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The role of organic farming in sustainable agricultural production

Anne-Kristin Løes, NORSØK, lecture PJH 300 October 11, 2019

PJH 300: Sustainable Production Systems in Agriculture

About myself: Working with nutrient supply to organic agriculture at NORSØK since 1988


Residues from chicken after removing of fillets contain lots of N and P


Dried fishbones contain lots of N and P

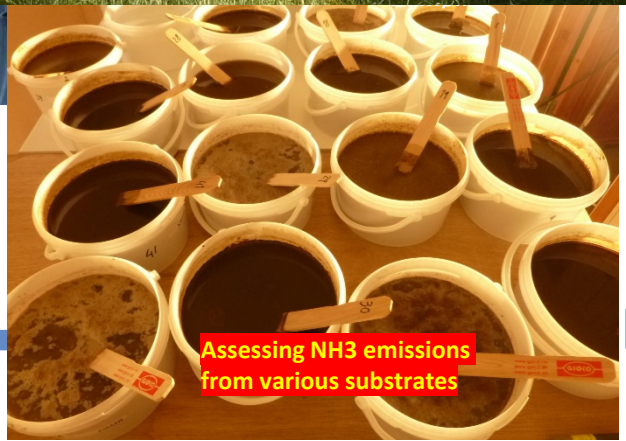

Digesting cow slurry for biogas – how does it affect soil and plant growth?


Ca in eggshells is more bio-available than in dolomite


Less fibres in digested slurry


Assessing nutrient uptake in field experiment with oats


Assessing nutrient uptake in pot experiment with ryegrass


Assessing NH3 emissions from various substrates

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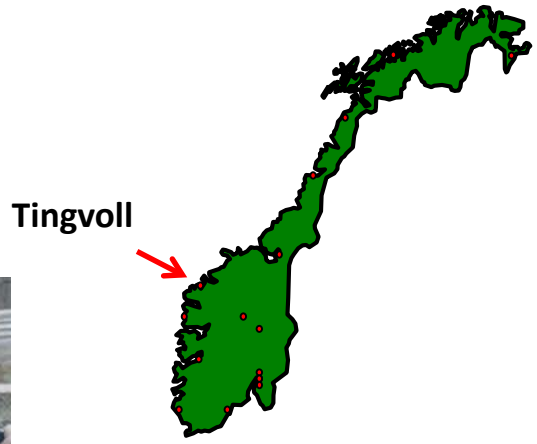
Norsk senter for økologisk landbruk

About NORSØK: Norwegian Centre for Organic Agriculture

Tingvoll farm has been a hub for organic research and development since 1986

NORSØK has 21 employees by October 2019



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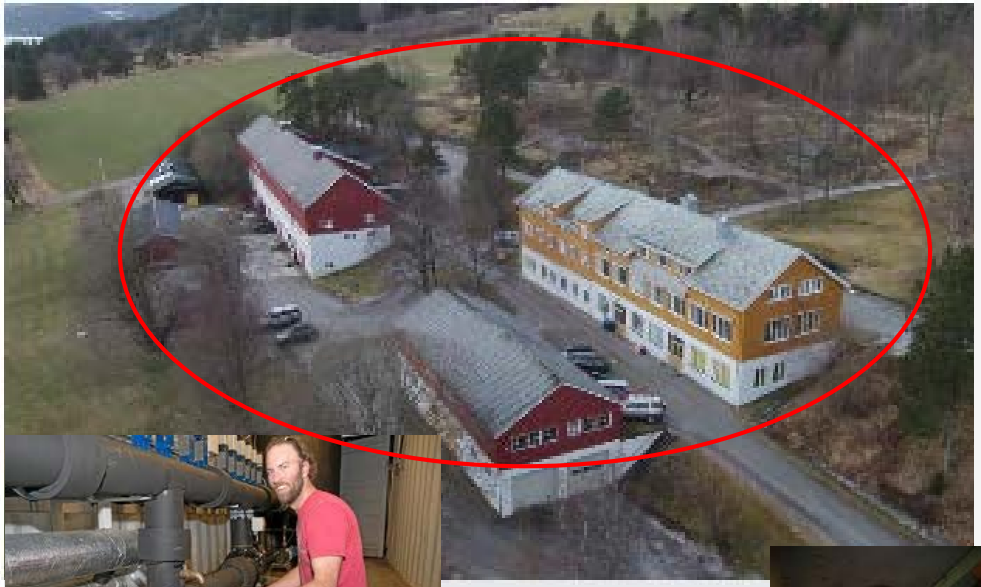
BUT: NORSØK is not alone in Tingvoll!
15 scientists and staff from NIBIO
are our close colleagues



NIBIO PROSJEKTER PUBLIKASJONER TEMA KALENDER TJENESTER NYHETER ANSATTE OM NIBIO ENGLISH VERSION

Søk i nibio.no: Bruk anførselstegn ved søk på eksakt ord eller frase ? Søk →

NO EN

Tingvoll

MEDARBEIDERE →

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Kontorsted: Tingvoll

Tingvoll gård. Foto: Atle Wibe, NORSØK

NIBIO Tingvoll har sitt utspring fra NORSØK som ble etablert på Tingvoll i Møre og Romsdal i 1986. NORSØK hadde status som nasjonalt kompetansesenter (1989) i økologisk landbruk og ett av åtte frittstående institutt under Landbruksdepartementet fra 1997. I 2006 ble NORSØK sin aktivitet slått sammen med Planteforsk og Jordforsk, til Bioforsk. Ved etableringen av Norsk institutt for bioøkonomi (NIBIO) 1. juli 2015, ble det bestemt at NORSØK skulle overta personell og på nytt bli nasjonalt kompetansesenter for økologisk landbruk. Resterende personell utgjør nå stasjon NIBIO Tingvoll.

Fag og fokus

Husdyr og fôrkvalitet, beiting og utmark, genetikk, fôrdyrking, sensorteknologi og velferd hos husdyr, vilt og viltforvaltning, agronomi og næringsforsyning, produktkvalitet, biogass, slam og kompostering.

Utstyr og lokaler som er tilgjengelig for utleie

Møterom, laboratorium med mikroskop og diverse laboratorieutstyr for preparering av prøvemateriale, forbehandlingsrom med tørke- og klimaskap, samt forsøksutstyr som grimer og GPS halsbånd.

NIBIO TINGVOLL

Tingvoll forskningsstasjon ligger i Tingvoll kommune på Nordmøre.

Adresse: Gunnars vei 6, NO-6630 TINGVOLL

Geografisk plassering: Breddegrad: 62.91341N Lengdegrad: 8.18623E

Temperatur i vekstsesongen april – september (1995-2013): 11,0 °C

Årsnedbør (1991-2007): 1 268 mm.

Middel årstemperatur (1995-2013): 6,4 °C

Nedbør i vekstsesongen april –september (1995-2013): 575 mm.

Vekstdøgn (5 °C) (Hanem 1973-1990): 182

Vekstdøgn (5 °C) (Tingvoll gard 2005-2013): 186

Fagavdelinger på Tingvoll

Tingvoll farm – organically managed dairy production + experimental farm

Loose-housing shed for 22 dairy cows

Small-scale biogas plant

The role of organic farming in sustainable agricultural production

CONTENTS

- Why talk about organic agriculture (OA) in PJH300?
- What is organic agriculture?
  - Conceptually
  - Globally: Organisations, regulations; Organic 1.0, 2.0, 3.0
  - IFOAM's definition and basic principles of OA
  - Global statistics

BREAK

- List of milestones, and current situation for the development of OA in Norway
- Typical organic farms in Norway
- Statistics
- OA as a speartip for increased sustainability; examples from Norway
- Rounding off: Increased interest for renewable resources in the era of bioeconomy, "business as usual" vs. "strong sustainability"

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Why talk about OA in PJH300?

Organic agriculture (OA) = sustainable?

- Sustainability is a normative word; nobody wants to be unsustainable
- The origin of the word, *sustinere* (Latin) is «to keep in existence», maintain
- Scientific origin in German forest management: Harvest only the regrowth
- For agriculture: Capable of maintaining long-term productivity while environmentally sound
- ***What is sustainable differs over time and with local conditions (reduce the largest risk)***
- Assessing the sustainability of agricultural systems requires retrospective evaluation and heavy monitoring
- The compiled sustainability of agricultural systems (social, ecological and economic) is almost impossible to measure exactly
- So, why justified in PJH300?
- OA aims for sustainability, and wants to contribute to ***sustainable development***
- OA movements established a discurse on sustainability long before the non-sustainability characteristics of industrialised, heavy input-agriculture were fully understood
- OA is a rapidly growing agricultural sector, and supported e.g. by EU and many countries as a strategy for sustainable development

To be read:
Rigby & Cáceres 2001
http://www.sciencedirect.com/science/article/pii/S0308521X00000603

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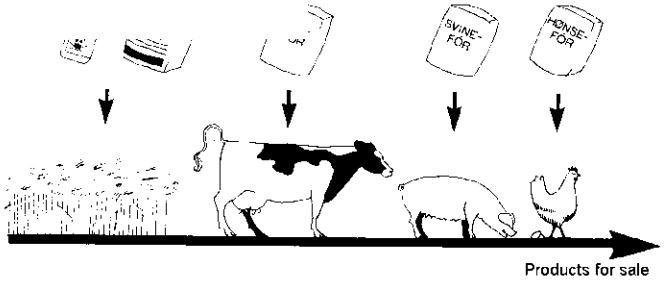
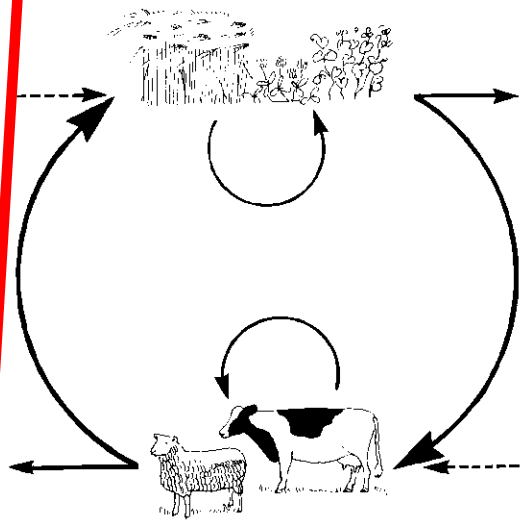
What is organic agriculture?

The simple explanation:

Organic agriculture = Refraining from external inputs, such as mineral fertilizers and synthetic pesticides

Conventional vs. organic agriculture = Linearity vs. cycles





Conventional systems are more close to an industrial approach where inputs are used to make outputs, and the aim is to maximize profit by *controlling nature*

Relationship to nature: Humans are separated from nature
Controlled nature is good, and wild nature is good
Approach: Intensify agriculture to save wild nature

Organic systems are more close to a natural approach where cycles of energy, nutrients and organic matter are designed and optimized to create a surplus, and economic output, by *cooperating with nature*
Relationship to nature: Humans are an integrated part of it; systemic perspective: Humans may create valuable natural environments

Further reading:
Alrøe & Kristensen 2003
http://orgprints.org/552/1/Systemic_Ethic_published_2003.pdf

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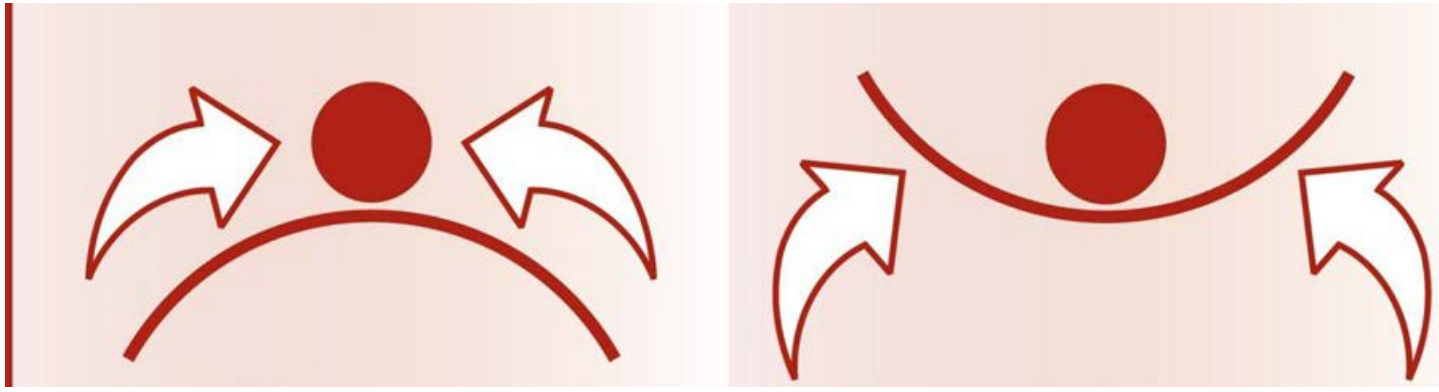
Control ⟷ Adaptation



Under the Control Model, keeping the ball in position is by design dependent on protection and interventions

Under the Adaptation Model, returning to the original position after a disturbance is part of the design

- Protect livestock and crops from disturbance
- Add-on solutions, no basic changes
- Reduce diversity to reduce variability
- Monitoring, interventions
- High long-term risk

- Reducing consequences of disturbance, not eliminating
- Utilize robust components, robust design, self-regulation
- Reduce variability by diversity
- Knowledge = ability to find good solutions, rather than ready-made solutions
- Lower long-term risk

To be read:
ten Napel et al. 2006: Utilising intrinsic robustness in agricultural production systems (p. 32-53)
http://www.louisbolk.org/downloads/2309.pdf

OA is based on international cooperation, standards, regulations and labels

- IFOAM Organics International established 1972 (France)
- IFOAM= International Federation of Organic Agricultural Movements
- IFOAM basic standards important for developing EU regulations for organic production and labelling in 1991 (EEC 2092/1991)
- About 800 member organisations from 120 countries
- Organic World Congress every 3 years (Sept 2020: Rennes, France; https://owc.ifoam.bio/2020/en)

EU label for organic products

IFOAM ORGANICS INTERNATIONAL | CULTIVATING CHANGE.

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Organic = Certified - and much more

- Fulfilling conditions in EU regulations = minimum
- Several certification bodies have stricter regulations
- In several countries, producers «only» fulfilling EU regulations are seen as «second class» organic farmers
- In Norway, organic production is regulated by EU law since 1994 (European Economic Agreement); the national authority is the Norwegian Food Safety Authority, audits are carried out by Debio

Bio, eco, biodynamic, organic…

- Organic agriculture developed, and develops differently in different countries and parts of the world
- Different associations and categories of organic merged into «organic» (in Norwegian: økologisk) during the late 70-ties
- The diversity of OA practices is still reflected in labels, certification bodies and associations

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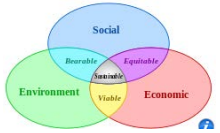
IFOAM – Organic International's definition of Organic Agriculture

Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved.

Ratified in 2008

IFOAM: *"Our goal is the worldwide adoption of ecologically, socially and economically sound systems that are based on the principles of organic agriculture"*



To be read:
http://www.ifoam.bio/en/organic-landmarks/principles-organic-agriculture

IFOAM's four basic principles

Organic agriculture is based on:

- The principle of **health:** OA should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible
- The principle of **ecology:** OA should be based on living ecological systems and cycles, work with them, emulate them and help sustain them
- The principle of **fairness:** OA should build on relationships that ensure fairness with regard to the common environment and life opportunities
- The principle of **care:** OA should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment

Principle of health

- The health of individuals and communities cannot be separated from the health of ecosystems. Healthy soils produce healthy crops that foster the health of animals and people.
- Health is not simply the absence of illness, but the maintenance of physical, mental, social and ecological wellbeing.
- Immunity, resilience and regeneration are key characteristics of health.
- Organic agriculture is intended to produce high quality, nutritious food that contributes to preventive health care and wellbeing. In view of this it should avoid the use of fertilizers, pesticides, animal drugs and food additives that may have adverse health effects.

Principle of ecology

- The production is to be based on ecological processes, and recycling. Nourishment and wellbeing are achieved through the ecology of the specific production environment, e.g. for crops, the living soil; for animals, the farm ecosystem.
- Organic management must be adapted to local conditions, ecology, culture and scale. Inputs should be reduced by reuse, recycling and efficient management of materials and energy in order to maintain and improve environmental quality and conserve resources.
- Organic agriculture should attain ecological balance through the design of farming systems, establishment of habitats and maintenance of genetic and agricultural diversity.
- Those who produce, process, trade, or consume organic products should protect and benefit the common environment including landscapes, climate, habitats, biodiversity, air and water.

Principle of fairness

- Organic agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities.
- Fairness is characterized by equity, respect, justice and stewardship of the shared world, both among people and in their relations to other living beings.
- Organic agriculture should provide everyone involved with a good quality of life, and contribute to food sovereignty and reduction of poverty.
- Organic agriculture aims to produce a sufficient supply of good quality food and other products.
- Animals should be provided with the conditions and opportunities of life that accord with their physiology, natural behavior and wellbeing.
- Natural resources should be managed in a way that is socially and ecologically just and should be held in trust for future generations.
- Fairness requires systems of production, distribution and trade that are open and equitable and account for real environmental and social costs.

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Principle of care

- OA should be managed in a precautionary and responsible manner to protect the health and wellbeing of current and future generations and the environment.
- Practitioners can enhance efficiency and increase productivity, but this should not be at the risk of jeopardizing health and wellbeing.
- New technologies need to be assessed and existing methods reviewed.
- Given the incomplete understanding of ecosystems and agriculture, care must be taken.
- Science is necessary to ensure that OA is healthy, safe and ecologically sound. However, scientific knowledge alone is not sufficient. Practical experience, accumulated wisdom and traditional and indigenous knowledge offer valid solutions, tested by time.
- OA should reject unpredictable technologies, such as genetic engineering.
- Decisions should reflect the values and needs of all who might be affected, through transparent and participatory processes.

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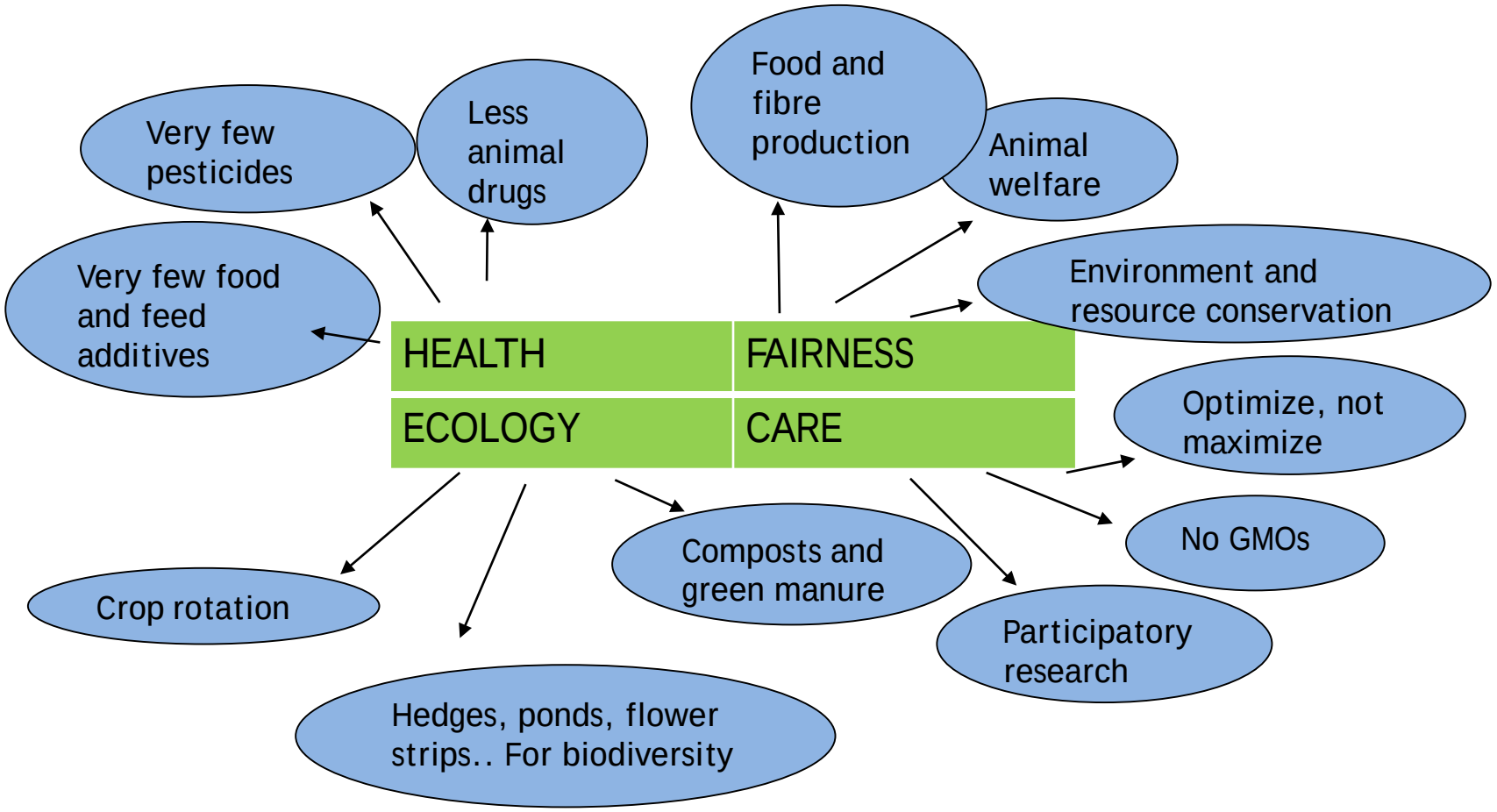
Principles and practices



Phases of development

- **Organic 1.0:** Pioneer phase, aiming for a radical change and opposing to problems caused by changes in agriculture around 1920 such as soil erosion, decline of crop varieties, rural poverty, the introduction of mineral fertilizers, increasing mechanization and specialization.

- **Organic 2.0:** Development of organizations (IFOAM 1972), practice and philosophy codified into standards, later into legally-mandated regulatory systems (USDA, EU).

- **Organic 3.0:** From niche into the mainstream; positioning organic systems as part of the multiple solutions needed to solve the tremendous challenges faced by our planet and our species

From Organic 2.0 to Organic 3.0:

A 100 years' history, but still only 1% of the agricultural land

Benefits of regulation:

- Guidance and guarantee for consumers
- Prerequisite for fair/premium prices
- Fair conditions for producers

Drawbacks of regulation:

- Smallholders often practice organic without certification; such production can not be sold as organic
- Increases bureaucracy, puts a distance to other sustainabilityt-oriented alternatives and movements
- Indirectly supports specialized, less diverse organic production by economic adaptation to minimum requirements

Ambitions for Organic 3.0: Agriculture is a force for good, providing solutions to global challenges:

-Climate change
-Depletion of natural resources
-Energy consumption
-Hunger
-Inequity
-Loss of biodiversity
-Pollution

To be read:
Arbenz et al 2016
http://www.ifoam.bio/sites/default/files/organic3.0_v.2_web_0.pdf

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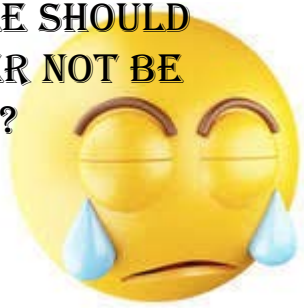
From Organic 2.0 to Organic 3.0 (continued)

Building on the four organic principles, Ecology, Health, Fairness, Care, with six main features:

- A culture of innovation
- Continuous improvement towards Best Practice
- Diverse ways to ensure transparency and integrity (above certification)
- Inclusiveness of wider sustainability interests
- Empowerment from the farm to the final consumer
- True value and cost accounting

Agriculture should be able to drive societal development, with close consumer-producer relationships

GLOBAL CRISES---
PEOPLE SHOULD BETTER NOT BE HERE??



GLOBAL POSSIBILITES---
PEOPLE MAY CONTRIBUTE POSITIVELY TO NATURE

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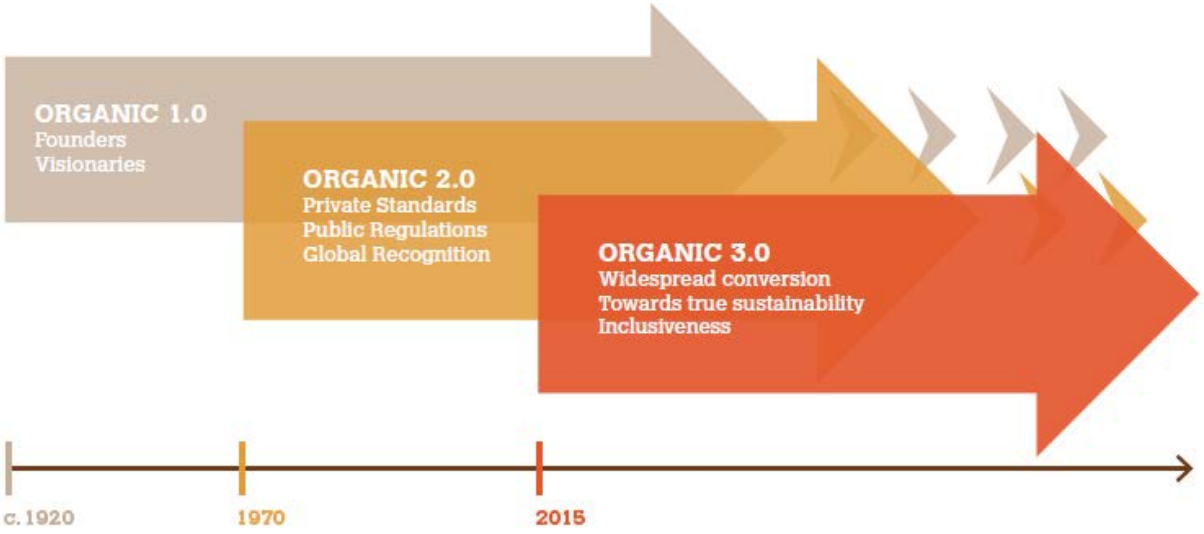
From Organic 2.0 to Organic 3.0 (continued)

From the focus on regulations, still fulfilling minimum requirements, with the overall aim of development towards Best Practice as defined by the Sustainable Organic Agriculture Action Network (SOAAN)

Calls for farmers being empowered and self-aware

Processors and traders being social entrepreneurs

Responsible consumers



Further reading:
Best Practice Guideline for Agriculture and Value Chains
SOAAN 2013
http://www.fao.org/3/a-ax270e.pdf

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Global level:
From niche to volume

- Since 1985, a rapid growth in organic production and consumption, linked to public support, research and increased acceptance in the scientific community

- Shares of organically managed agricultural land by 2016:
- Globally, 1.2 %
- Europe: 2.7 %
- EU: 6.7 %
- Norway: 4.8 %
- Sweden: 18 %

- By 2017, 87 countries had implemented regulations for organic production

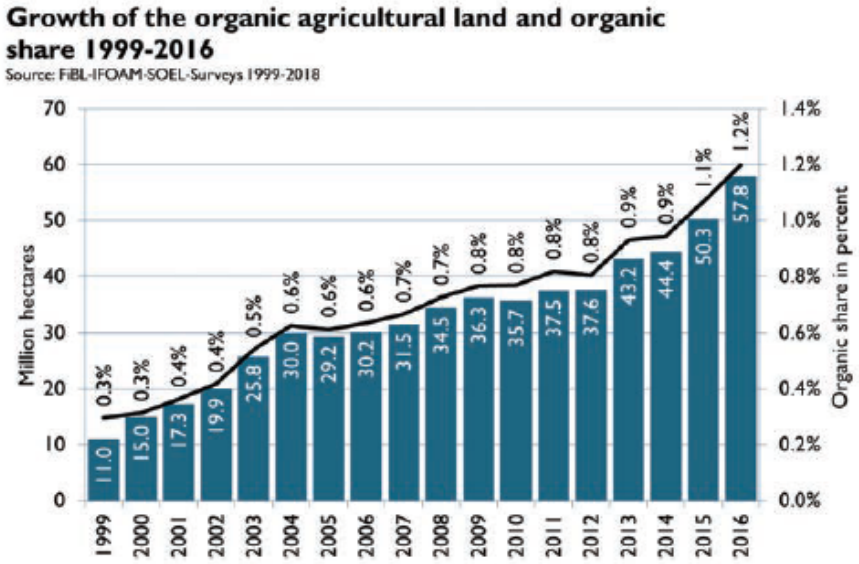


Figure 5: World: Growth of the organic agricultural land and organic share 1999-2016

Source: FiBL-IFOAM-SOEL surveys 2000-2018

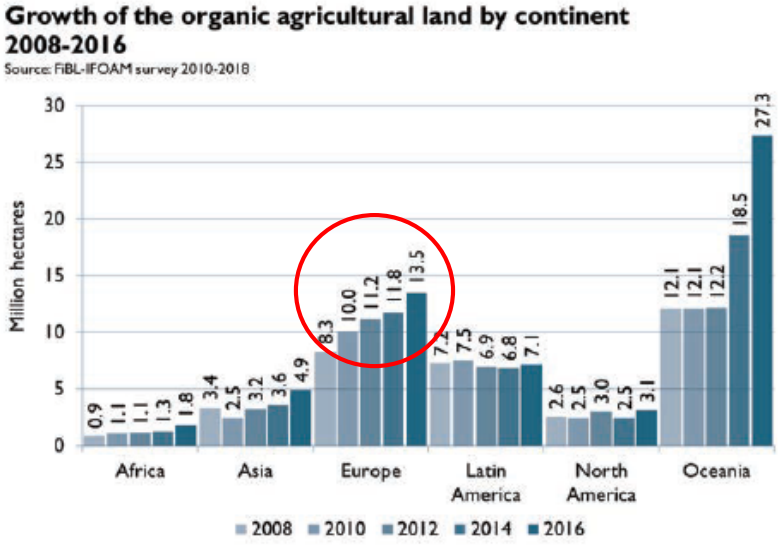
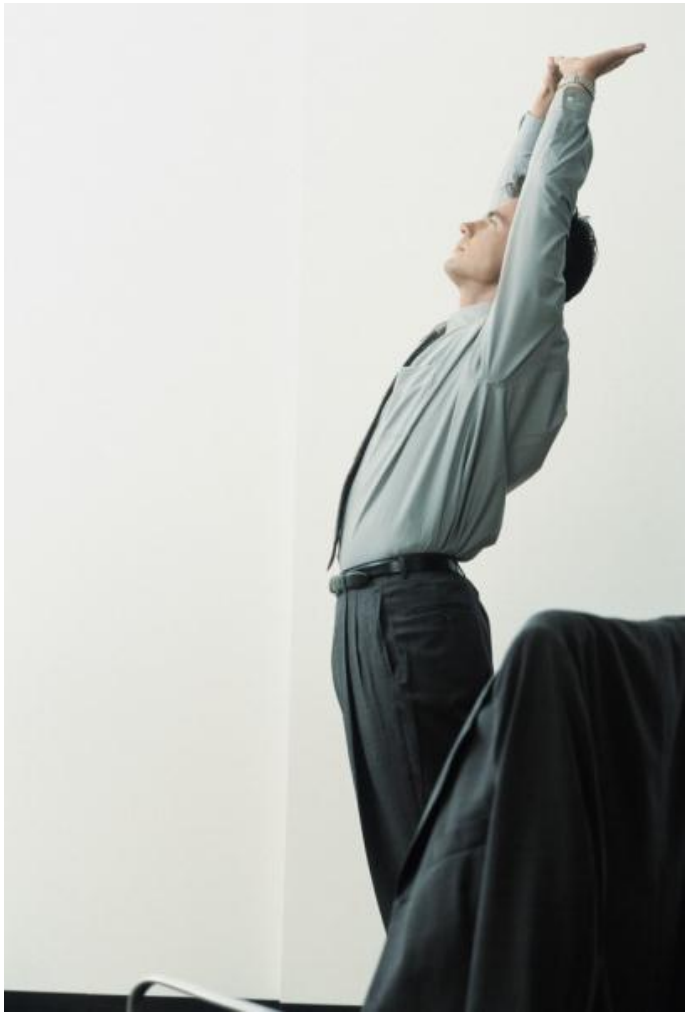


Figure 6: World: Growth of the organic agricultural land by continent 2008 to 2016

Source: FiBL-IFOAM-SOEL surveys 2010-2018

Source:
Lernoud & Willer 2017
The World of Organic Agriculture. Statistics and Emerging Trends 2018

Time for a break!



The role of organic farming in sustainable agricultural production

CONTENTS, PART 2

- List of milestones, and current situation for the development of OA in Norway
- Statistics
- Typical organic farms in Norway
- OA as a speartip for increased sustainability; examples from Norway
- Rounding off: Organic 3.0; and back to sustainability: "business as usual" vs. "strong sustainability"?

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Organic agriculture in Norway

Fokhol farm, Stange, Norway July 2016
90 ha diversified organic production

- **Pioneer phase: very few, very dedicated farmers, often aiming at «back to the land», self-sufficiency**
- **Spreading ideas to consumers, students**
- **Establishing organisations**
- **Conducting research, advisory service**
- **Certification, political support, public goals**
- **Growth, conventionalisation**
- **Scepticism; what is «sustainable»?**

Organic pioneers: The first organic farm in Norway, N. Sletner established 1932

Development of OA in Norway 1931-2019, important milestones

1924 The Agriculture Course in Koberwitz, Poland. Rudolf Steiner.
1931 Bio-dynamic management established at N. Sletner, Østfold
1950 Bio-dynamic Association established in Oslo , journal "Herba"
1971 NGO established in Bergen: "Alternativ jordbruk" (Alternative? Agriculture!). "Jordsøkjarsambandet" 1977, Norsk økologisk landbrukslag (NØLL) 1984. Originally "Back to the earth", gradually more and more the largest organic movement in Norway. Journal "Jordvett" 1982, later (since 2000?) "Ren mat"
1977 Research initiated by UMB (NLH) students, MSc theses
1980 1st organic extension service, MFBJ established, in NW Norway. Approved by NLR (LFR) 1984. Journal "Hummelposten", later "Økologisk landbruk"
1981 RCN (Research Council of Norway) appointed a committee to describe status, research needs and future potential for OFF in Norway
1985 1st research project in OFF funded by RCN (animal manure management, Dr. Sissel Hansen)
1985 UMB started education in organic farming (OF) methods
1985 More organic extension service: FABIO (Telemark, Buskerud, Vestfold) and FØKO (indre Østlandet – Hedmark++) established
1986 Certification body, Debio established, Bjørkelangen
1987 NORSØK (Norwegian Centre for Ecological Agriculture) established in Tingvoll
1988 "30 farm project", large project at NORSØK initiated by the Agricultural Agreement (AA) Research Fund; Whole farm case studies, 1988-1997
1988 Education in OF established at Sogn vocational school, Aurland
1990 Economic support for conversion and organic production introduced by the Ministry of Agriculture and Food (MAF)
1990 Organic extension service available in the whole country, support by the AA
1992 Specific OFF research programme launched by RCN
1994 Organic production officially approved as a part of the EEA-agreement (European Economic Area)
1995 Certified organic milk for sale (Dalsgården), premium price introduced 0,60 kr/litre for milk sold as organic
1997 NORSØK approved as public research institute and national centre of competence
1998 Professorship in agro-ecology including OF established at UMB, organic education established at HIH (Blæstad)
1999 Official goal of 10% organically managed farmland within 2010 declared by MAF
2000 1st Action Plan for Organic Farming launched by Norwegian Agricultural Authority (SLF)
2000 NØLL, the Norwegian herb grower association and the (organic) Producers' union formed Oikos, later Oikos Organic Norway
2003 SLF action plan revised, more emphasis on market development
2005 Red-green government declared the double 15% aim: 15% organic food production and consumption within 2015
2005 TINE put up a goal of 4% organic milk sales within 2010; current aim: 6% in 2015
2006 Bioforsk established
2008 Ministry of local government and regional development + MAF launched the project "Økoløft", 52 municipalities funding to be organic frontrunners
2009 Date for double 15% goal extended to 2020
2009 Most recent OFF action plan released by MAF: https://www.slf.dep.no/no/miljo-og-okologisk/okologisk-landbruk/handlingsplaner/publikasjoner.
2010 Frontrunner counties appointed: Sogn & Fj.+ Hordaland (fruit), Akershus+Østfold (public procurement), N-S.Trøndelag (dairy), Buskerud (cereals), Vestfold (vegetables)
2010 COOP challenges TINE by selling organic milk as a separate brand, "Änglagård"; Norwegian defence aims at 15% organic in 2012
2011 DIFI clarifies: Organic food = environmental consideration, public procurement should prefer organic food
2012 Retailer KIWI launches large campaign to support organic purchase, cutting costs equal to the VAT (value added tax, 15 % in Norway on food)
2015 Røros organic dairy company expands their production, new plant opened at Tolga (http://www.rorosmeieriet.no/drift-pa-tolga/)
2016 Collaboration project initiated: "Landbrukets økoløft" , with 30 "inspiration farmers" around Norway, lead by Organic Norway (Oikos)
2017 EU regulations 834/2007, 889/2008 and 1235/2008 finally implemented in Norway after boycott of purchasing organic salmon

«Milestone» 2018: No more public goal in Norway for organic production or consumption

Regjeringa.no

Søk

Tema | Dokument | Aktuelt | Departement

Du er her: Forsida • Aktuelt • Nyheiter •
Strategi for økologisk produksjon: Skal møte forbrukarane sin etterspurnad - 11.07.2018

Regjeringa med ny strategi for økologisk produksjon:

Skal møte forbrukarane sin etterspurnad

Nyheit | Dato: 11.07.2018

Regjeringa la, 25. mai, fram ein nasjonal strategi for økologisk jordbruk. Det har dei siste åra vore ein sterk vekst i etterspurnaden etter økologisk mat. Målsettinga er at økologisk produksjon skal utvikle seg i takt etterspurnaden frå forbrukarane. For å nå dette målet blir det etablert eit eige dialogforum og eit økologiprogram.

New strategy for OA from the Norwegian government, 2018:

- Organic production should cover the demand in the Norwegian market
- A forum for dialogue is established
- A national program for OA is established (covering mostly already established supportive measures)

- Demand decreasing --?
- Or value chains not designed to supply retailers and consumers with organic produce?
- Or value chains negative towards OA?

Nordmenn kjøper ikke lenger økologisk. Det taper Lars 140.000 kroner på bare i år

Bøndene ble oppfordret til å produsere mer økologisk, men kundene vil ikke ha det. I stedet selges frukten som ordinær vare. – Jeg taper åtte kroner kiloen, sier Lars J. Nå.

Silje Thalberg
Journalist

Publisert 3. sep. kl. 16:58

ØKOPLOMMER: For ti år siden la Lars J. Nå om plommeproduksjonen til økologisk drift. Økoplommene har vært kjempepopulære, men for to år siden snudde det. I år vil Nå gå på en økonomisk smell.
FOTO: PRIVAT

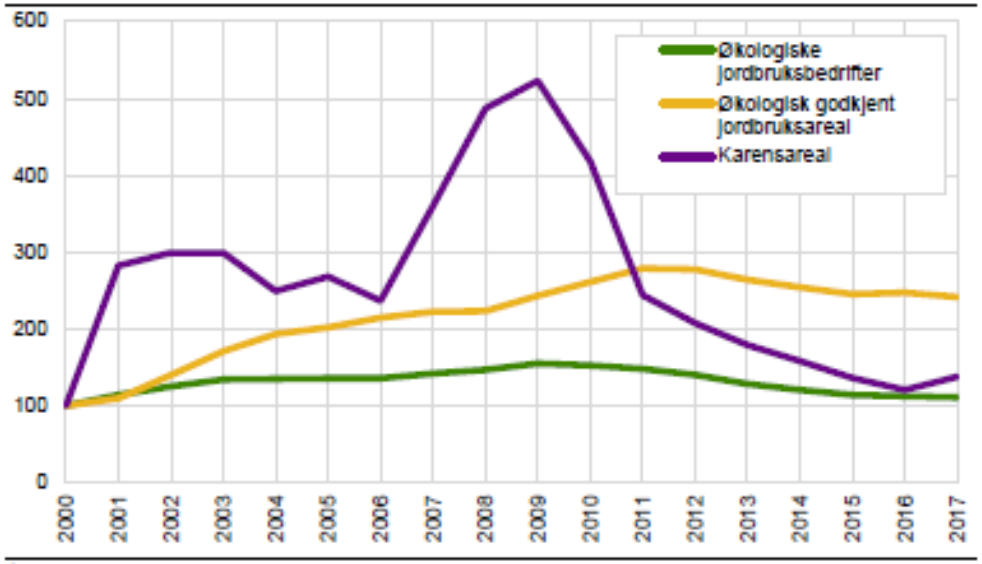
Organic agriculture in Norway

46 000 ha: 4.8 % of agricultural land;
5.1% of agricultural entreprises
(n= 40300)

Until 2017: Public goal of 15% organic production and consumption by 2020

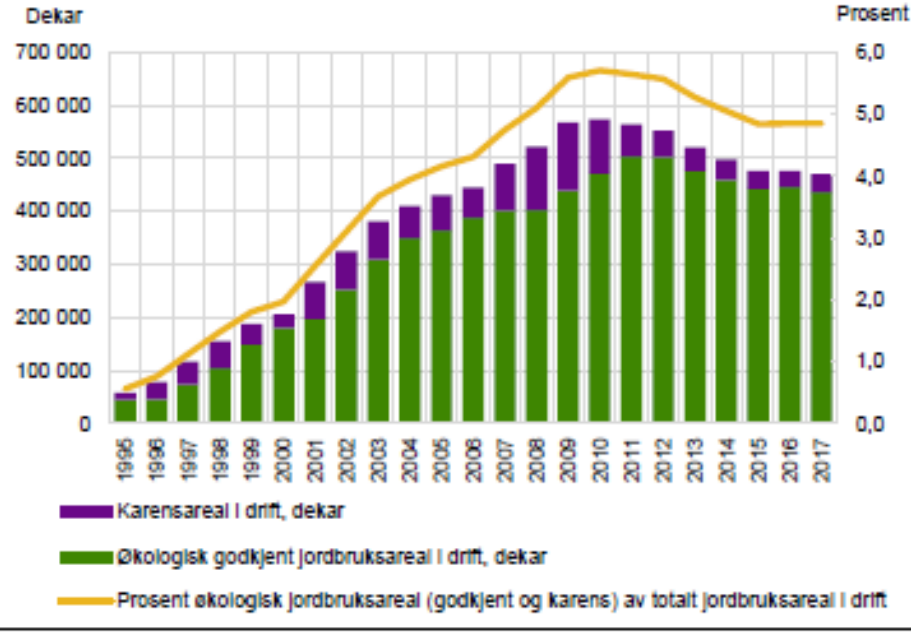
Source: SSB, Statistics Norway 2019
https://www.ssb.no/natur-og-miljo/artikler-og-publikasjoner/_attachment/380271?_ts=16970bfc590
(in Norwegian)

Figur 5.1 Indeks for utvikling i talet på økologiske jordbruksbedrifter, økologisk godkjent jordbruksareal og karensareal[1]. 2000=100



[1] Til og med 2011 er økologisk godkjent areal ute av drift tatt med.
Kjelde: Debio og Jordbruksstatistikk, Statistisk sentralbyrå.

Figur 5.2 Økologisk godkjent jordbruksareal og karensareal[1]



[1] Til og med 2011 er økologisk godkjent areal ute av drift tatt med.
Kjelde: Debio og Jordbruksstatistikk, Statistisk sentralbyrå.

Organic agriculture in Norway

- Perennial leys = 80% of the agricultural land (15% cereals, 5% other crops)
- Main productions = dairy cows (3.9 % of total) and sheep (2.6% of total)
- Egg production 7 % of total laying hens
- Market challenges, how much sold as organic?
- Cow milk: 54 % in 2015, 57% in 2016
- Meat 52% (2015)
- Eggs 90%, poultry meat 90% (2015)

Animal welfare-organic fodder-less veterinary drugs

Organic dairy cow farms often cooperative

Skaun økomjølk, S.Trøndelag

113 hectar

70 dairy cows

4-5 years of ley,

2 years barley or green fodder

8300 kg milk/cow

28% concentrates

Applies conventional pig manure

Source: Torbjørnsen 2015
https://okologisklandbruk.nlr.no/media/ring/3550/nr%202%2015/31-33.pdf (in Norwegian)

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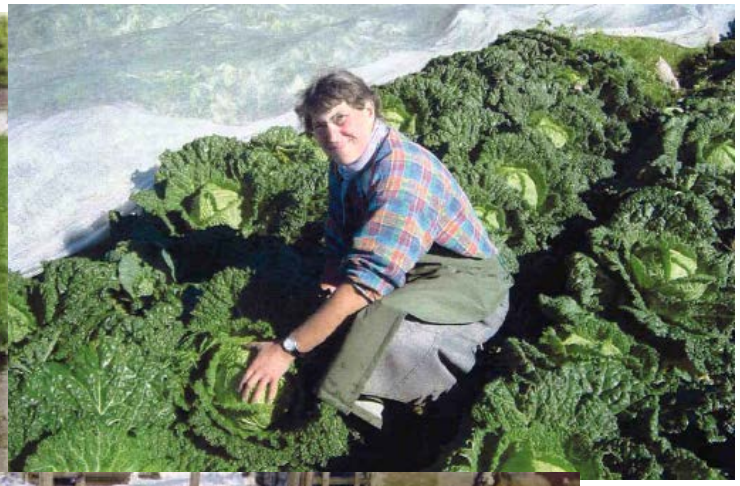
A diversified organic vegetable farm

Vågsholt, Grimstad, Aust-Agder



28.5 hectar

49 ewes (adult sheep) + lambs

Winter wheat
Carrots
Potato
Cabbage
Blue berries
Lettuce
Maize

Grenhouse: Cucumbers, tomato

Fodder for the sheep

Source: Agdermat
http://www.agdermat.no/agdermat/vedlegg/Presentasjon-Vagsholt-Gard.pdf (in Norwegian)

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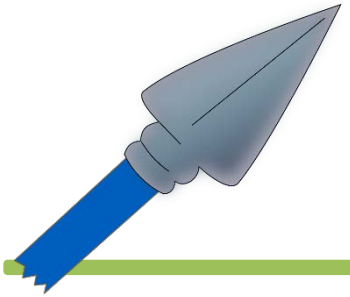
OA as a «spear tip» for increased sustainability – Norwegian examples

Regjeringen mener at økologisk landbruk har en spydspissfunksjon som kan bidra til å fremme et mer miljøvennlig jordbruk generelt (p. 136).

The Government considers that organic agriculture has a function as a spear tip that may foster a more environmentally friendly agriculture in general

Further reading (in Norwegian):
Solemdal & Serikstad 2015
http://orgprints.org/30179/



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Organic farming has affected research and development

Introducing innovative research topics such as participatory research, farm level studies, soil biology:

- Whole farm case studies
- Farm level nutrient budgets
- Farming system comparisons
- Effect of anaerobic digestion on soil biology

Long-term experiment (1989-) to compare conventional, integrated and organic farming systems at NIBIO Apelsvoll, Kapp, Norway

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Composting

Optimizing the utilization of organic material, replace peat in growth media

Ulike jordprodukter til oppal av småplanter, her i test med blomkål. Nr. 9 er hestegjødselkompost og nr. 10 er løv- og hestegjødselkompost.

Compost from horse manure (9) and horse manure mixed with leaves (10) gave very good plantlets of cauliflower compared with commercial growth substrates. Study by Kirsty Mc Kinnon, NORSØK

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Soil fertility and legumes

- Soil structure, organic matter, compaction
- Increased interest in legumes, diverse utilization

Example: http://www.fao.org/3/a-i4803e.pdf: FAO recommends agroecology to reverse soil degradation and achieve food security, e.g. by increasing and monitoring soil organic matter, facilitating and monitoring of soil biology and building on local farmers' knowledge

GHANA - Wendu. Hedgerow intercropping. Hedgerow of Laucaena leucocephala (Leguminosae) and maize as a companion crop in a field at Wenchi. Leucaena fixes nitrogen. ©FAO/Pietro Cenini

Cover crops: Cover crops are usually leguminous crops grown to improve soil health by guaranteeing permanent soil cover, adding organic matter to soil and fixing atmospheric nitrogen. These help reverse soil degradation even in densely populated areas where long term fallows are simply no longer possible.

The use of Mucuna spp. as a cover crop in different African locations has increased soil organic matter, improved nitrogen availability in soils and positively affected yields.

Mucuna = Velvet bean

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Non-herbicide weed management

- weed harrowing
- flaming before seed germination
- thermal weed management
- robots and advanced weed equipment

38 weed species resistant towards glyphosate

- Glycines (glyphosate) = herbicides inhibiting 5-enolpyruvylshikimate-3-phosphate (EPSP) synthase
- EPSP = key enzyme in the shikimic acid pathway
- Shikimic acid pathway = involved in the synthesis of the aromatic amino acids tryptophan, tyrosine, phenylalanine
- Depletion in amino acides implies hampered synthesis of protein
- Glyphosate resistant crops are designed with alternative EPSP enzyme

- Resistant species comprise several grass species such as Lolium perenne (Italian and perennial ryegrass), Lolium rigidum, Poa annua, Bromus species (Australia)

- Resistance towards herbicides is a large problem for conventional plant production; weeds rapidly develop resistance towards new herbicides

Sources:
http://www.weedscience.org/Summary/MOA.aspx?MOAID=12
http://www.norsklandbruk.no/plantekultur/akende-resistens-mot-plantevernmidler/

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Thermal treatment of seeds instead of (toxic) coatings

Animal welfare

- More space
- Restrictions on slatted floors
- Outdoor access for all animals
- Demand for grazing also by loose housing of dairy cows
- At least 2 times a week, outdoor access all year for fixated cows
- Cow-calf relationship; increased focus on calf welfare (At least 3 days cow-calf together)
- Less concentrates in feed ration
- Pigs: Access to straw etc., piglets with the sow 40 days before rearing (conv: 28)

Animal health

Poultry:

Experiences showed chicken performed well without feed antibiotics, narasin (banned 2016)

SLUTT PÅ ANTIBIOTIKABRUK: All norsk kylling skal være Narasin-fri i løpet av 2016. Foto: NTB SCANPIX / SHUTTERSTOCK

Seier for forbrukerne: Antibiotikafôret kylling fases ut i løpet av året

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Antibiotics in animal feed in Norway?

CERTAINLY NOT!

….Hmmm, what about Narasin?

Public position: Not an antibiotics.. only a «coccidiostatic», used in all conventional poutry feed.. The Norwegian Food Safety Authority claimed that this addition was necessary for animal health and welfare.

Hva er narasin?

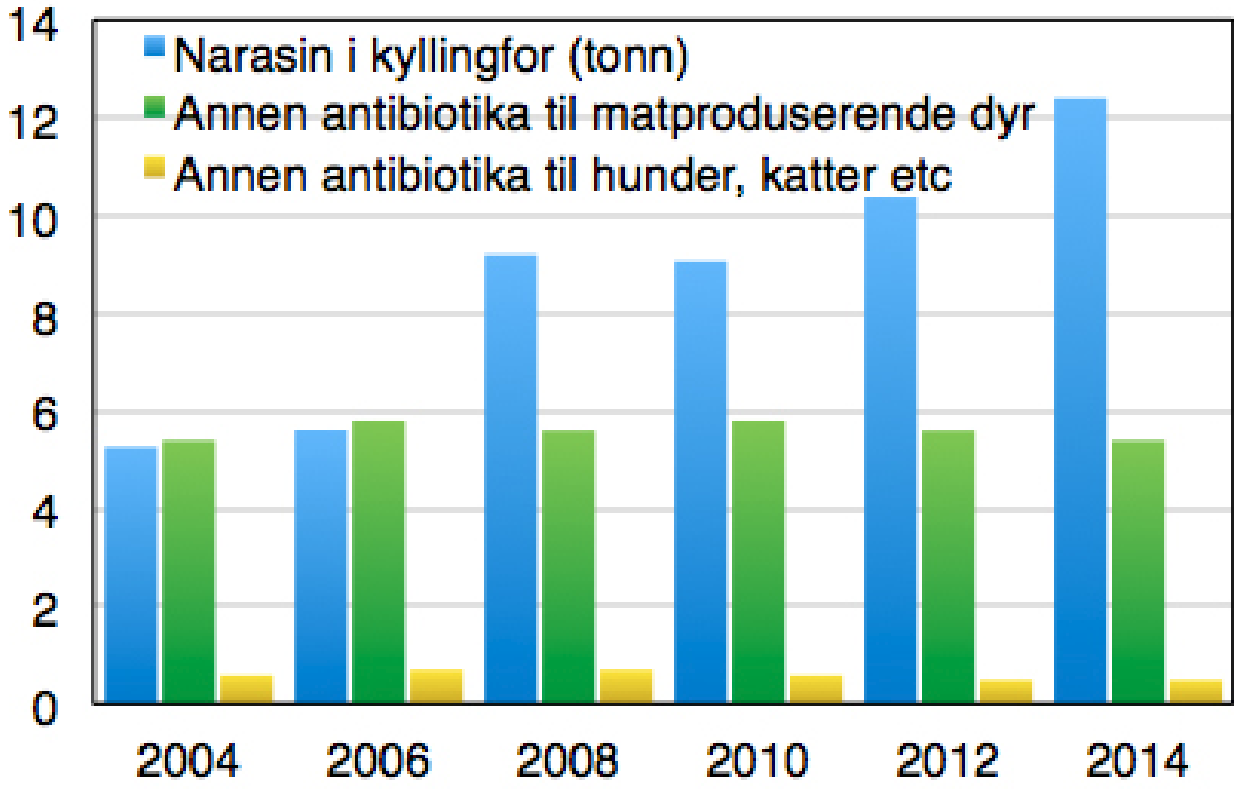
Narasin er et godkjent fôrtilsetningsstoff som er klassifisert i tilsetningsstoffgruppen koskidiostatika. Dette brukes i fôret til slaktekylling for å motvirke koksidier, som er en type encellete parasitter som kan gi alvorlig tarmsykdom hos kylling. Å bruke koksidiostatika som forebyggende tiltak for å kontrollere koksidiose i moderne slaktekyllingproduksjon er nødvendig av både dyrehelse- og dyrevelferdsmessige grunner.

Mattilsynet

Statens tilsyn for planter, fisk, dyr og næringsmidler

From 2014 to 2014, the consumption of poultry meat increased rapidly, along with a steady increase in the use of Narasin

Årlig forbruk av narasin til kylling i Norge sammenlignet all annen antibiotika brukt på matproduserende dyr, samt mengden antibiotika brukt på kjæledyr som katter og hunder. Alle tall i tonn.



https://forskning.no/mat-veterinaermedisin/2014/12/ti-ting-du-bor-vite-om-narasin-og-kylling

In 2014, Swedish scientists warned that Narasin may lead to development of resistance in bacteria towards vancomycin, which is a «final solution» antibiotics and crucially important in human medicine:

Laboratorieforsøk i Sverige har vist at enkelte bakterier som eksponeres for narasin, kan utvikle motstandsdyktighet. Denne resistensen er koblet med resistensgener overfor antibiotikumet vancomycin. Vancomycin er forbeholdt behandling av alvorlige infeksjoner hos mennesker, og resistens mot dette middelet er svært uheldig.

Scared by consumer reactions and significant droppings in sales, within the end of 2016, Norwegian producers of chicken had found a way to eliminate Narasin in chicken feed by vaccination of the chicken

Still, about 1 ton a year with coccidiostatica is used in Norwegian poultry feed– for young TURKEY (8-9 weeks)

Source:https://www.mattilsynet.no/dyr_og_dyrehold/for/forstatistikk_landdyrfor_2018.34378/binary/F%C3%B4rstatistikk%20landdyrf%C3%B4r%202018

Tabell 1: Bruk av koksidiostatika i fjørfefôr fra 2014 til 2018

	2014		2015		2016		2017		2018	
	Tonn blandi ng	Kg aktivt stoff	Tonn blandi ng	Kg aktivt stoff	Tonn blandi ng	Kg aktivt stoff	Tonn blandi ng	Kg aktivt stoff	Tonn blandi ng	Kg aktivt stoff
Monensin-Na	15824	1313	12068	1081	10053	874	9856	875	9030	820
Narasin	182790	12409	134848	9126	8038	562	1311	92	741	52
Lasalocid			1581	164						
Blnd. totalt m/koksid-iostatika	198614	-	148497	-	18091	-	11167		9771	

Organic vs. Conventional production of turkey

Producers of organic chicken have have always managed without Narasin in feed, due to more space, access to outdoor area and diverse varied feeding

Dyrevelferd

En av de få som driver med økologisk kylling i Norge er Kjell Frøyland i Hattefjeld i Tistedal som ligger i Halden kommune. Han og kona leverer nesten 9000 økologiske kyllinger gjennom Stangekylling hvert år. Frøyland har drevet økologisk i seks år. Tidligere drev de konvensjonelt.

– Vi har ikke hatt nevneverdig problem med sykdom, sier Frøyland. Han tror dyra blir mer robuste fordi de har mer plass og får gå ute. Han merker en del skepsis fra veterinærhold til økologisk kyllingproduksjon, men den mener han er ubegrunnet.

Frøyland har tro på at kyllinger som får variert kosthold og har god plass holder seg friskere enn de som står tett. Et viktig motiv for å legge om til økologisk var at dyrevelferden ble bedre i et økologisk opplegg.

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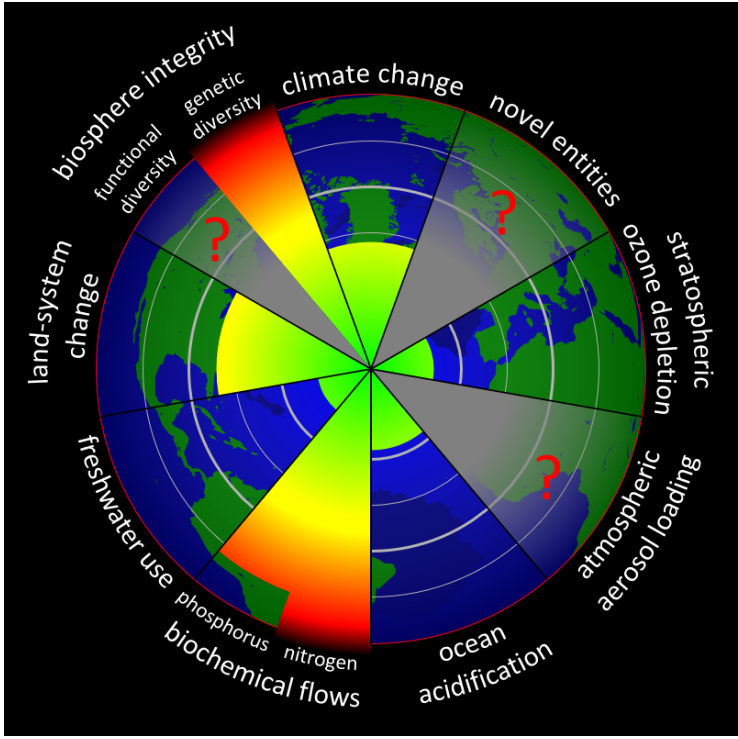
Another example: More diverse marketing and distribution

- Farmers' markets
- Box schemes
- Community supported agriculture

-- often include organic produce, or are organically managed

Environmental effects

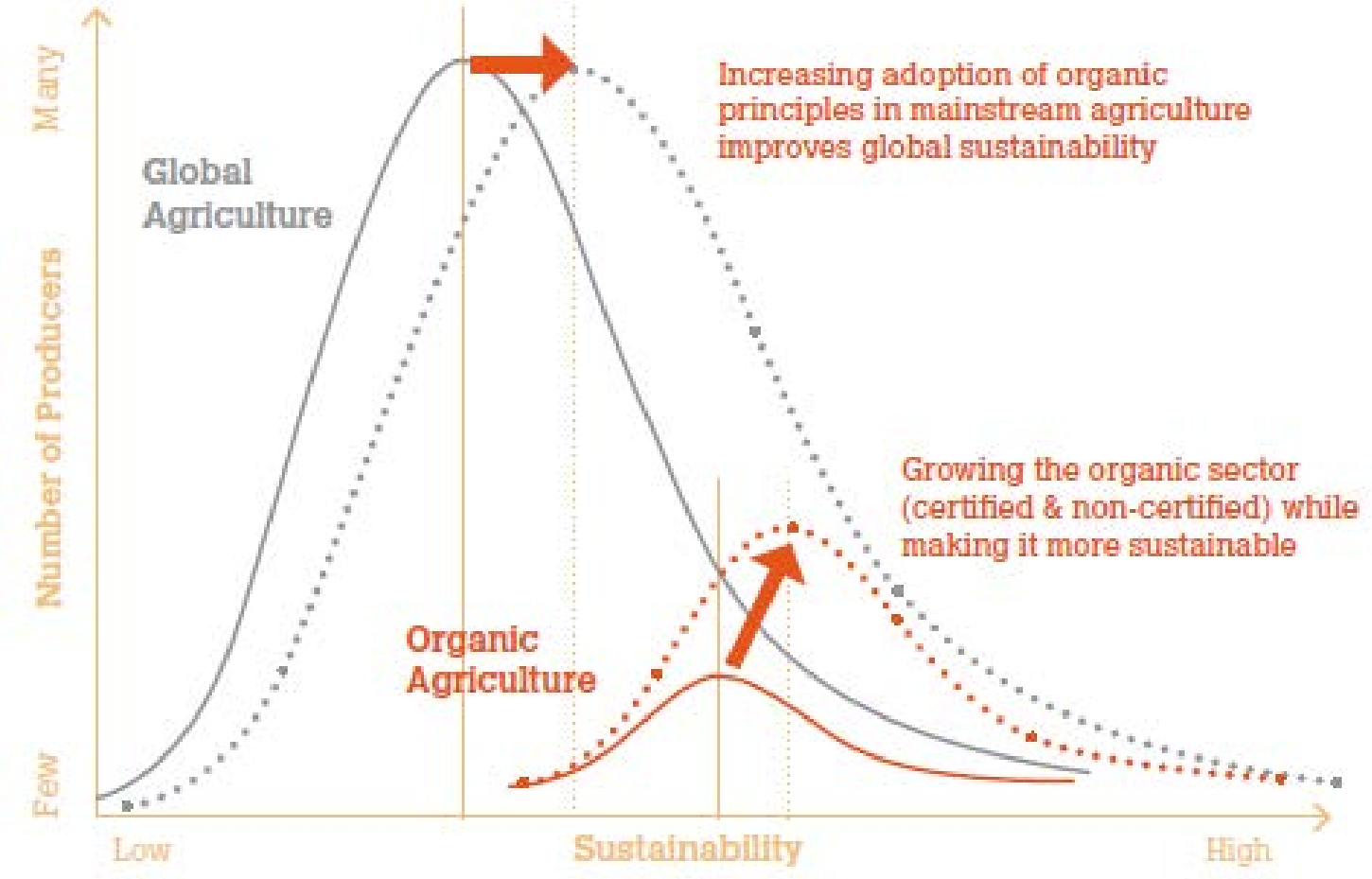
- Nutrient budgets with lower surplus; better farm level N efficiency
- Lower risk of nitrate pollution to water bodies (take care in arable systems!)
- More diversified production and long-term leys may accumulate more soil organic matter (climate mitigation)
- Mineral N fertilisers contribute significantly to stress the planetary boundary for N, causing acidification, eutrophication etc.



Kilde: Rockström et al 2009/wikipedia: Planetary boundaries

Outlook – Organic 3.0?

- FAO: Agroecological methods have a large potential to reduce hunger
- More work demanded in OA = positive when unemployment rates increase
- Conversion of public areas (role model), sensitive areas (environmental protection), public catering (supporting sustainable development)



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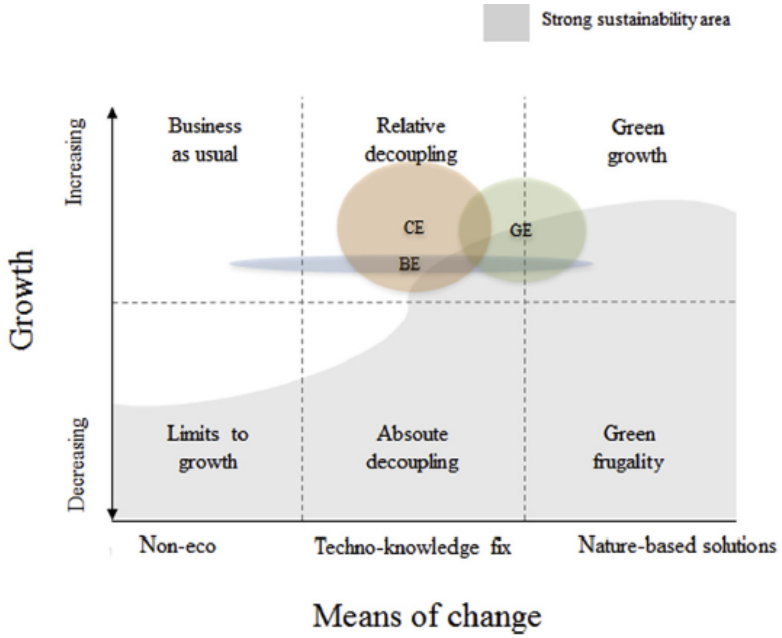

Bissniss as usual – or green frugality (NO: nøysomhet)? = strong sustability)

Fig. 7. The position of the sustainability concepts along different combinations of growth and means of change. Figure modified from Franceschini and Pansera (2015). The size of the circles represents the amount of retrieved literature dealing with the individual concept.

Table 2
Six narratives describing the economic dimension of sustainability (based on Franceschini and Pansera, 2015).

Narrative	Definition
Business-as-usual	Economic growth is prioritized, environmental sustainability is not explicitly pursued. Sustainability is given by the efficient conversion of natural capital into human-made capital.
Relative decoupling	Natural and human-made capitals cannot be considered interchangeable. Negative environmental impacts can be partly avoided through increasing eco-efficiency in pursuing economic growth.
Green growth	Economic growth and environmental sustainability can be reconciled and can have mutual positive feedback. This process if fuelled by nature-based solutions, i.e. ecological adaptation and resilience; these are conceived in opposition of or in addition to techno-knowledge solutions.
Limits to growth	Technological development does not meet the needs of human society. The natural limits of the planet produce a shrink or collapse in economic growth.
Absolute decoupling	Natural and human-made capitals cannot be considered interchangeable. Economic growth is not excluded as long as negative environmental impacts can be completely avoided through increasing eco-efficiency. Environmental sustainability is thus prioritized over growth.
Green frugality	Awareness of ecological limits and limits to growth are sought; techno-knowledge solutions are substituted or complemented with nature-based solutions, ecological adaptation and resilience.[a]

[a] Concrete solutions to the management of natural resources that build on the understanding of ecosystem services, e.g. using restoration of wetlands' ability to retain and purify water as part of water management (Kettunen and Ten Brink, 2015).

Source/Further reading:
D'Amato et al. 2017: Green, circular, bio economy: A comparative analysis of sustainability avenues
https://doi.org/10.1016/j.jclepro.2017.09.053

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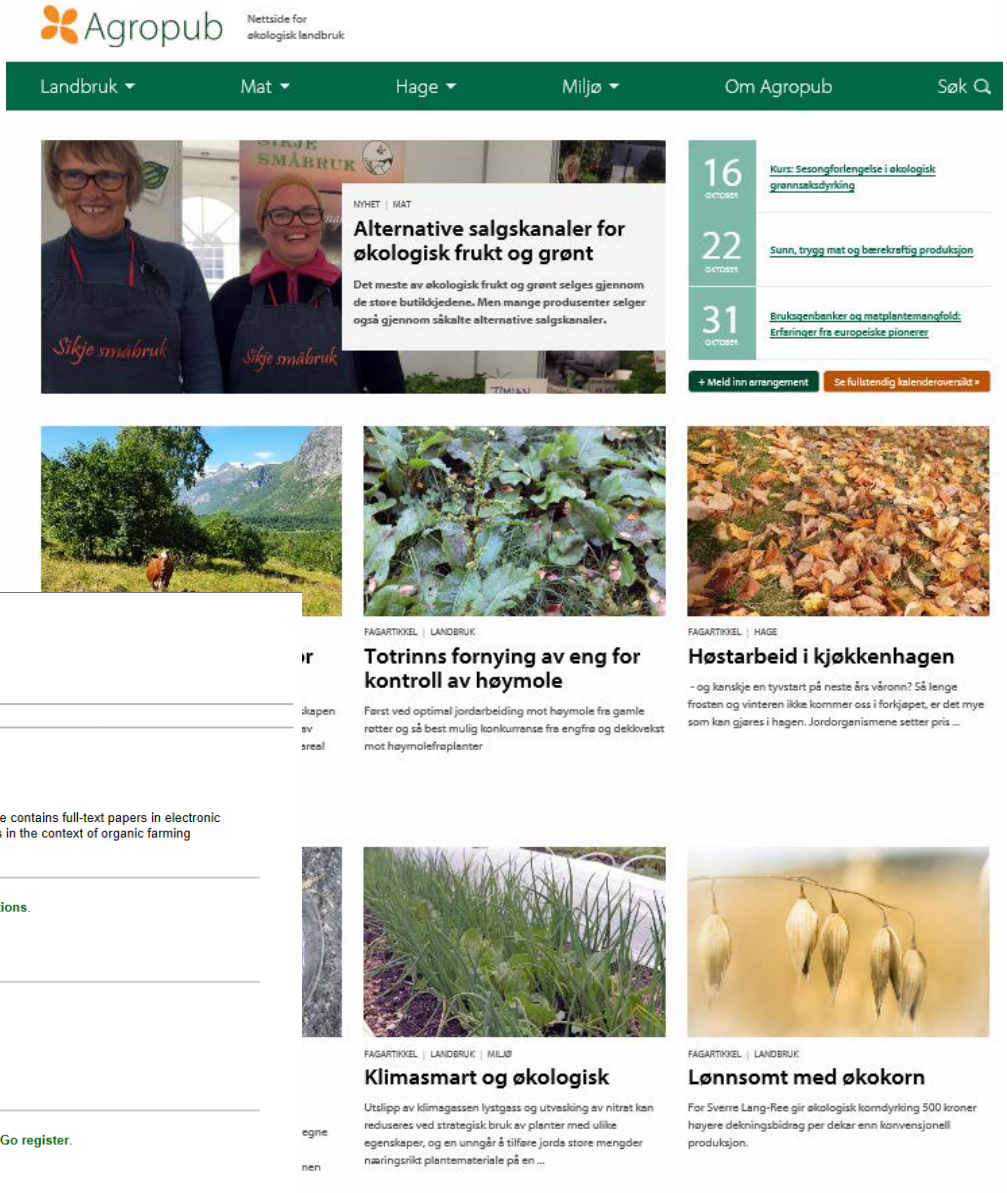
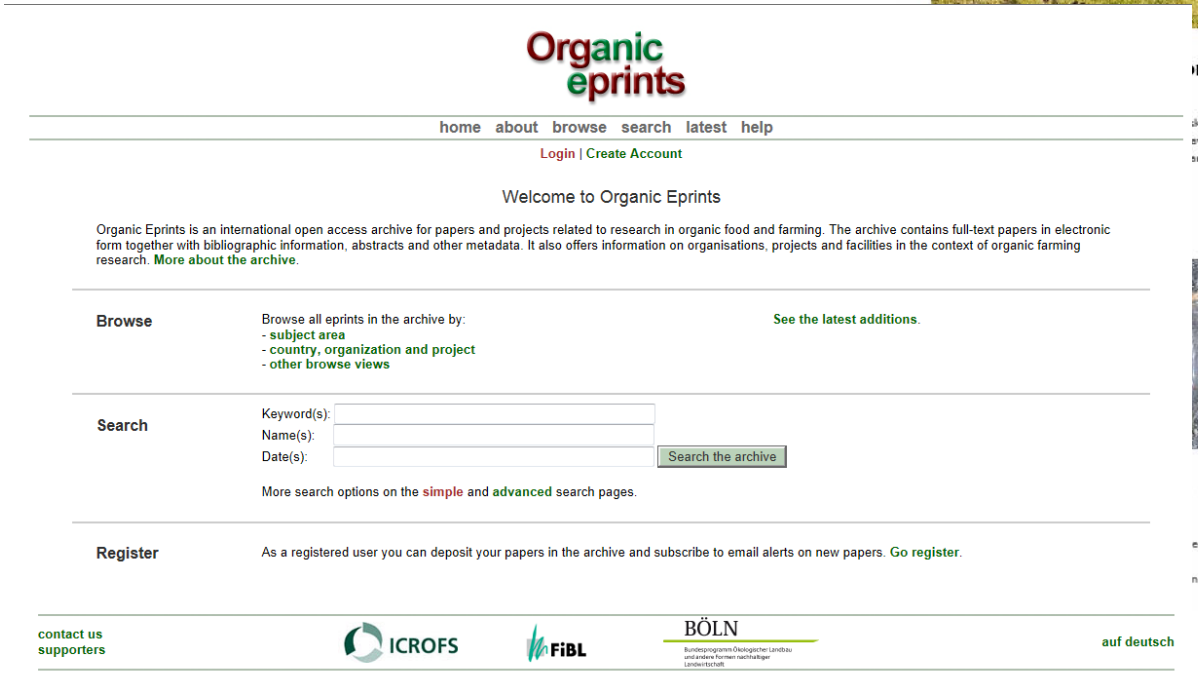
Two important sources of information:

www.orgprints.org

www.agropub.no





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