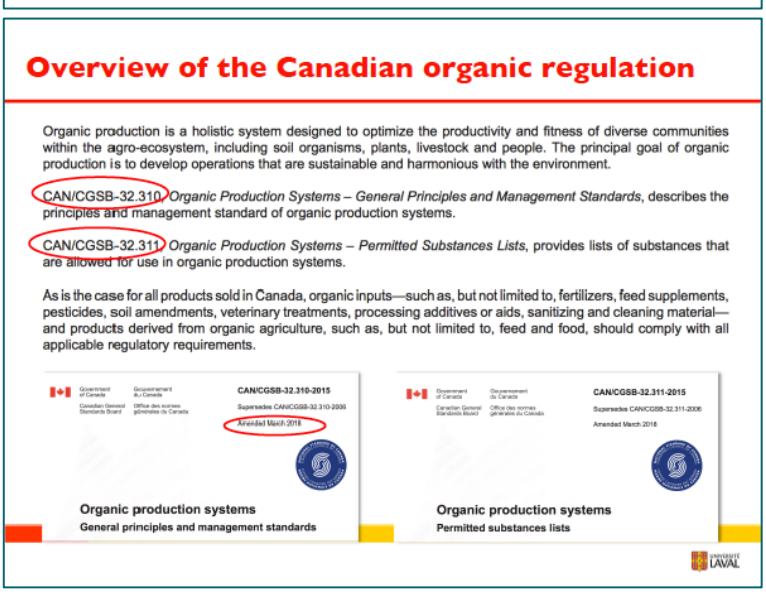

Organic greenhouse horticulture
> 8,302 ha ⇨ ~1.8% total vegetable greenhouse area
(up to 473,466 ha)
North America (Mexico) 27%
Morroco 3%
Israel 6%
Northern Europe 8%
Mediter-ranean EU 52%
Spain
Italy
France
Countries ha
Mediter.-EU 4,600
Northern-EU 230
North Amer. 2,275
Israel 500
Morroco 230


Organic farming – Mexico
Organic vegetables
46 573 ha
⇨ Organic greenhouse vegetables
> 1 875 ha
Low Tech greenhouses
High Tech greenhouses
(Photo: L. Christie 2015; J. Martin, Agrisys)
Conventional
⇨ 3,676 to 4,305 ha greenhouses
⇨ 15,000 ha protected crops (2010)
States-GH conv. ha %
Sinaloa 2 500 28
Baja California 1 220 14
Baja California Sur 1 000 11
Sonora 990 11
Jalisco 900 10
San Luis Potosi 360 4
Puebla 300 3
(Hickman, 2016; USDA Foreign services; Willer and Lemo


Organic protected vegetables – USA
Countries ha
USA 186 (20%)
California 51.86
Oregon 28.47
Florida 12.36
Pennsylvania 11.15
Vermont 7.42
Maine 6.87
Georgia 6.52
Arizona 6.09
Texas 4.22
Total greenhouse ↑1.6 x
since 2007 : 574 ha to 911 ha
(heated and not heated greenhouse)
Other vegetables 33%
Tomato 32%
Herbs 15%
Bell-Sweet pepper 8%
Squash-Melon 4%
Bean-Pea 1%
Lettuce 7%
Spinach 2%
Brassica oleracea 1%
High Tech greenhouses
Low Tech greenhouses


Organic greenhouse vegetables – Canada
Total greenhouse vegetables (2015) ⇨ 1,439 ha
1.34 billion CAN$ in 2016 - ↑ 25% since 2012 - ↑ 53% since 2008
Organic greenhouse horticulture (ha)
Atlantic 10%
Prairies 3%
Quebec 38%
Ontario 23%
BC 26%
Quebec BC Ontario Atlantic Prairies
⇨ Organic vegetables (field) 4,678 ha (↑ ~ 3x)
⇨ Organic greenhouse vegetables ~ 87 ha (6%)
2011 ha
Canada 86.6
Quebec 33.2
BC 22.3
Ontario 20.2
Atlantic 8.5
Prairies 2.4
A. Cull AAFC, Sector Specialist, Ottawa, ON, Canada
CANSIM Tableau 001-0006 Statistique Canada 2015


Canadian Organic Regulation – under review July 2018
• < 30 June 2009 = voluntary regime system, except in Quebec
• Regulations apply to domestic and imported products; all product must meet Canada's standards defined by the Canadian general standards board (www.inspection.gc.ca)
• Under the umbrella of the Canadian Food Inspection Agency
≥ 95% organic content
CANADA ORGANIC • BIOLOGIQUE CANADA
• Consumer trust
• Regulates import/export
CFIA
Certification verification body
Certification body
Growers, Processors, Handlers, Importers
Quebec
New Brunswick
Nova Scotia
Manitoba
British Columbia


Overview of the Canadian organic regulation
Organic production is a holistic system designed to optimize the productivity and fitness of diverse communities within the agro-ecosystem, including soil organisms, plants, livestock and people. The principal goal of organic production is to develop operations that are sustainable and harmonious with the environment.
CAN/CGSB-32.310 Organic Production Systems – General Principles and Management Standards, describes the principles and management standard of organic production systems.
CAN/CGSB-32.311 Organic Production Systems – Permitted Substances Lists, provides lists of substances that are allowed for use in organic production systems.
As is the case for all products sold in Canada, organic inputs—such as, but not limited to, fertilizers, feed supplements, pesticides, soil amendments, veterinary treatments, processing additives or aids, sanitizing and cleaning material—and products derived from organic agriculture, such as, but not limited to, feed and food, should comply with all applicable regulatory requirements.
CAN/CGSB-32.310-2015
Organic production systems
General principles and management standards
CAN/CGSB-32.311-2015
Organic production systems
Permitted substances lists

Overview of the Canadian organic regulation

General principles of organic production Organic Agriculture is based on the :

Principle of health – Organic agriculture should sustain and enhance the health of soil, plants, animals, humans and the planet as one and indivisible.

Principle of ecology – Organic agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.

Principle of fairness – Organic agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities.

Principle of care – Organic agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

Prohibited substances, materials or techniques

- all products of and materials from **genetic engineering**
- all products, materials or processes using **nanotechnology**
- **irradiation** for the treatment of organic products and inputs
- **sewage sludge**
- synthetic crop production aids and materials
- synthetic **growth regulators**
- **cloned livestock** and its descendants
- synthetic **allopathic** veterinary **drugs**
- synthetic **substances** used in organic product preparation
- equipment, storage containers, storage facilities and packaging materials treated with synthetic fungicides, preservatives, fumigants and **pesticide**
- **substances that are not listed** in CAN/CGSB-32.311
- **Soil amendments**, such as fertilizer or composted plant and animal material, that contain a substance not listed

Overview of the Canadian organic regulation

Canada currently has organic equivalency arrangements with :

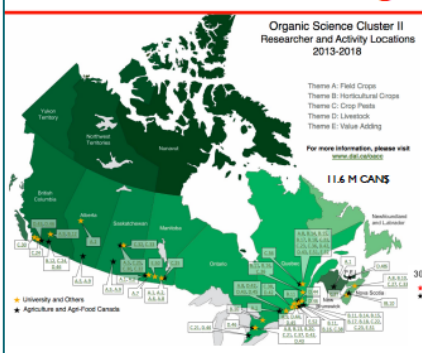
- the United States
- European Union (EU)
- Switzerland
- Costa Rica
- Japan

Discussions regarding equivalency arrangements with *Mexico* and *South Korea* are currently underway.

Ongoing discussions with the United States, Canada's largest trading partner, regarding the North American Free Trade Agreement (**NAFTA**), which affects trade between Canada, Mexico and the United States → *the outcome of these negotiations will be an important issue for the organic industry, alongside all other industries, to ensure that Canada does not lose this significant market.*

USA → Global Organic Supply Chain Integrity Task Force (Organic Trade Association) to develop best practices guide to use in managing and verifying global supply chain integrity to help brands and traders manage and mitigate the risk and occurrence of organic fraud.

Resarch in Canada – Organic Science Clusters



OSCII is supported by over 65 contributing partners on 37 Research Activities. OSCII includes over 170 collaborating researchers at over 36 institutions across Canada.

The first two OSC cycles have funded projects related to animal welfare, innovative processing solutions, sustainable pest management strategies and optimizing productivity.

https://www.dal.ca/faculty/agriculture/oacc/en-home/organic-science-cluster/OSCIII.html

OFC FBC OACC Canada

OSCs aim to increase and support Canada's scientific capacity in organic agriculture, linking scientists with stakeholders and maximizing the impact of organic science through knowledge transfer.

Main contentious inputs - Canada

1 Prevent contamination

5.2.2 *If unintended contact with prohibited substances is possible, distinct buffer zones or other features sufficient to prevent contamination are required:*

d) crops at risk of ***contamination from commercialized GE*** *crops shall be protected from cross-pollination. Mitigation strategies such as but not limited to physical barriers, border rows, strategic testing or delayed planting shall be implemented unless generally accepted isolation distances for the at risk crop type are present.*

NOTE Generally accepted isolation distances for crops at risk of contamination from commercialized GE crop types include: soybeans – 10 m (33 ft), corn – 300 m (984 ft), canola, alfalfa (for seed production) and apples– 3 km (1.8 mi.).

Discussion/debate

Canada is the world's fifth largest producer of GMOs. So the problems of contamination are real. Some organic fields are surrounded by GM crop fields. It is necessary to prevent the contamination but it is extremely difficult (with the wind, the bees, the cross pollination, etc);

→ Should we re-evaluate isolation distances or add mandatory prevention measures?

Another issue: there is no contamination threshold established in Canada, nor in the United States.

→ Should we establish a contamination threshold? At the moment, it is the traders/wholesalers who establish it by testing crops and drop in value organic crops that show contamination rates.

Main contentious inputs - Canada

2 Synthetic - definition

3.39 non-synthetic

substance derived from mineral, plant or animal matter that has not been chemically altered.

3.65 synthetic substance

manufactured substance, including petrochemicals, formulated by a chemical process or by a process that chemically alters compounds extracted from plant, micro-organisms, animal or mineral sources. This term does not apply to compounds synthesized or produced by physical processing or biological processes, which may include heat and mechanical processing. However, minerals altered through chemical reactions caused by heating or burning are classified as synthetic.

Discussion/debate

- Are synthetic substances substances invented / compounded by humans that are not found in nature, or are they substances identical to natural substances but manufactured in the laboratory?
- With the new technologies, how could we trace the origin of the substance? For example vitamin C, is derived from natural source or made in lab. Both are identical.
- The Canadian organic standard **carefully examines the manufacturing processes of substances** to ensure that none of these processes violates the standard (processes without the use of GMOs, chemical substances or denaturing chemical reactions). However, with the modernization of technologies, it is increasingly difficult to find fully compliant non-synthetic substances on the market.

Should we relax the norm?

Main contentious inputs - Canada

3 Parallel production

5.1.4 *The enterprise can be converted one unit at a time, and each converted unit shall respect the requirements of this standard. The exception to this norm, parallel production, is only allowed in the following cases: perennial crops (already planted), agricultural research facilities and production of seed, vegetative propagating materials and transplants.*

Discussion/debate

The issue of parallel production will still be on the agenda of the standard revision work starting in July 2018.

→ The obligation for producers to convert all of their crops to organic at the same time constitutes an important barrier for the expansion of the Canadian organic sector.

For example, a monoculture producer who is learning organic farming will hesitate to convert everything at the same time because he is learning and does not want to lose everything if his conversion does not occur harmoniously. It's too risky.

Main contentious inputs - Canada

4 Greenhouse production

7.5.6 *Supplemental heat, with proper exhaust of burnt gasses, and* ***supplemental lighting****, are permitted. Supplemental nutrition with substances listed in Table 4.2 of CAN/CGSB-32.311, is permitted.*

Discussion/debate

Greenhouse cultivation must be under natural lighting; lighting systems are only allowed as extra.

→ Producers are asking to introduce plant factory cultivation within the canadian organic standard, without the solar radiation.

Main contentious inputs - Canada

5 Hydroponic growing systems

7.5.3 Hydroponic and aeroponic productions are prohibited.

7.5.5 The following conditions apply to containerized, staked crops (for example, tomatoes, sweet peppers, cucumbers, eggplant):

c) the soil volume shall be at least 60 L/m^2 (1.2 gal./ft$_2$), based on the total growing area

Discussion/debate

There is debate regarding the Hydroponic Prohibition because Hydroponic is allowed in the United States.

→ disadvantage for Canadian producers – unfair as US products are largely supplied on the Canadian organic market

→ aquaculture producers request the organic label on their vegetable products, cultivated under aquaponic control; as these plants are grown hydroponically (without any soil), there is a contradiction with the prohibition of hydroponics in agricultural production.

Main contentious inputs - Canada

6 Permitted substances

4.1.2 *Use of a listed substance in a manner inconsistent with the scope of the table in which it appears is not permitted, except as specified in substance annotations.*

4.1.3 *Substances listed in Tables 4.2 and 4.3 shall comply with prohibitions in 1.4 of CAN/CGSB-32.310.The following additional requirements apply to substances produced on substrates or growth media (for example, micro- organisms and lactic acid):*

a) if the substance includes the substrates or growth media, the substrates or growth media ingredients shall be listed in Table 4.2 or 4.3;

b) if the substance does not include the substrates or growth media, the substance shall be produced on non-genetically engineered substrates or growth media, if commercially available.

Discussion/debate

100% compliant substances are becoming scarce because of the modernization and chemification of technologies; moreover, the manufacturers refuse to reveal their manufacturing processes or the residues of the substrate present in the final product.

For example, certain enzymes, amino acids or other inputs are derived from genetically modified bacteria in industrial manufacture.

→ It will be necessary to decide whether to relax clauses 4.1.2 and 4.1.3.

Main contentious inputs - Canada

7 Biodegradable mulches

Tables 4.2 and 4.3 *Plastic mulches: Non-biodegradable and semi-biodegradable materials shall not be incorporated into the soil or left in the field to decompose.*

Use of polyvinyl chloride as plastic mulch or row cover is prohibited.

Biodegradable mulches: 100% of biodegradable mulch films shall be derived from bio-based sources. Formulants or ingredients shall be listed in Tables 4.2 or 4.3.

Biodegradable polymers and Carbon Black from GE or petroleum sources are not permitted. As a temporary exemption, biodegradable mulch film used on organic farms in 2014 but which do not meet the petroleum source requirement may be used without removal until January 1, 2017.

Discussion/debate

Biodegradable mulches have been banned since January 2017.

→ Growers argue that 100% plastic or semi-biodegradable mulches are more harmful to the environment and they request the reintroduction of biodegradable mulches.

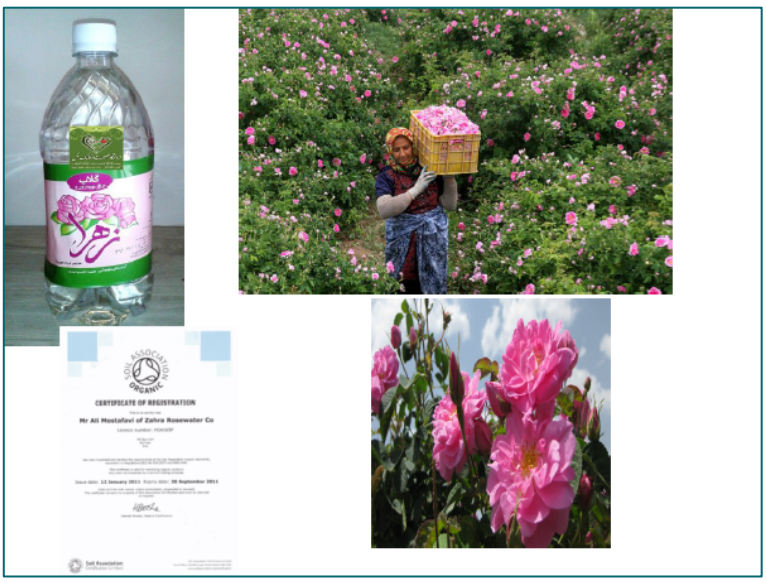


Main contentious inputs - Canada

8 Issues with USA

- **Chilean nitrate** is prohibited in Canada, while it is allowed in the USA and used in Mexico
  - → not renewable
  - → 70% of our horticultural products are coming from USA and Mexico
- **Hydroponics** is prohibited in Canada, while it is allowed in the USA
- **Parallel production** is allowed in the USA without any visual demarcation
  - → Organic field nearby GMO field
  - → Field/greenhouse crops of a same variety on the same producing facility
- **Conformity of input manufacturing processes - intrants**
  - → 100% compliant substances are becoming scarce
  - → not as strict as Canada for other countries (*from the cradle to the fork*)

9.2 Professor Dr Reza Ardakani, Asia (Iran)



The Gaps!!

How familiar the scientists are with the organic regulations, standards, and guidelines?

- The numbers of literature derived from research programs based on authentic organic management systems are not credible, yet.
- The organic sector needs specific research and innovation requirements which are not shared by other parts of the food and farming sector.
- Therefore, there is an urgent need for harmonization of scientific research based on organic production, corresponding with standards and regulations

Needs Harmonization
Scientists and Research & Regulations and Standards

Use of Vegetable Oils as Biopesticide is one of the option!

During recent years considerable attention has been paid to: exploitation of plant materials in protection of food commodities from insect infestations. Extracts of some plant species viz. *Lantana camara* [14], *Illicium verum* [15], *Tithonia diversifolia* [16] have been reported to possess strong insecticidal activity against different storage insects. Plant derived products namely, azadirachtin from neem (*Azadirachta indica*), pyrethrin from pyrethrum (*Chrysanthemum cinerariaefolium*), carvone from caraway (*Carum carvi*) and allyl isothiocynate from mustard (Brassica nigra) and horseradish(*Armoracia Rusticana*) oil have received global attention due to their pesticidal properties and potential to protect several food commodities [17-20]. Essential oils produced by different plant genera have been reported to be biologically active and are endowed with insecticidal, antimicrobial and bio regulatory properties [19,21-23]. The volatility and biodegradability of flavour compounds of angiosperms will be advantageous if they are developed as pesticide insecticide [24]. There may be least a chance of residual toxicity by treatment of food commodities with volatile substances of higher plant.

Citation: Singh A, Khare A, Singh AP (2012) Use of Vegetable Oils as Biopesticide in Grain Protection -A Review. J Biofertil Biopestici 3:114. doi:10.4172/2155-6202.1000114

Vitamin Concentration of Feedstuffs

Table 4: Average Vitamin Levels in Various Feed Ingredients (Units/lb)

Feed Ingredient	Vitamin A* (TIU**)	Vitamin E (IU***)	Vitamin B12 (µg)	Riboflavin B2 (mg)	Niacin (mg)	Pantothenic Acid (mg)
Alfalfa Meal, 20%	49	70	5	7.0	24.5	14.9
Dehydrated Alfalfa Meal, 17%	36	60	5	5.6	20.5	13.6
Dehydrated Barley, 12% Grain	-	16	-	0.9	26	2.9
Corn Distillers Dried Solubles	0.35	37	13	7.7	52	9.5
Corn Gluten Meal, 60%	7.5	17	-	0.7	25	3.8
Corn, Yellow, Ground	0.95	13	-	0.5	10.5	2.3
Cottonseed Meal Solvent, 41%	-	6	-	2.3	18	14.0
Feather Meal	-	-	39	0.9	8	2.7
Fish Meal, Herring	-	10	99	4.1	40	5.2
Fish Meal, Menhaden	-	6	84	2.2	25	4.0
Fish Meal, Peruvian	-	2	84	3.0	29	4.0
Mean and Bone Meal, 50%	-	1	20	1.7	19	1.6
Poultry By-Product Meal	-	2	120	5.1	46	8.8
Sorghum Grain	-	8	-	0.5	19	5.2
Soybean Meal, Solvent 50%	-	2	1	1.4	10	6.0
Soybean Meal, 44%	-	2	1	1.5	12	6.6
Wheat Bran	-	12	-	1.4	95.5	13.2
Wheat Middings	-	20	-	0.9	43	8.0
Wheat, Soft, 10%	-	9	0.5	0.6	27	5.8
Whey, Partially Delactosed	-	-	11	25.2	27	31.3

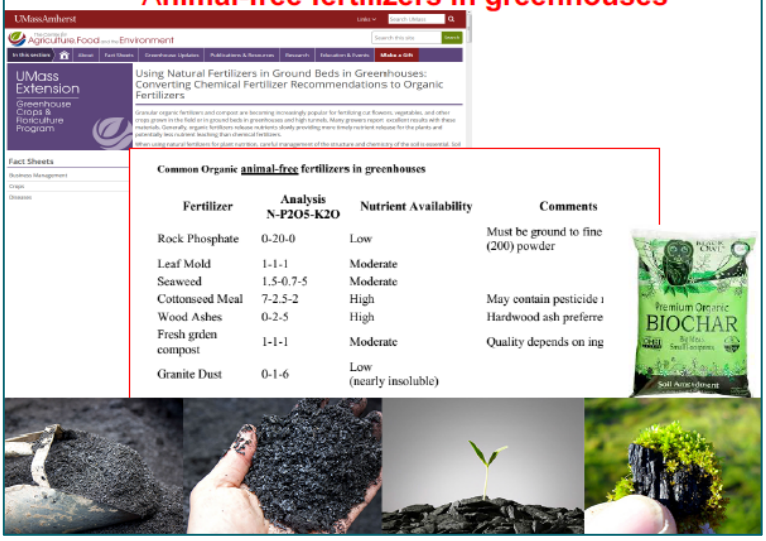
*Equivalent to stabilized vitamin A activity. **Thousand international units. ***International units.

Table 4: Average Vitamin Levels in Various Feed Ingredients (Units/lb)

Feed Ingredient	Choline (mg)	Folic Acid (mg)	Thiamin B1 (mg)	Vitamin B6 (mg)	Biotin (µg)
Alfalfa Meal, 20%	735	1.2	1.8	3.6	200
Dehydrated Alfalfa Meal, 17%	689	1.0	1.5	3.0	160
Dehydrated Barley, 12% Grain	467	0.2	2.3	1.8	64
Corn Distillers Dried Solubles	2,185	0.5	3.1	5.0	160
Corn Gluten Meal, 60%	150	0.1	0.1	2.9	87
Corn, Yellow, Ground	244	0.1	1.8	2.5	36
Cottonseed Meal Solvent, 41%	1,300	1.0	3.0	3.0	200
Feather Meal	400	0.1	0.1	2.0	20
Fish Meal, Herring	1,831	0.1	0.3	2.0	190
Fish Meal, Menhaden	1,400	0.1	0.3	1.2	120
Fish Meal, Peruvian	1,678	0.1	0.3	1.6	170
Mean and Bone Meal, 50%	990	0.2	0.5	0.7	88
Poultry By-Product Meal	2,700	0.2	0.1	2.0	200
Sorghum Grain	308	0.1	1.8	1.7	131
Soybean Meal, Solvent 50%	1,252	0.3	1.1	3.2	122
Soybean Meal, 44%	1,244	0.3	3.0	3.0	145
Wheat Bran	450	0.8	3.0	4.2	163
Wheat Middings	680	0.5	2.1	4.2	151
Wheat, Soft, 10%	358	0.1	2.2	1.5	46
Whey, Partially Delactosed	802	0.4	1.7	1.8	115

https://www.dsm.com/markets/anh/en_US/Compendium/vitamin_basics/vitamin_concentration_of_feedstuffs.html

Animal-free fertilizers in greenhouses

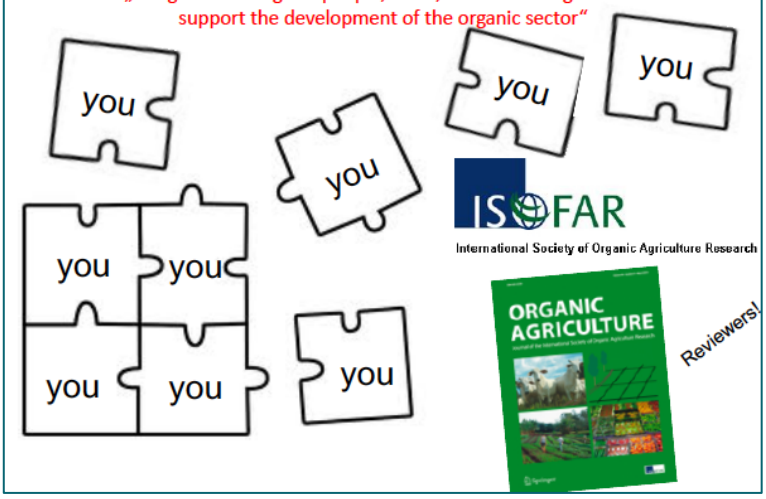


Common Organic animal-free fertilizers in greenhouses

Fertilizer	Analysis N-P2O5-K2O	Nutrient Availability	Comments
Rock Phosphate	0-20-0	Low	Must be ground to fine (200) powder
Leaf Mold	1-1-1	Moderate	
Seaweed	1.5-0.7-5	Moderate	
Cottonseed Meal	7-2.5-2	High	May contain pesticide r
Wood Ashes	0-2-5	High	Hardwood ash preferre
Fresh grden compost	1-1-1	Moderate	Quality depends on ing
Granite Dust	0-1-6	Low (nearly insoluble)	

Global Organic Agriculture Movements

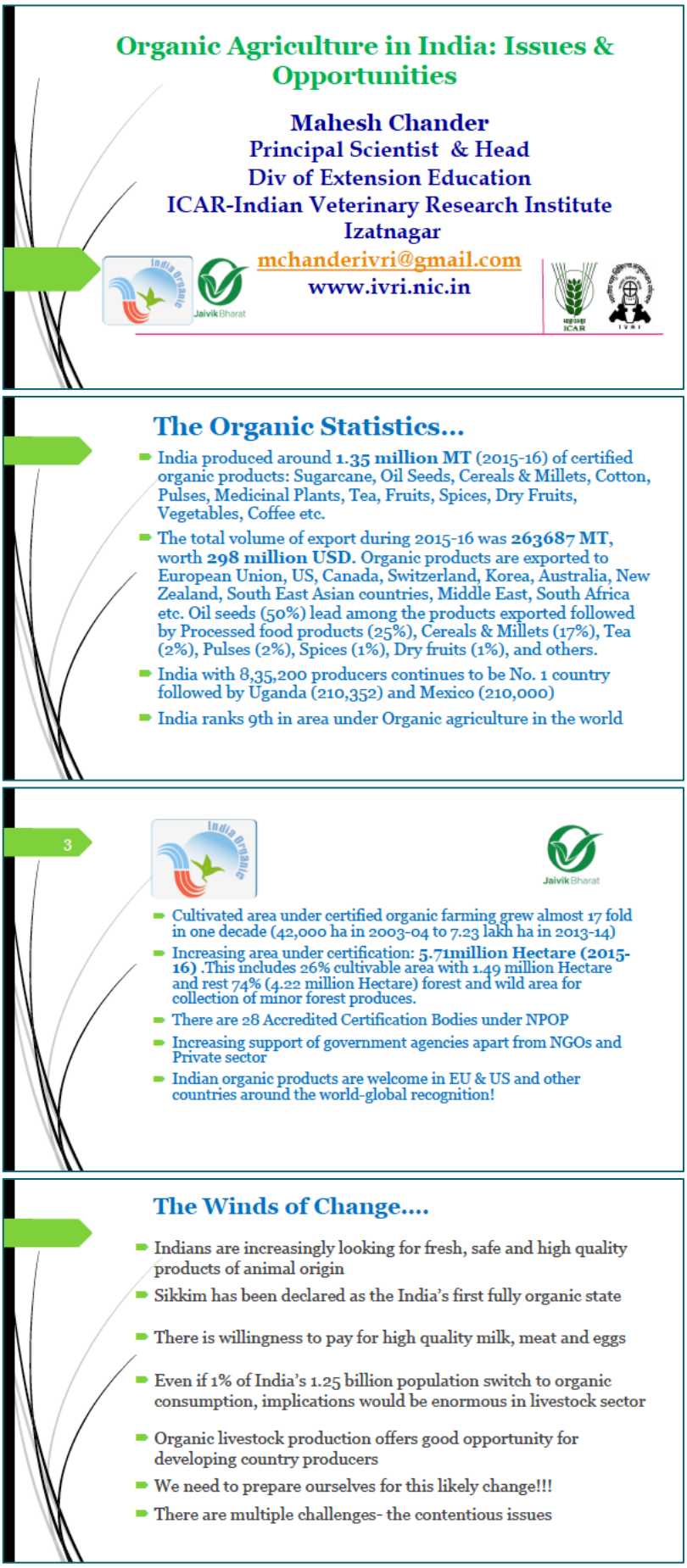
„bring isolated organic people, ideas, and results together to support the development of the organic sector"



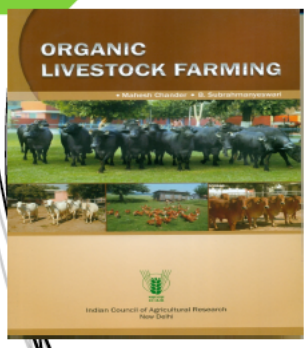
ISOFAR
International Society of Organic Agriculture Research

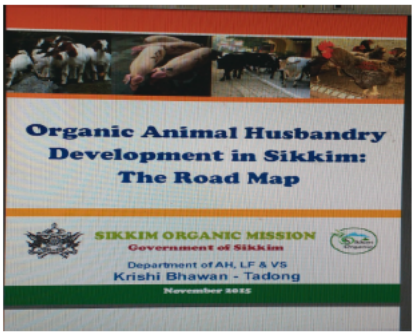
Reviewers!

9.3 Dr Mahesh Chander, Asia (India)



Knowledge Management is important





When we say NO to chemicals.....

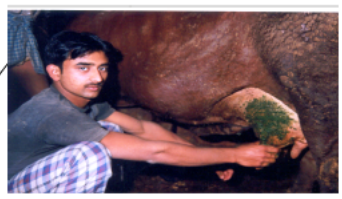
- When we say NO to chemicals-fertilizers, pesticides, weedicides, synthetic growth promoters, antibiotics, synthetic amino acids
- We must be able to credibly say- we have natural alternatives to these hazardous chemicals, carcinogens
- We need science, research, technology development, demonstration and extension of these natural alternatives to chemicals!

When we say NO to chemicals.....

- We need to find potential alternatives to
  - ANTIBIOTICS
  - Synthetic Amino acids-required in livestock production
- We need natural ways to substitute Antibiotics & Amino acids??????
- We are deficient in organic feed and fodder

We need research for effective alternatives

This cow suffers from mastitis: any organic remedy to minimize antibiotic use?



Some plants have healing properties: how to validate them for use in organic animal husbandry?

20

Organic agriculture-evolving rapidly

Trade, retailing, marketing, export-Dominate

Bio-inputs, organic methods-slow development

Sustainability- often questioned

Research on input intensive conventional agriculture-significant funding

Funding for Organic agriculture research: <1%

Organic Plus, Padova

Use of sprouts in Animals Diet

Sprouts are powerhouse of Nutrients

Biological control of ticks by Indigenous hens

Less Investment

Eco-friendly farm

Cows are Stress free resulting in easy letting down of milk.

Improved rearing conditions minimize health expenditure & improve production

Promote disease resistant & stress tolerant local breeds: Tharparkar, Sahiwal

Animal Welfare...

Researchable areas

- strategies for improving livestock husbandry on organic holdings
- practical methods of controlling pests and diseases in cereals, fruit and vegetable growing
- investigating the efficiency of organic and conventional farming systems in terms of fertilizer and energy use
- Improving soil fertility using organic inputs/efficient use of organic inputs
- Soicio-economics of organic agriculture
- the causal agents of diseases, preventive measures, and complementary and alternative medicine for animals

32

Enhancing sustainability of organic agriculture: Way forward

- More funds for organic agriculture research
- Eco-intensification
- Accommodating location specific indicators in organic standards (stocking density in livestock-impractical)
- Improving quality of bio-inputs
- Organic agriculture to be included in agricultural curriculum of Agricultural universities

9.4 Professor Dr Sang Mok Sohn, Asia (South-Korea)

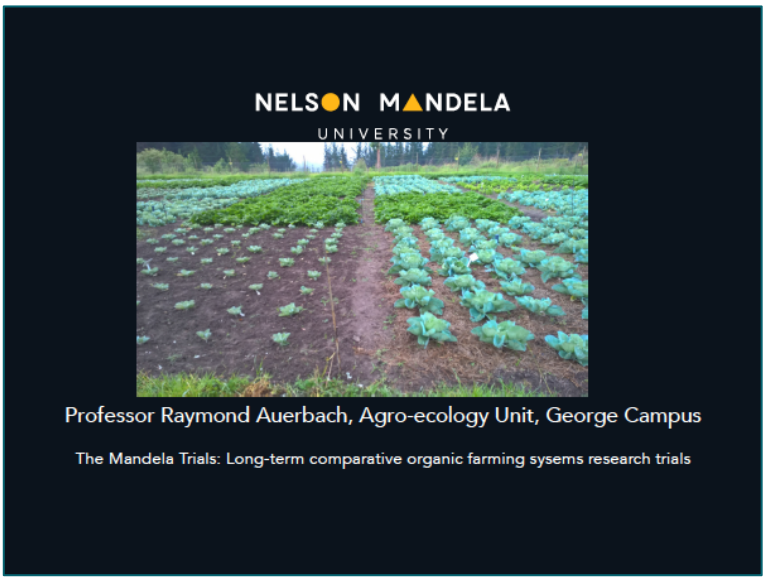
Untreated seed

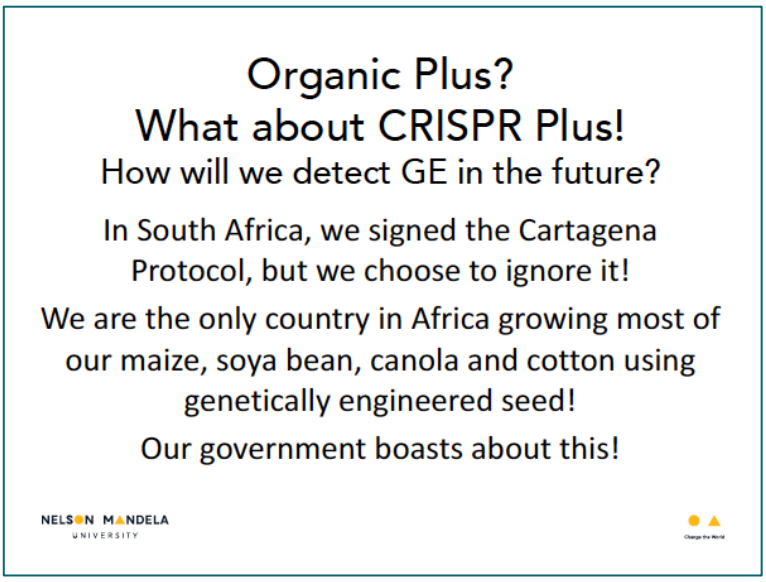
- To sow an organic seed is an essential element for organic crop production according to Codex guidelines, EU regulation and USDA NOP. Nevertheless, many countries in Asia do not implement one of minimum requirements of organic agriculture. Some countries have written on the organic seed in the regulation of national regulation, but farmers used to sow the treated seed applying organic fertilizers like compost. And farmers think that their products are still organic once it is harvested. They insist that they attempt to buy organic seed, but organic seeds are not available in neighboring agriculture markets and shops in most Asian countries.
- In case the treated seed are sown in the field, the dried seed, which has around 15% water content, will absorb the soil water as it is placed in the soil layer.
- By this absorption of soil water and pesticides coated in seed outside will be dissolved and taken up into seed embryo. In the process of seed germination, pesticides will be diluted and transported to the root and shoot of the young plant, hence these seedlings already belong to contaminated crops by pesticide.
- Recently, some farmers try to sow untreated seeds, although the seeds are harvested in conventional farming methods, or they try to sow indigenous seeds.
- It is recommend to breed an organic seed by seed company in Asia, or at least cultivated organic farming method, and it should deliver to organic farmers with not treated way.

Overuse of organic fertilizer

- Organic fertilizers are carbon-based compounds that increase the productivity and growth quality of plants. According to organicfacts.net (2016), they have various benefits over chemical fertilizers, such as: 1)organic fertilizers are easily biodegradable and do not cause pollution, 2)food produced using organic fertilizers is free from harmful chemicals, 3) cost of production is less as organic fertilizers can be prepared locally or in farm, 4)organic fertilizers help maintain soil structure, fertility, and increasing its nutrient-holding capacity.
- Organic fertilizers such as compost, manure, and press cakes, are applied to increase soil fertility and deliver the nutrients such as N, P, K to cover the need of crop.
- However, the information on their N and P availability is not well known to organic farmers. Hence, organic farmers in Asia apply too much organic fertilizers; In some areas in China and Korea, organic farmers apply around 20~40t/ha/year while other farmers apply 80~100t/ha/year (Sohn, 2013). In Indonesia, up to 190t/ha/year of organic fertilizer is usually applied on organic vegetable farms (Moeskopsa,B. at al, 2010).
- Due to high application of organic composts and manures in Organic Farming systems in Korea, which results in high nutrient accumulation in the soils, a high potential risk of groundwater pollution has been recently assumed from the soil.
- Especially for vegetable cultivation areas, the organic fertilizer might be used much more than the need of the vegetable because farmers have preconceptions about organic fertilizers, such as compost being very good to crop.

9.5 Professor Dr Raymond Auerbach, Africa (South-Africa)





10 Appendix C Vison paper on phase-outs and phase-ins, Goesan, South-Korea, October 2022

ISOFAR scientific workshops at the 2nd Organic Expo, October 1-3, 2022 in Goesan, South Korea

How can organic agriculture & agroecology contribute solving the climate crisis in a healthy world?

ULRICH SCHMUTZ[1]

Key words: organic, contentious inputs, organic-plus, system re-design, agroforestry, mixed farming, climate mitigation, dynamic agrovoltaism, robots, planetary health

Abstract

This vison paper first reflects on the history of the organic movement in the last 100 years. It then describes research examples of how organic agriculture with a deeper understanding of agroecology can contribute not only to the climate crisis, but the overall planetary health crisis, pollution, biodiversity loss, animal welfare and social discrimination. For the description of the present 2020-30, I will use examples of current Horizon 2020 research and innovation actions to improve organic (Organic-PLUS, RELACS) add more perennial and mixed farming (AGROMIX, MIXED) and a deepening agroecology (Agroecology for Europe, All-Ready) with plans for agroecological living labs and research infrastructures, shaping the participation and multi-actor part of Horizon Europe until 2030. The paper will then, as a novel contribution, add thoughts on the next 100 years of the organic movement. Looking so far ahead is of course difficult and highly speculative, but it is not uncommon as perspective in forestry or agroforestry. For this reason this conceptual paper takes the very-long view and describes and discusses an organic-plus pathway to solve the multiple planetary crises within the next 100 years.

Introduction

In the year 2023/24, the organic movement can celebrate its 100st birthday. As with many movements whose ideas and concepts have circumnavigated the globe, the beginnings can be faint, patchy and contested. There are many thinkers and farming practitioners whose ideas are akin to organic farming and which were active before 1923/24, but I argue that the 'twin-track of organic', organic-biological and biological-dynamic (bio-dynamic) can be traced back to events in Switzerland and today's Poland. The Jungbauernbewegung at Grosshöchstetten (1923) and Bauernheimatschule Möschberg (1932), Switzerland, is a school of thought combining the social, political agency of small-scale farmers with biological/organic production methods. It explains why today the largest research institute in the world for organic farming (FiBL Forschungsinstitut für Biologischen Landbau) is located in a small mountainous country. Bioland the largest organic association and certification body in Germany and Europe also has its roots in this political movement. This twin of the 'twin-track roots' of organic production with food system change and power redistribution in the food supply chain is combined with making autonomous basis-democratic decisions on certification in a 'farmer parliament'. All these are ideas very akin to political agroecology today. The second twin, and at the beginning the larger one, is the bio-dynamic movement going back to the 'Landwirtschaftlicher Kurs', Gut Koberwitz/Kobierzyce, Silesia (1924), Poland. There the emphasis was less on small-scale farmer empowerment but on holistic diets, health care and lifestyles in combination with spiritual and community supported agriculture. Organic is in both cases a holistic body and 'organism' (origin of the word) which is much more than just the certification of agricultural production. Since then the movement has further grown in the 'twin-track' but bonded together in 1972 in Paris, France as International Federation of Organic Agriculture Movements (IFOAM) and later made into law in Europe with the EU 'Eco-regulation': EEC-No. 2092/1991 European Council Regulation on organic production of agricultural products (plants) and animals EC No. 1804/1999, European Union. Since then many new concepts are adding to the diversity e.g. permaculture, agroecology, agricology, vegan organic, agroforestry, regenerative farming, ecological intensification, carbon farming, all not necessarily currently certifiable as organic, but with

[1] Coventry University, Centre for Agroecology, Water and Resilience, Ryton Organic Gardens, England, United Kingdom, www.coventry.ac.uk/cawr, ulrich.schmutz@coventry.ac.uk, acknowledging contribution to my thinking from participants of the Organic-PLUS project and other project mentioned above. All views expressed in the vision paper are exclusively my own.

large affinity to the 'twin-track' described earlier. Organic PLUS, better organic systems without all contentious inputs is just one of those additions and certainly more will be added as every generation within a 30-year cycle has new ideas.

Material and methods

As a vision paper, the main method used is conceptional thinking. This is however built on the transdisciplinary research of many replicated trials on contentious inputs like copper, peat, fertiliser, plastic mineral oils, in laboratories, greenhouses and farmer's fields as well as in-vitro and in-vivo livestock assessment of alternatives to antibiotics, anthelmintics and synthetic vitamins. The natural science was combined with social science, focus groups, large-scale representative consumer samples across Europe and dedicated farmer-consumer competency group research. As a coordinator of this research, the vision paper is not detailing the individual methods as they can be found in project deliverables published papers and further forthcoming work. Instead the purpose of the vison paper is to take the long-view locking at the potential phase-out scenarios currently researched and expand the concept of contentious inputs to all emissions and pollution from fossil fuels and nuclear power, and a vision for organic phase-in in the next 100 years. In addition, to the Horizon-2020 Organic-PLUS and its sister project RELACS, also concepts and ideas on agroforestry and mixed farming from projects AGROMIX and MIXED and on deeper agroecology (Agroecology for Europe, All-Ready) have influenced this vison.

Results and Discussion

The results from the 4-year long 8 million Euro projects Organic-PLUS and RELACS indicate that **all contentious inputs can be phased-out**. The question is only when and the timelines differ. The phase-out timelines are calibrated for organic agriculture in Europe including EU-organic, Britain, Switzerland, Norway, and Turkey. All phase-out timelines (1-14 in the figure) are also applicable worldwide, however the dates may vary and other phase-in could be considered.

For **copper as a fungicide** the use in all crops they can be reduced from 4 kg/ha per year to 2 kg/ha per year after the current 7-year long regulation runs out in 2027. Once 2 kg/ha per year runs another 7 years to 2034 it is possible to reduce copper additions completely. However, copper is a micro-nutrient and copper fertiliser and fungicide use below 2 kg/ha per year should be allowed, if there are copper deficiencies in the soil. A total phase-out of a plant micro-nutrient is impossible and as long as healthy natural soil copper levels are not exceeded, application of below 2 kg/ha after 2034 should be still be acceptable. However, there is also historic copper pollution build-up, and here a **'drawdown'** to retain a healthy soil for carbon storage is needed which could mean no copper additions until 2122. The copper phase-out is more important in perennial crops (e.g. apple, almond, citrus, hops, olive, roses) as crop rotations like with potatoes, aubergines, tomatoes and other greenhouse crops are not possible.

Mineral oils for plant protection can be phase-out immediately, alternatives are available. The same is the case for **mineral oils as machinery lubricants**. This raises teh big question of phasing out all other **mineral oils in diesel, petrol and heating oil**. This was not part of Organic-PLUS research, but a visionary timeline is given based on the ban of diesel and petrol new car sales in the United Kingdom 2030 or EU 2035: For organic agriculture and machinery this should also apply as tractors are slower developed 2035 is a realistic goal for new machinery and 2050 for removing all fossil fuel tractors and machinery while retaining horse power and solar battery power tractors and robots.

Non-organic straw can be phased out immediately as alternative bedding is available. 25% organic land use will help with availability of straw. The same can be concluded for **non-organic manure** this can be phased-out immediately, alternative fertilisers are available and if organic farms need manure they can always increase own organic livestock as mixed farming should be encouraged. This policy is an example of an indirect support for mixed farming and divers land use with agroforestry systems. The increase of organic land to 25% (or 30% in some countries) by 2030 will help with any availability and supply chain problems. **Non-organic fertilisers** can also be phased-out soon but currently there is limited availability e.g. Vinasse from sugar-beet and leguminous fertilisers like bean powder are not (yet) exclusively from organic farming systems. This still provides a pathway for pesticide contamination from conventional inputs. Here, again, 30% organic by 2030 will help with the overall

availability of organic product and by product from processing. Further research is needed to explore options to secure and reliable sources enough nutrient inputs required for a growing organic sector. This also includes Humanure and Struvit (a phosphor fertiliser base on human waste).

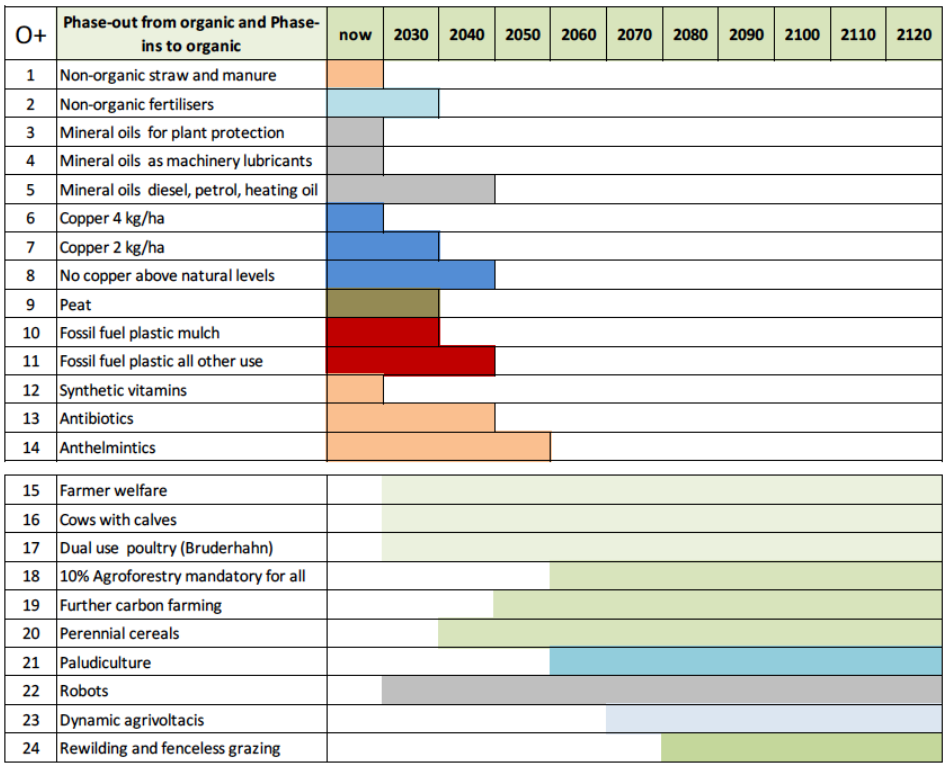


Figure 1. Phase-out vision (1-14) of contentious inputs and phase-in (15-24) vison of other practices until 2120 in Europe and worldwide.

Peat as a soil conditioner is already phased-out, remaining phase-outs are needed for **nursery crop production** (plant and tree nurseries), for **blocking growing media** and as **casing for mushrooms**. Peat smoke is used in very low quantities to flavour whiskey and fish, even for this alternatives are available. Artisan use of peat, e.g. in crofting, small-scale farms who use peat as a traditional fuel, can be exempt. Peat restoration and peat lands are among the key drawdown options, and it is useful to re-wet peatland also where currently organic farming is practised, alternative crops like wet rice, water cress are possible to establish **organic paludiculture** (the practice of farming on wet land, such as rewetted bogs and fens) also in temperate climates where those soils have been drained and given over to agricultural production. Agroforestry can be added around the new 'paddy fields' of Northern Europe.

Fossil fuel derived **plastic mulch** can be phased-out until 2030. Alternative biodegradable bio-plastics are available, they require further research in more applied innovation actions. Like all other phase-outs this phase out is also required in conventional horticulture and agriculture. **Fossil fuel plastic in all other uses** will require more time. Research is ongoing for tree-guards, clips and many horticultural inputs to be 100% bio-based and bio-degradable. The bio-based materials should be ideally from organic crops (potato starch, maize etc.), however it is not likely this will be available until 2050. Therefore, the first aim is to phase out fossil fuels. **Plastic in tools, tractors, solar batteries** will be more difficult to remove and this is often recycled and does not degrade the soil with pollution, therefore this is currently not a priority but by 2060 this should also be possible to remove and replaced with bio-based plastic. **Plastic in packaging** is equally highly contentious, especially among organic consumers as shown in

our surveys, and this can also be removed very soon as alternative bio-degradable materials are available. **Plastic films, netting, polytunnels** and other large scale horticultural inputs are difficult to replace as the alternatives are less durable or glass is heavier. However **dynamic agrivoltacis** might bring a solution as this greenhouse will be able to protect crops and equally produce electricity for heating the greenhouse, provide battery storage and charging tractors and robots.

For **synthetic vitamins** alternative are available, they might be slightly more expensive but those synthetic inputs should not be used in organic as not to confuse consumers. By providing more free-range and herbal additions synthetic vitamins are not needed. The use of **antibiotics** is different as this requires system re-design in some intensive organic systems in Europe. These are very 'conventional' still with high yielding dairy breeds and limited grazing. Those systems, without re-design and re-creating a mixed grazing landscape with agroforestry, will have little chance to remain organic until 2050. In all other organic system, including 365 days free-range pigs antibiotics are not needed and should only be reserved for accidental damage in single animal (as per the organic welfare and care principles). Group treatment or mastitis for the whole dairy, sheep or goat herd will be phase-out. The full phasing out of **anthelmintics** is difficult as grazing is still too confined in organic. Mixed grazing and healthy use of pasture is often not possible and here re-design is also required to 'rewild' organic grazing patterns, introduce more trees, (agroforestry) with beneficial anthelmintic properties and generally reduce the intensity further while equally increasing quality.

Items not researched in the contentious inputs projects Organic-PLUS and RELACS are listed in the figure separately (15-24). **Farmer and animal welfare** were interestingly combined as an issue by or farmer-consumer competency groups. Animals have rights and agency in organic food and farming systems and it is therefore interesting to note that the welfare concepts can be applied to all species on a farm. Therefore the vison is to phase-in **farmer welfare** much more prominently as currently the case. This means, living wages, social capital, reduced working hours but generally empowerment of all land-workers, including seasonal workers, volunteers and creating agency for all in community supported agriculture and direct marketing schemes as well as power over the supply chain pricing. This goes back all the way to 1923 and the Jungbauernbewegung at Grosshöchstetten (1923) described in the introduction, at is shameful that farmer welfare has not yet been fully achieved and might hopefully not need another 100 years.

Further issues for **animal welfare** are cows with calves and the practice of separation should have never been allowed in organic. This is equally the case for dual breeds, killing male chickens or goats at birth is just totally unacceptable with the principles of organic care and a shadow of the conventional past of many systems. Total re-design is needed. Further growth of **Vegan organic** is also very welcomed as it gives remaining animal more space to re-design and improve grazing to phase-out anthelmintics. **100% Vegan organic** is not desirable as it would erase all benefits of high welfare animals and make domesticated animals extinct. These are heritage species which have co-evolved with humans in our own 'domestication'.

Mandatory **Agroforestry** (10% or more) in organic, additional carbon farming methods like further reduced tillage, perennial cropping of cereals and vegetables, will be able to store much more carbon in the soil as organic can currently offer. This is also the case for the further promotion of **organic paludiculture**, already discussed under peatland restoration. Items also envisioned for a phase-in, once fossil fuel are completely phased-out, is more **dynamic agrovoltaism**, sharing fields and **agroforestry with solar panels**, which provide sun-burn protection, better micro-climate and hail and heavy rain cover for crops with their dynamic (changeable positioning). Those will be a further mixture in the landscape and able to charge all remaining tractors and robots. It s envisaged that **robotics** will make machinery smaller and more flexible again and a new combination of robots, farm animals and humans working on the land and with agroforestry and forests will be possible by 2120. Humans will be able to do the work on the land they like to do, while the un-wanted work will be done by robots. Humans will have more time for interaction with farm animals, agro-biodiversity and also contribute to **rewilding and fenceless grazing** of large areas. Finally with agroforestry increase, forestry on farms will also be better integrated in livestock grazing, also with the aim to reduce forest fires and increase the carbon storage on farms agroforests and forest with a more combined landscape transforming soil carbon management.

Conclusion

With this vision organic agriculture can phase-out all remaining contentious inputs. This will still take at least 10 more years to achieve, but it is made easier as it is combined with the growth of organic land to 25% or 30% by 2030. In addition further research investment from the Strategic Research and Innovation Agenda (SRIA) for a European Partnership on **Agroecology Living Labs and Research Infrastructures** over the next decade will help that organic is rejuvenated by the social and food system principles of agroecology including the social questions of farmer welfare and fairer community supported supply chains. The phase-out will target inputs head on, which contribute to the **climate crises (all fossil fuel inputs, all peat, all plastic),** while equally open up organic to carbon 'drawdown' back to 350 ppm CO_2, by rewetting peatland, making agroforestry mandatory and improving perennial cereals and vegetables with the integration of trees. **Dynamic agrivoltacis** will make organic energy independent, charging batteries, robots and heating greenhouses. In fact organic agriculture will be a net renewable solar energy exporter. **Wind energy** were appropriate will also be included in some fields, however the large-scale off-shore wind parks (e.g. in Doggerland/Atlantis) will already be sufficient. **Nuclear power** and further pollution with emissions is unwanted and unnecessary. **Anaerobic digestion** (AD) within organic will also play a major role to produce heat, electricity or heating gas, were a gas grid available. Using green manure crops in digesters and digestate from organic and food waste inputs as fertiliser will increase organic yield, however to much higher yields are not required if food waste (once animal fodder from cropland suitable for human consumption is classified as wasteful) is largely removed and globally healthy low meat diets are in place. Organic will also contribute to rewilding and re-wetting peatlands as **higher yields are not needed** following '**peak population' in 2050**. Organic is also well placed for the **degrowth** area following **'peak population'** (currently predicted by me at 8.8 billion). Degrowth requires a further system re-design and this time of **capitalism with ecological economics and social equity**. This will however not be the end of all markets or financial skills as a degrowing economy is much more difficult to manage, and this might be one reason why there is a large intersest to shift 'peak population' further back to 2070.

References

Details of projects and further references are found on the websites, accessible with any internet search engine.