Landwirtschaft und Umwelt

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update 10/2025

Entwicklungen, Züchtung, Ziele
Konventionelle Methoden Biotech
GVO, Klonieren, Crisp
Green Revolution
Öko Ziele, Values, Trade
Organic farming principles
Organic farming forms
Healthy soil, yields, sustainability
Local or organic, trading

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Webs

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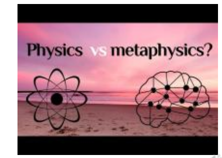
From the view of natural science, in the light of scientifc methods, Epistemologie



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WHO, UN-, Risk Assessment

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Direct, indirect risks consequences

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Why farm?

- Increase yields
- To decrease the risk of loss, weeds, pests, environmental hazards

- Eventually, people transported some wild plants (such as wild cereals) from their natural habitats to more productive habitats and began intentional cultivation.

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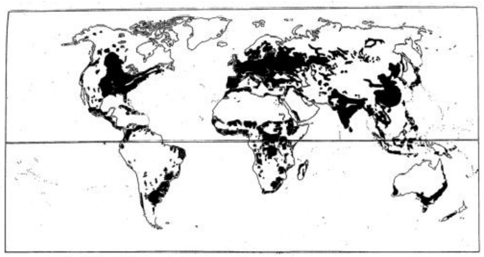
Arable Land: Where is it?



The world distribution of arable land *Source: The Times Atlas of the World*, London, 1968, pp. XXVI–XXVII

7

12,000 BC

- People of the Natufian culture, living in the Southwest Asia (Middle East) begin to cultivate cereals; grasses grown for their edible seeds.
- (Ceres - the Roman goddess of grain.)

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9,800 BC

- Earliest evidence for domesticated wheat is found at sites in the Middle East.

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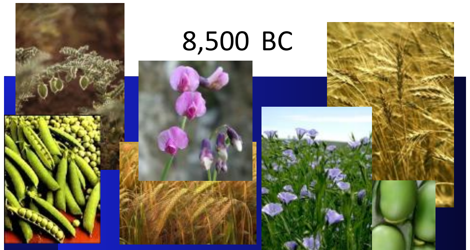
8,500 BC



- People across the Fertile Crescent begin growing domestic wheat, barley, chickpeas, peas, beans, flax and bitter vetch.

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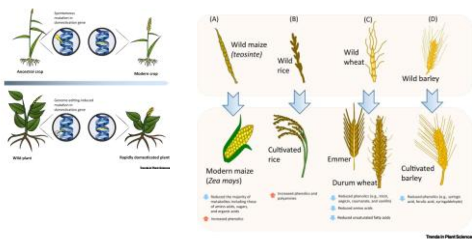

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Coevolution: crops Society
Spread, centers of origin

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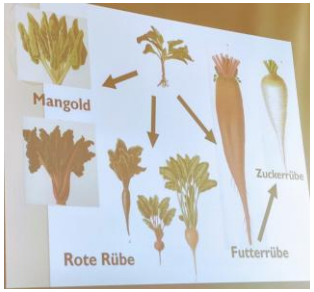

stammen von derselben Wildart und Familie (Gänsefuß-gewächse) ab

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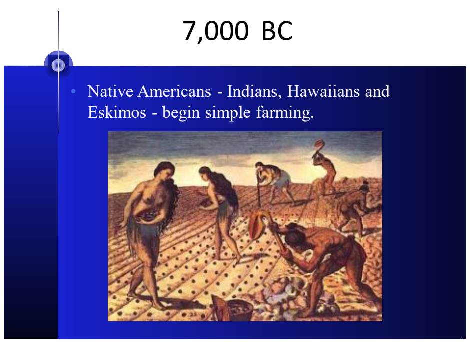

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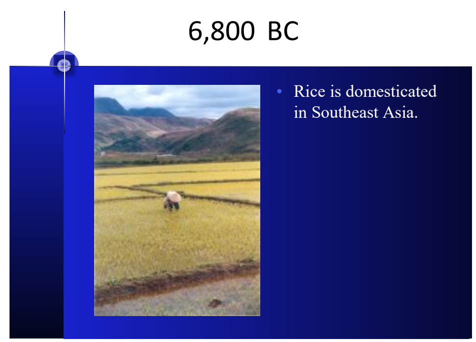

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18

6,500 BC


- Evidence that cattle are domesticated in Turkey.

19

4,000 BC, Cont'd

- Evidence that rice is domesticated in northwestern Thailand.

20

Plowing the Fields

21

4,000 BC


- Egyptians discover how to make bread using yeast.

22

3,500 BC

- First agriculture in the Americas, around Ecuador.

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2,000 BC


- Evidence of the domestication of chickens around India. (Some sources state that this may have happened earlier in other parts of the world.)

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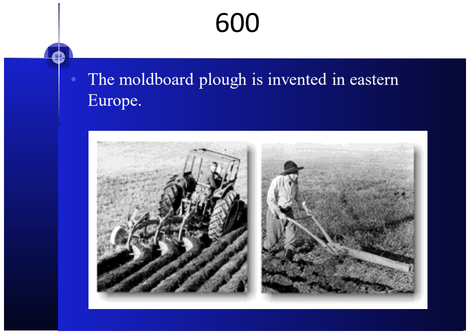

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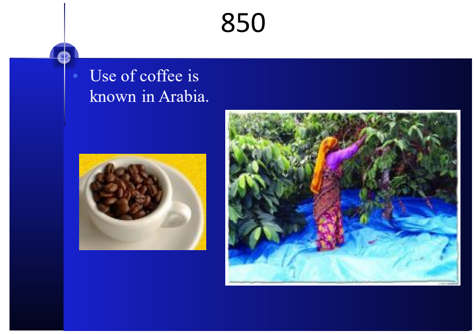

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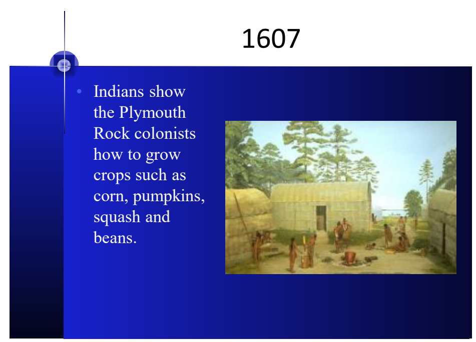

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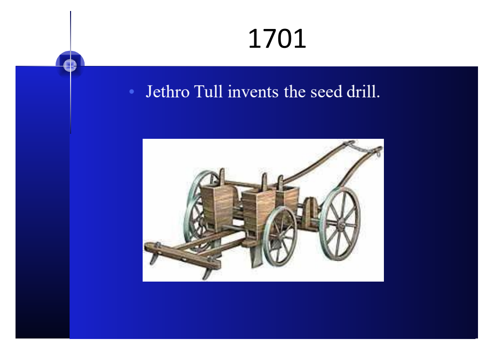

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Modern Seed Drill

31

1809

- Nicholas Appert invents canning for food preservation.

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1834

- Cyrus McCormick invents the reaper.
- mowing

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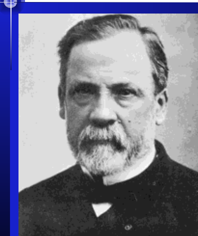
1855

- Gregor Mendel publishes his paper describing Mendelian Inheritance.

35

1871



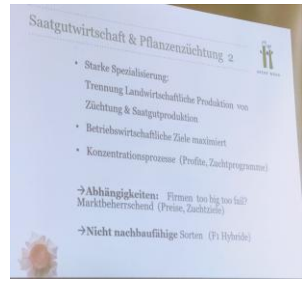
- Louis Pasteur invents pasteurization.

36

2000s

- Improved varieties of corn are developed. These varieties exhibit additional resistance to pests and diseases.

37



38

2000s

- Development of new pesticides.

39

2000s

- Genetically modified organisms are cultivated around the world.

40

2000s

- ***Biotechnology***, the science to change organisms or their environment, or to get products from organisms, begins to be used.

41

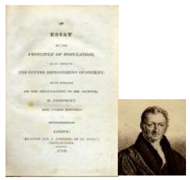
CGIAR Consultative Group on International Agricultural Research.
http://www.cgiar.org

11

42

T. Malthus: 1766- 1834
Crisis in food production

Malthus' Basic Theory



12

43

Models for population growth and food security:

Pessimistic or Alarmist Theory

Malthus - 19th century, Coale & Hoover (1958), Paul Ehrlich (Population Bomb), Meadows (Limits to Growth) – 1960s and 1970s. Focus on population policy & fixed, non-renewable resources.

Optimistic Theory
Ester Boserup – 1960s – 70s (agric. Intensification)
Julian Simon – 1970s - 80s (human capital)

Neutralist or Revisionist Theory

Allen Kelley/Ron Lee/Simon Kuznets/Nat'l Academy of Sciences 1986 Report – mid 1980s to the present. Focus on longer-term, policy feedbacks, mixed impacts, renewable resources & property rights.
Population Matters by Nancy Birdsall et al – 1990s (surveys confirm overall negative impact of population growth on per capita output growth across a large # of countries)

44

GREEN Revolution

Term coined by U.S. Agency 1968)
Movement to increase yields by using:
. New crop cultivars
. Irrigation
. Fertilizers
. Pesticides
. Mechanization
A planned international effort funded by:
Rockefeller Foundation
Ford Foundation
Many developing country
governments
Purposed to eliminated hunger by improving
crop performance Norman Borlaug (1970
Nobel price)

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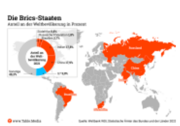
45

Oekonomic power groups



46

Green Revolution

Development of new varieties (originally of wheat in Mexico and rice in the Philippines) during the 1950s and 60s.

High yielding varieties (HYVs) (also known as modern varieties (MVs)) were more responsive to inorganic fertilizer and irrigation, and faster maturing. Bred with pest and disease resistance.

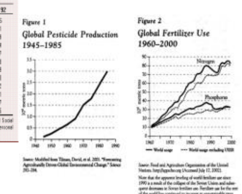
47

Green revolution

Table 10.1 Trends in Yields in 93 Developing Countries

Crop Type	Yield (kilograms per hectare) 1961/63	1969/71	1979/81	1990/92
All cereals	1,171	1,461	1,894	2,466
Excluding China	1,116	1,271	1,557	1,951
China	1,336	2,070	3,017	4,329
Wheat	868	1,153	1,637	2,364
Excluding China	964	1,146	1,460	1,997
China	673	1,169	2,046	3,208
Rice	1,818	2,218	2,653	3,459
Excluding China	1,650	1,865	2,145	2,798
China	2,355	3,281	4,236	5,722
Maize	1,157	1,456	1,958	2,531
Excluding China	1,122	1,291	1,572	1,837
China	1,285	2,005	3,038	4,545

Source: Nikos Alexandratos, Chief of Global Perspective Studies Unit, Economic and Social Department, Food and Agriculture Organization of the United Nations, Rome, 1995 (personal communication, based on data from *FAOSTAT-Mainframe*).



14

48

Green revolution: Sustainability

From the perspectives of feeding a growing population, the Green Revolution was a smashing success.

Behind this success story, however, are some disturbing issues:
Planting with identical high yield varieties:
・reduces genetic diversity and increases vulnerability to pests,
・ necessitating heavy use of pesticides.
・Agriculture makes heavy use of fresh water.
・High dependency on technology.
・Questionable sustainability.

Cropland per capita is declining world-wide, as agriculture land is degraded, or urbanized. Increasing the yields from available farmland appears to be the key to increased food production ?

15

49

Critiques of Green Revolution

1. "Social" critique
   a. the green revolution didn't fix problems associated with access by the poor
   b. technology destroys social fabric
2. "Scientific" critique
   a. the green revolution escalated uses of technology, especially environmentally damaging technologies
   b. GR reduced genetic diversity

50

Millennium Ecosystem assessment, 2001-2005

51

Overview of Findings

- Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber and fuel
- The changes that have been made to ecosystems have contributed to substantial net gains in human well-being and economic development, but these gains have been achieved at growing costs in the form of the degradation of many ecosystem services, increased risks of nonlinear changes, and the exacerbation of poverty for some groups of people
- The degradation of ecosystem services could grow significantly worse during the first half of this century and is a barrier to achieving the Millennium Development Goals
- The challenge of reversing the degradation of ecosystems while meeting increasing demands for their services can be partially met under some scenarios that the MA has considered but these involve significant changes in policies, institutions and practices, that are not currently under way

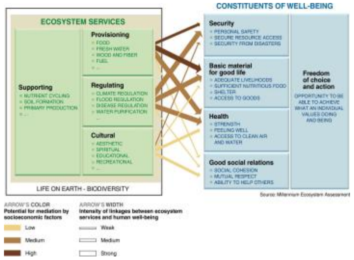
52

Focus: Ecosystem Services

The benefits people obtain from ecosystems

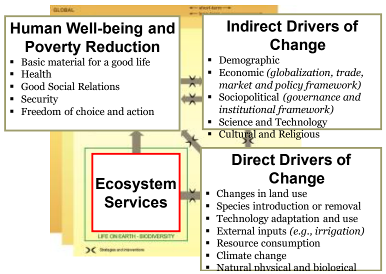
53

Focus: Consequences of Ecosystem Change for Human Well-being



54

MA Framework



55

MA Findings - Outline

- 1. Ecosystem Changes in Last 50 Years
- 2. Gains and Losses from Ecosystem Change

Three major problems may decrease long-term benefits

  - Degradation of Ecosystem Services
  - Increased Likelihood of Nonlinear Changes
  - Exacerbation of Poverty for Some People
- 3. Ecosystem Prospects for Next 50 Years
- 4. Reversing Ecosystem Degradation

56

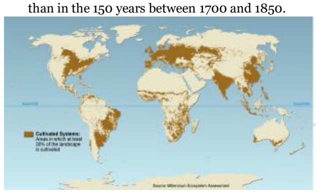
Finding #1

- Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history
- This has resulted in a substantial and largely irreversible loss in the diversity of life on Earth

57

Unprecedented change in structure and function of ecosystems

•More land was converted to cropland in the 30 years after 1950 than in the 150 years between 1700 and 1850.



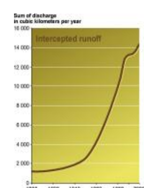
Cultivated Systems in 2000 cover 25% of Earth's terrestrial surface

(Defined as areas where at least 30% of the landscape is in croplands, shifting cultivation, confined livestock production, or freshwater aquaculture)

58

Unprecedented change: Ecosystems

- 20% of the world's coral reefs were lost and 20% degraded in the last several decades
- 35% of mangrove area has been lost in the last several decades
- Amount of water in reservoirs quadrupled since 1960
- Withdrawals from rivers and lakes doubled since 1960



Intercepted Continental Runoff: 3-6 times as much water in reservoirs as in natural rivers

(Data from a subset of large reservoirs totaling ~65% of the global total storage)

59

Limits of Carrying capacity : MA, Changes in direct drivers

Habitat transformation:

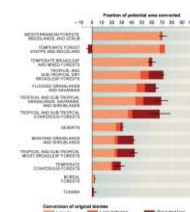
- Further 10–20% of grassland and forestland is projected to be converted by 2050

Overexploitation, overfishing:

- Pressures continue to grow in all scenarios

Invasive alien species:

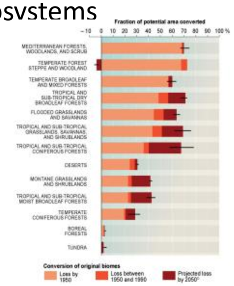
- Spread continues to increase



60

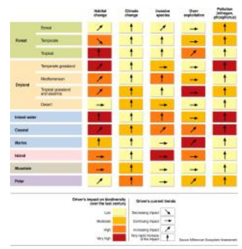
Unprecedented change: Ecosystems

- 5-10% of the area of five biomes was converted between 1950 and 1990
- More than two thirds of the area of two biomes and more than half of the area of four others had been converted by 1990



61

Direct drivers growing in intensity

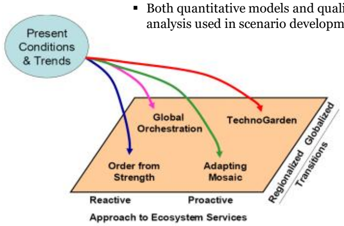


- Most direct drivers of degradation in ecosystem services remain constant or are growing in intensity in most ecosystems

62

MA Scenarios

- Not predictions – scenarios are plausible futures
- Both quantitative models and qualitative analysis used in scenario development



63

Scenario Storylines

- **Global Orchestration** Globally connected society that focuses on global trade and economic liberalization and takes a reactive approach to ecosystem problems but that also takes strong steps to reduce poverty and inequality and to invest in public goods such as infrastructure and education.

- **Order from Strength** Regionalized and fragmented world, concerned with security and protection, emphasizing primarily regional markets, paying little attention to public goods, and taking a reactive approach to ecosystem problems.

64

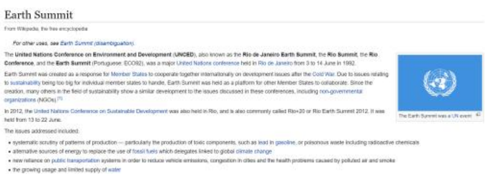
Scenario Storylines

- **Adapting Mosaic** Regional watershed-scale ecosystems are the focus of political and economic activity. Local institutions are strengthened and local ecosystem management strategies are common; societies develop a strongly proactive approach to the management of ecosystems.

- **TechnoGarden** Globally connected world relying strongly on environmentally sound technology, using highly managed, often engineered, ecosystems to deliver ecosystem services, and taking a proactive approach to the management of ecosystems in an effort to avoid problems.

65

Earth Summit (RIO) 2012



Earth Summit

From Wikipedia, the free encyclopedia

For other uses, see Earth Summit (disambiguation).

The **United Nations Conference on Environment and Development** (**UNCED**), also known as the **Rio de Janeiro Earth Summit**, the **Rio Summit**, the **Rio Conference**, and the **Earth Summit** (Portuguese: ECO92), was a major United Nations conference held in Rio de Janeiro from 3 to 14 June in 1992.

Earth Summit was created as a response for Member States to cooperate together internationally on development issues after the Cold War. Due to issues relating to sustainability being too big for individual member states to handle, Earth Summit was held as a platform for other Member States to collaborate. Since the creation, many others in the field of sustainability show a similar development to the issues discussed in these conferences, including non-governmental organizations (NGOs).[1]

In 2012, the United Nations Conference on Sustainable Development was also held in Rio, and is also commonly called Rio+20 or Rio Earth Summit 2012. It was held from 13 to 22 June.

The issues addressed included:

- systematic scrutiny of patterns of production — particularly the production of toxic components, such as lead in gasoline, or poisonous waste including radioactive chemicals
- alternative sources of energy to replace the use of fossil fuels which delegates linked to global climate change
- new reliance on public transportation systems in order to reduce vehicle emissions, congestion in cities and the health problems caused by polluted air and smoke
- the growing usage and limited supply of water

The Earth Summit was a UN event

66

http://www.resalliance.org/

67

ESSP:http://www.essp.org/

68

http://ecotippingpoints.org/resources/understanding-how-ecotipping-points-work.html

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Case study environmental tipping point: Apo Island

http://www.sdvillage.ph/biodive/apoislan

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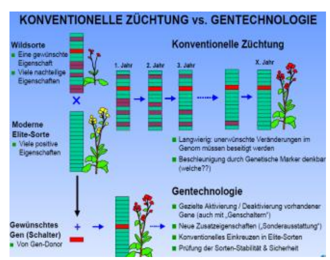
Plant breeding, selection

Breeding, yield, time for development



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71

Selection

- Artificial versus natural selection (pp.
- Humans have selected for the properties they desired in plants. Selection has been both unconscious and purposeful.
- With either type, there must be heritable variation upon which selection can work.

- The plant nucleus contains pairs of homologous chromosomes that contain the genes.
- A duplicate set of these homologous chromosomes occurs in each cell of the plant (diploid number).
- But, the same form of the gene may not occur in both. Different alleles. Homozygous and heterozygous.
- Many important crop characters appear to be controlled by one gene, but others not.

72

Genes and alleles, Mutations

- In populations of plants under natural selection, there are often individuals with different alleles for any particular gene.
- Sexual reproduction (meiosis and fertilization) normally tends to maintain variation in populations. Inbreeding tends to reduce variation.
- Although we usually consider a single gene, in practice, thousands are being crossed each time meiosis and fertilization occur.

- Sometimes mutations create new allelic combinations. Ultimately, the only source of new alleles in a population is mutation.
- Mutations that are better for the plant or for humans are quite rare. For new alleles derived from mutations to be established in a population of plants, sexual reproduction must occur.

73

Variation

- Sexual recombination is the mechanism for maintaining variation in natural populations.
- Sometimes alleles enter a population by immigration from other populations.
- "Crossing over" is an important effect in making new combinations of genetic material.
- Other changes involve deletions, duplications, or inversions of genetic material.
- In nature, gene frequencies vary in populations of plants over geographic distance.
- At some point, limits as to how much the plant can tolerate are reached and this helps to define the range of a plant.
- There are various kinds of culture methods including tissue culture, cell culture, hairy root cultures. Genes can be introduced by "shooting them in", by protoplast fusion, or other molecular methods.

74

Polyploidy

- Sometimes plants end up with more than the diploid number of chromosomes. This often occurs when some of the reproductive cells don't divide properly.
- Polyploids. Diploid, tetraploid, hexaploid, triploid etc. Many crop plants involve polyploidy in their formation.
- Many types of polyploids are sterile. Polyploid plants are often larger than diploid plants. Polyploidy often occurs by chance. Humans often take advantage of the plants in which it has occurred.

75

Plant species

Botanists tend to consider a species to be a group of populations that are derived from a single ancestor and which can be distinguished morphologically from other groups of populations. Plant species are not defined well by reproductive barriers as in many groups of animals. Polyploids are often derived from diploid ancestors.
Many hybrids occur between related plant species. Often cultivated plants have been given different names than their wild progenitors. One of the big problems is deciding what are the wild progenitors of cultivated plants.
Evolutionary relationships. How do we know how closely related plants are?

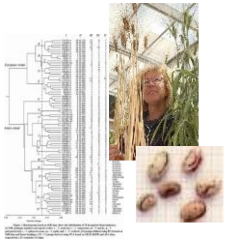
76

Landraces, Diversity

Refers to the particular kinds of old seed strains and varieties that are farmer-selected in areas where local subsistence agriculture has long prevailed. Landraces are highly adapted to specific locales or groups.

Definition :
modified by native and also immigrant farmers.

The term is usually applied to varieties of corn, squash, and beans that were domesticated by native farmers,



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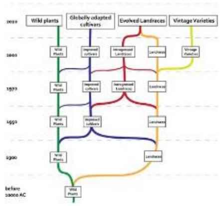
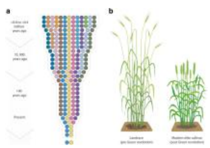
77

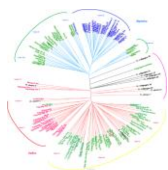
Wild, cultivars, races, varieties



78

Crop diversity, characterstics





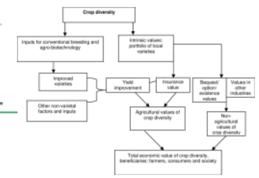
79

Value of Diversity , traits


Crop diversity decrease will affect resistance to disease, drought

nature plants

Global plant diversity as a reservoir of micronutrients for humanity



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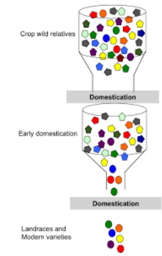
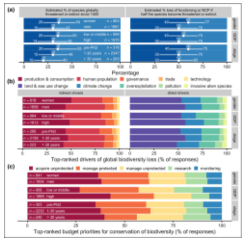
Loss of diversity





81

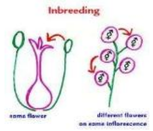
BREEDING METHODS

A). Inbreeding B). Outbreeding C). Heterosis

82

INBREEDING

- Mating of Parents who are Closely Genetically related.
- Results in Increased Homozygosity which can increase the Chance of
- Offspring being affected by Recessive traits.



83

MERITS & DEMERITS

MERITS OF INBREEDING

- A) Increase of Homozygotes, B)Production of Pure lines. C)Elimination of Deleterious Recessive Characters. D)Production of Valuable Breeds.

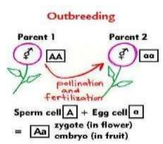
DEMERITS OF INBREEDING

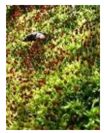
- A) Low yield B)Inbreeding Depression C)Appearance of Deleterious Characters.

84

OUTBREEDING

- Mating of Unrelated individuals
- Also known as Cross Breeding.
- The offspring formed by mating of Two unrelated parents.





85

TYPES OF OUTBREEDING

A)INTRASPECIFIC : Matting between Members of Same Species.

B)INTERSPECIFIC : Matting between Members of Different Species.

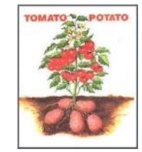
C) INTERGENERIC :
Matting between the Members of Different Genera.

86

TYPES OF OUTBREEDING

INTERSPECIFIC

INTERGENERIC



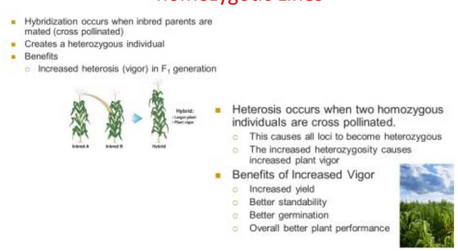
87

RESULTS OF OUTBREEDING

A)Numerous varieties of better Yielding crop plants.
B) Paddy hybrids produce more Grains.
C)Tall and Dwarf coconut hybrid yields more number of Nuts
D)Caddish is a hybrid Between Cabbage and Radish
E)Pomato is a hybrid between Potato and Tomato.

88

Hybrid breeding; Heterosis: crossing of homozygotic LInes



89

HETEROSIS BREEDING

- The Increased growth vigour or yield of hybrids over the Parents is known as Heterosis or Hybrid vigour.
- Crop breeding to manifest heterosis is called Heterosis breeding.
- It brings out the Superiority in F1 individuals but the vigour tends to Decrease from F2 generation onwards.

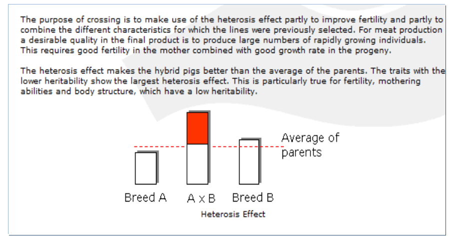
90

HETEROSIS BREEDING

- Heterosis means Deviation of Offspring from the Actual Character of Parents.
- In Plants, Heterosis appears due to Developmental stimulation induced by the Union of Gametes coming from Two genetically complementing parents.

91

Hybrid: Heterosis effect



92

ADVANTAGE & DISADVANTAGE

ADVANTAGE

1. In many crops, F1 hybrids are Early in Maturity.
   EX : Cabbage, Onion, Tomato etc.
2. They produce goods with Uniform size.
   Ex : Onion and Cabbage.
3. They are resistance to Biotic and Abiotic stresses.
   Ex : Cucumber, Tomato and Onion.
4. They are always high yielding varieties

DISADVANTAGE

1. Production cost is High.
2. Fresh seeds is to be Purchased every time to raise new crop.
3. Sometimes F1 hybrids are Vulnerable to disease.

93

Requisites of hybrid seed production

Breeders responsibilities

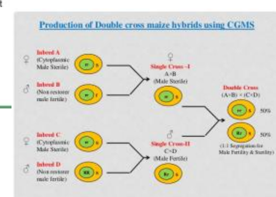
- Develop inbred lines
- Identification of specific parental lines
- Develop system for pollen control

Major problems for breeders & producers

- Maintenance of parental lines
- Separation of male and female reproductive organs
- Pollination

94

genetic male sterility



95

Hybrid Seed production

Hybrid seed production field
The lower number of male pollinator rows (whitish-yellow) alternate with the larger number of female seed parent (male-sterile) rows (red).
Lowering the ratio of female to male pollinator rows is one method that the commercial industry is using to ensure rapid and more complete pollination of the female.

62

96

Precision breeding
Marker assisted breeding

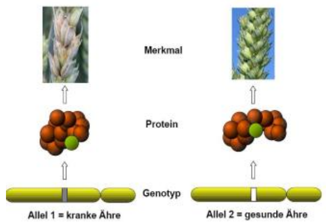
In molecular or marker-assisted breeding (MB), DNA markers are used as a substitute for phenotypic selection and to accelerate the release of improved cultivars.

Marker-assisted selection (MAS). Selection of individuals with specific alleles for traits controlled by a limited number of loci (up to 6-8).

Marker-assisted backcrossing (MABC). Transfer of a limited number of loci (e.g. transgene, disease resistance loci, etc.) from one genetic background to another.

97

Breeding for an improved trait using markers



52

98

Breeding with Markers

In der Züchtung wird ein genetischer Marker für die indirekte Selektion eines gewünschten Merkmals verwendet

Voraussetzung für die Züchtung: Marker und Merkmal werden gemeinsam vererbt
⇨ Kopplung

Marker:

Morphologische Marker:
z.B. Farbe
Biochemischer Marker:
Enzyme
Molekulare Marker

53

99

Breeding, Molecular Markers

Was sind molekulare Marker?

Sequenz-Unterschiede in einer genomischen Region (Locus).
Variationen in der DNA-Sequenz (Polymorphismen) nutzen.

Markerklassen

▶ RFLP	Restriction Fragment Length Polymorphism	DNA-DNA-Hybridisierung
▶ AFLP	Amplified Fragment Length Polymorphisms	PCR
▶ SSR	Simple Sequence Repeats bzw. Mikrosatelliten	PCR
▶ SNP	Single Nucleotide Polymorphisms	Sequenzierung
▶ DArT	Diversity Array Technique	DNA-DNA-Hybridisierung

54

100

Advantages molecular marker

Some of the advantages of using molecular markers instead of phenotypes to select are:

- o Early selection (at seedling, or even for seeds) ➡ Chance to select the right plant before flowering
- o Reduced cost (fewer plants, shorter time)
- o Reduced cycle time (if gene is recessive or measured after flowering) ➡ Chance to select heterozygous plant
- o Screening more efficient (if it is a complex trait)

101

Sweetcorn

Marker Assisted Selection

Important gene controlling endosperm in sweet corn

Category	Gene	Sweetness	Texture	Flavor	Germination /Vigor	Shelf life
Standard sweet	su1	10% sucrose ⬇	creamy ⬆	good ⬆	good ⬆	short ⬇
Sugar-enhanced	se	2X sucrose	creamy	good	good	longer
Super sweet	sh2,bt1, bt2	3X-8X sucrose ⬆	Less creamy ⬇	poor ⬇	poor ⬇	Long ⬆

In recent years new varieties have been developed that have different combinations of the three major genes (su, se and sh2) 'stacked' together.

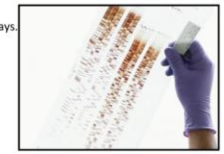
Category	Kernels type	Advantage	Variety name
High sugar sweet corn	• 25% sh2 kernels • 25% se kernels • 50% su kernels	• su vigor • higher sugar ⬆⬆	• Sweet Chorus • Sweet Rhythm
High sugar sweet corn	• 100% sh2 kernel • se trait in all kernels	• high sugar • long shelf life • tender ⬆⬆⬆	• Gourmet Sweet™ • Multisweet™ • Xtra-Tender Brand™

102

Use of fingerprinting

DNA fingerprinting is used in several ways.

- Paternity and Maternity test
- Plant Variety Protection
- Genetic purity test
- Studying biodiversity
- Tracking genetically modified crops



103

Testing can be done on seed or leaf

F = female parent, M = male parent

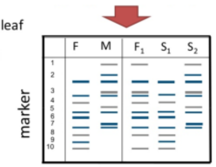
F1 = Hybrid

S1 = Sample#1

: Same female / different male

S2 = Sample#2

:Different female / Same male

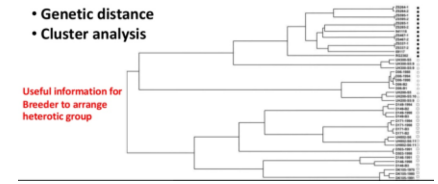


DNA profile using 10 different marker (dominant marker)

104

Genetic mapping

- Genetic distance
- Cluster analysis



105

Introducing new traits in a plant family:(Random) Mutation Breeding

Examples of plants that were produced via mutation breeding are given in the table below

Crop	Cultivar Name	Method Used to Induce Mutation
rice	Calrose 76	gamma rays
wheat	Above	sodium azide
	Lewis	thermal neutrons
oats	Alamo-X	X-rays
grapefruit	Rio Red	thermal neutrons
	Star Ruby	thermal neutrons
burmuda grass	Tifeagle	gamma rays
	Tifgreen II	gamma rays
	Tift 94	gamma rays
	Tifway II	gamma rays
lettuce	Ice Cube	ethyl methanesulphonate
	Mini-Green	ethyl methanesulphonate
common bean	Seafarer	X-rays
	Seaway	X-rays
lilac	Prairie Petite	thermal neutrons
St. Augustine grass	TXSA 8202	gamma rays
	TXSA 8212	gamma rays

Quite a few flower cultivars have been developed via mutation breeding, among them some of the cultivars of Alstroemeria, begonia, carnation, chrysanthemum, dahlia, and snapdragon.

67

106

Mutation breeding

Mutation refers to sudden heritable change in the phenotype of an individual.

Mutation occurs in two ways:

(1) By alteration in nuclear DNA(point mutations)

(2) By change in cytoplasmic DNA(cytoplasmic mutation)

The best example of useful cytoplasmic mutation is cytoplasm male sterility.

1927 – First proof of induced mutations in plants; radium ray treatment of Datura stramonium (Gager and Blakeslee).

1927 - Muller working with Drosphila provides proof of mutation induction by X-rays Muller champions induced mutation for animal and plant breeding and opens a new era in genetics and breeding.

107

A. Spontaneous mutations : Mutation occurin natural populations .

B. Induced mutations: Mutation may be artificially induced by various mutagenic agents.

Induced mutations are of two types:

1. Macro-mutations: Mutation with distinct morphological changes in the phenotype.

2. Micro-mutations: Mutations with invisible phenotypic changes.

108

Mutation breeding

1. Alkylating agents: EMS (ethyl methane sulphonate),methyl methane sulphonate (MMS),sulphur mustard, nitrogen mustard
2. Acridine dyes: proflavin,acridine orange, acridine yellow and ethidium bromide.
3. Base Analogues: 5 Bromo Uracil,5-chlorouracil. 4. Other mutagens: Nitrous Acid, Sodium Azide.

4. Mutation breeding is a cheap and rapid method of developing new varieties.
5. Induced mutagenes is used for the induction of CMS. Ethidium bromide (EB) has been used for induction of CMS in barley.
6. Mutation breeding is more effective for the improvement of oligogenic characters.
7. Mutation breeding is the simple, quick and the best way when a new character is to be induced

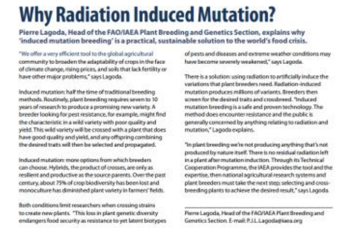
109

Limitations

a) The process is generally random and unpredictable.
b) Useful mutants are rare and predominantly recessive.
c) Mutants can have strong negative pleiotropic effects on other traits.
d) Health risks: handling, chemical mutagens; radiations, fast neutrons treatments.
e) Most mutants are of no use to breeding even if a large number of mutants can be produced.
f) Field trialling and germplasm storage can be expensive and require a lot of space and careful management if large mutant populations are handled.

110

IAEA


Why Radiation Induced Mutation?

Pierre Lagoda, Head of the FAO/IAEA Plant Breeding and Genetics Section, explains why 'induced mutation breeding' is a practical, sustainable solution to the world's food crisis.

"We offer a very efficient tool to the global agricultural community to broaden the adaptability of crops in the face of climate change, rising prices, and soils that lack fertility or have other major problems," says Lagoda.

Induced mutation: half the time of traditional breeding methods. Routinely, plant breeding requires seven to 10 years of research to produce a promising new variety. A breeder looking for pest resistance, for example, might find the characteristic in a wild variety with poor quality and yield. This wild variety will be crossed with a plant that does have good quality and yield, and any offspring combining the desired traits will then be selected and propagated.

Induced mutation: more options from which breeders can choose. Hybrids, the product of crosses, are only as resilient and productive as the source parents. Over the past century, about 75% of crop biodiversity has been lost and monoculture has diminished plant variety in farmers' fields.

Both conditions limit researchers when crossing strains to create new plants. "This loss in plant genetic diversity endangers food security as resistance to yet latent biotypes of pests and diseases and extreme weather conditions may have become severely weakened," says Lagoda.

There is a solution: using radiation to artificially induce the variations that plant breeders need. Radiation-induced mutation produces millions of variants. Breeders then screen for the desired traits and crossbreed. "Induced mutation breeding is a safe and proven technology. The method does encounter resistance and the public is generally concerned by anything relating to radiation and mutation," Lagoda explains.

"In plant breeding we're not producing anything that's not produced by nature itself. There is no residual radiation left in a plant after mutation induction. Through its Technical Cooperation Programme, the IAEA provides the tool and the expertise, then national agricultural research systems and plant breeders must take the next step: selecting and cross-breeding plants to achieve the desired result," says Lagoda.

Pierre Lagoda, Head of the FAO/IAEA Plant Breeding and Genetics Section. E-mail: P.J.L.Lagoda@iaea.org

111

Breeding: Irradiation

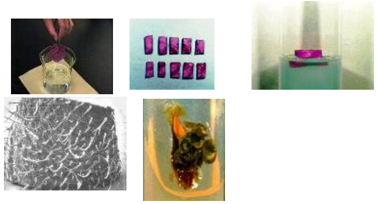
Breeding: Irradiation

Irradiator at Institute of Radiation Breeding Ibaraki-ken, JAPAN (http://www.irb.affrc.go.jp/)

68

112

Breeding: Tissue culture , Clones ?



70

113

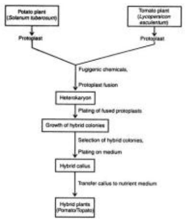
Somaclonal variation

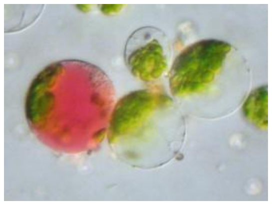
・Production of a new variety of japanese butterbur using somaclonal variation.(upper:new variety, lower:native variety)

71

114

Protoplast fusion





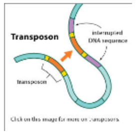
115

Tomoffel

116

Breeding using transposons

Ein Transposon ist ein DNA-Abschnitt bestimmter Länge im Genom, der seine Position im Genom verändern kann (Transposition). Man unterscheidet Transposons, deren mobile Zwischenstufe von RNA gebildet wird (Retroelemente oder Klasse-I-Transposon), von denjenigen, deren mobile Phase DNA ist (DNA-Transposon oder Klasse-II-Transposon).



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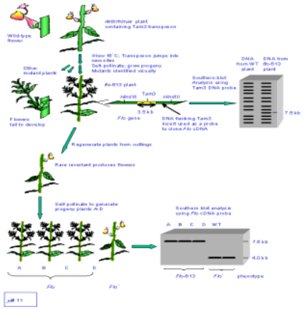
117



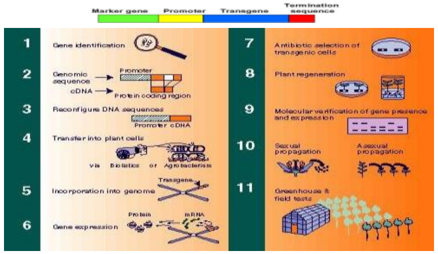
Transposon tagging

The molecular isolation of transposable elements now permits the cloning of genes in which the element resides. The major advantage of this system is that genes whose function is not known can be cloned

75

118

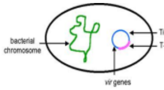
GM plants, Tranferring traits in ways which are not used in nature: GMOs

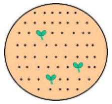


79

119

Agrobact. tumefaciens





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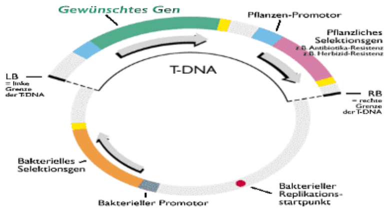
120

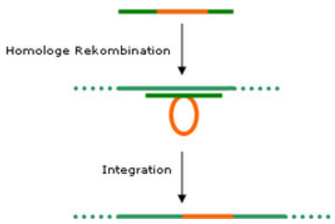
T DNA



124

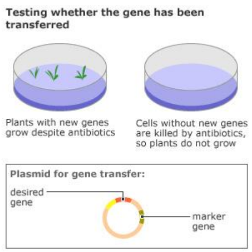
121

Homolog recombination



122

Antibiotic resistance marker gene



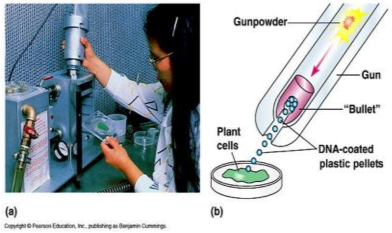
123

An assessment of the risks associated with the use of antibiotic resistance genes in genetically modified plants: report of the Working Party of the British Society for Antimicrobial Chemotherapy

http://www.gmo-compass.org/

124

Gene gun



125

125

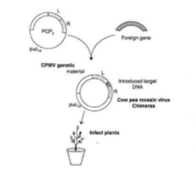
Methods, overview

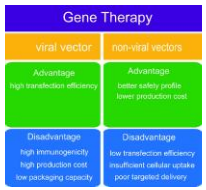
Table 1. Genetic manipulation technologies.

Technology	Definition
Genetic manipulation	Introduction of new genetic material via laboratory methods.
Biolistics	Use of helium-, gunpowder-, or electrical-discharge-mediated force to propel DNA-coated tungsten or gold microprojectiles into cells.
Agrobacterium tumefaciens	Soilborne bacterium causing crown gall disease of fruit trees. Used by biotechnologists to transfer any DNA into plant cells, from which transgenic plants are regenerated.
Agrobacterium rhizogenes	Soilborne bacterium causing hairy root disease. Transfers bipartite piece of bacterial DNA into plant genome, inducing elevated auxin synthesis and auxin sensitivity characterized by fluffy white hairy roots.

126

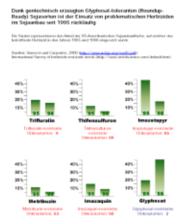
Transformation using Agrobaccterium tumefaciens, gene gun .. And virus vectors (also in human gene therapy ?

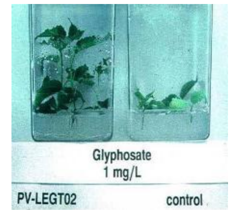




127

Herbicide tolerance, glyphosate





130

128

Herbicide Resistant Soybean

BEFORE AFTER

HERBICIDE APPLICATION

131

129

Herbicide Resistance: more or less herbicide? depending on local agricultural background

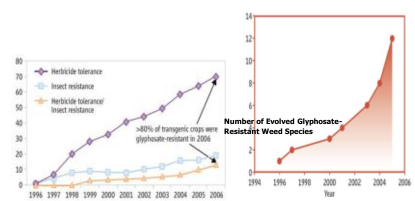
- Roundup Ready Soy, Corn, Canola
- Allows post-emergence herbicide spraying
- Increases yield
- Facilitates no-till farming
- 89% U.S. Soy crop (2006)

144

130

Old and new Problems: Resistance

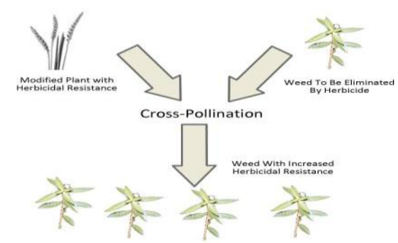
Herbicide Resistant Weeds Evolve



132

131

Herbizide resistance, gene transfer



133

132

Gene flow: multiresistant Rape


Environ. Biosafety Res. 5 (2006) 73–87
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DOI: 10.1051/ebr:2006017

Detection of feral transgenic oilseed rape with multiple-herbicide resistance in Japan

Mitsuko AONO[1*], Seiji WAKIYAMA[2], Masato NAGATSU[2], Nobuyoshi NAKAJIMA[1], Masanori TAMAOKI[1], Akihiro KUBO[1] and Hikaru SAJI[1]

[1] Environmental Biology Division, National Institute for Environmental Studies, 16-2 Onogawa, Tsukuba, 305-8506, Japan
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Repeated monitoring for escaped transgenic crop plants is sometimes necessary, especially in cases when the crop has not been approved for release into the environment. Transgenic oilseed rape (*Brassica napus*) was detected along roadsides in central Japan in a previous study. The goal of the current study was to monitor the distribution of transgenic oilseed rape and occurrence of hybridization of transgenic *B. napus* with feral populations of its closely related species (*B. rapa* and *B. juncea*) in the west of Japan in 2005. The progenies of 50 *B. napus*, 82 *B. rapa* and 283 *B. juncea* maternal plants from 95 sampling sites in seven port areas were screened for herbicide-resistance. Transgenic herbicide-resistant seeds were detected from 12 *B. napus* maternal plants growing at seven sampling sites in two port areas. A portion of the progeny from two transgenic *B. napus* plants had both glyphosate-resistance and glufosinate-resistance transgenes. Therefore, two types of transgenic *B. napus* plants are likely to have outcrossed with each other, since the double-herbicide-resistant transgenic strain of oilseed rape has not been developed intentionally for commercial purposes. As found in the previous study, no transgenic seeds were detected from *B. rapa* or *B. juncea*, and more extensive sampling is needed to determine whether introgression into these wild species has occurred.

Keywords: *Brassica* / establishment / glufosinate / glyphosate / herbicide / introgression / outcrossing / transgenic plant

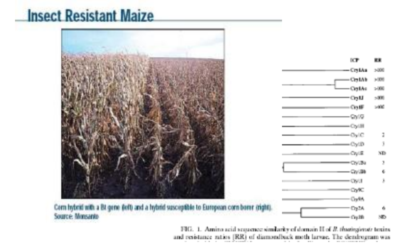
133

Insect resistance, BT maize

134

134

BT resistance: B. thuringiensis proteins



138

135

Roundup ready, Monsanto

137

136

Maiszünsler: wirtschaftlich bedeutendster Maisschädling

Es gibt mehrere Strategien zur Bekämpfung des Maiszünslers:

- **mechanisch durch Zerkleinern und Unterpflügen der auf dem Feld verbliebenen Pflanzenreste**
- **chemisch durch Einsatz von Insektiziden**
- **biologisch mit Hilfe von Trichogramma (Schlupfwespen)**
- **BT Toxin Präparate**
- **gentechnisch vermittelte Insektenresistenz besitzt (Bt-Mais)**

135

137

Bt Corn

- Natural insecticide from *Bacillus thuringiensis*
- Non-toxic to humans
- Target insect: corn borer
- Potential to:
  - reduce insecticide use
  - reduce mycotoxins
- 40% U.S. Corn crop Bt (2006)

142

138

Bt Concerns

- Bt pollen harms non-target species?
- Bt crops select for resistant insects
- Bt pollen can drift to organic fields
- Food system failed to keep BT Starlink corn out of human food products

143

139

Insect Resistant Cotton

140

140

Disease Resistance, viruses

Genetically engineered papaya resistant papaya ringspot virus

- Cantaloupes
- Cucumbers
- Corn
- Rice
- Papaya
- Potatoes
- Soybeans
- Squash
- Tomatoes
- Wheat

146

141

Growth-enhanced fish

Salmon Growth hormone expressed in cold waters & unlinked from seasonal temp.

Auto-transgenic mud loach: β-actin promoter linked to GH gene.

(Devlin et al. 1994)

157

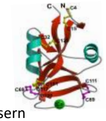
142

GM Salmon

- Probleme der Lachsindustrie
- gv Lachs von Aqua Bounty
- Produktionssteigerung über Ernährung, Krankheitsresistenz

- Gefahr für die Wildlachspopulationen
- Abhängigkeit des Fischfutters
- Umweltverschmutzung durch Lachszucht

143



- Atlantischer Lachs von Aqua Bounty
- **Wachstumshormon-Gen** des Chinook Lachs
- **Frostschutz-Protein-Gen**
- bessere Entwicklung in kalten kanadischen Gewässern
- Wachstum über das ganze Jahr
- normales Gewicht in der Hälfte der Zeit erreicht

BELFOND-CURIEUX, O.L et al.: Factors to consider before production and commercialization of aquatic genetically modified organisms: the case of transgenic salmon; Environmental Science & Policy 12; 170-189; 2009.

144

Golden Rice

Goldener Reis,

Unter **Goldenem Reis** (engl. *Golden Rice*) versteht man eine gentechnisch veränderte Reissorte. Es wurden zwei artfremde Gene und damit ein mehrschrittiger Syntheseweg in das Genom eingefügt. Das Phytoensynthase-Gen (*psy*) stammt von der Osterglocke (*Narcissus pseudonarcissus*) und das Carotindesaturase-Gen (*crtI*) von einem Bakterium Namens *Erwinia uredovora* (neuer Name: *Pantoea ananatis*).

Dank dieser zwei Gene kommt es zur Bildung von Beta-Carotin (Provitamin A) im Endosperm der Reiskörner, die deshalb (gold-)gelb / orange gefärbt sind. Das Provitamin wird dann im Körper zu Vitamin A (Retinol) umgewandelt.

147

145

GMO tobacco,
expression of human proteins in plants

146

GMOs in development:
CLAIMED BREEDING OBJECTIVES

152

147

CLAIMED BREEDING OBJECTIVES

153

148

09.12.2008

Claimed breeding objectives

154

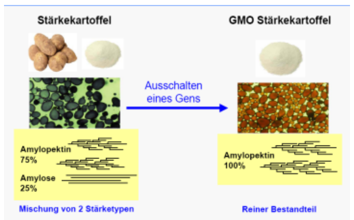
149

BREEDING OBJECTIVES

155

150

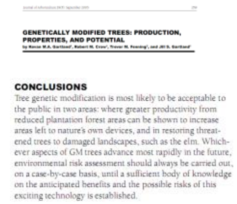
Breeding objectives



156

151

GMO Trees


GENETICALLY MODIFIED TREES: PRODUCTION, PROPERTIES, AND POTENTIAL

CONCLUSIONS

Tree genetic modification is most likely to be acceptable to the public in two areas: where greater productivity from reduced plantation forest areas can be shown to increase areas left to nature's own devices, and in restoring threatened trees to damaged landscapes, such as the elm. Whichever aspects of GM trees advance most rapidly in the future, environmental risk assessment should always be carried out, on a case-by-case basis, until a sufficient body of knowledge on the anticipated benefits and the possible risks of this exciting technology is established.

152

GM FLowers

Auto Toyota Turns to GMO Flowers to Relieve it of Prius Manufacturing Pollution


Source: DailyTech • October 30, 2009

A rather unusual way of rectifying manufacturing emissions has been developed by the world's leading automaker.

Are you overcome with guilt about how much carbon, sulfides, nitrides, and other emissions goodies were pumped into the atmosphere in the making of your new Toyota Prius? Do you feel dirty?

Well, Toyota has just the thing for you. It has genetically engineered two new species of flowers that soak up air pollution.

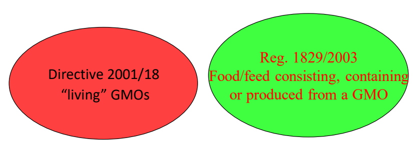
153

Regulations: Directive 2001/18/EC

- Directive 2001/18/EC on the deliberate release into the environment of GMOs
  - Clear definition of GMO and relative techniq.
  - Scope: product containing GMOs or consisting of such organisms
  - The experimental release of GMOs into the environment (for example field trials)
  - The placing on the market of GMOs (for ex. cultivation, importation or transformation)

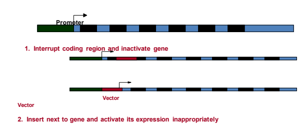
154

New directive. Scope of Directive 2001/18 and Regulation 1829/2003



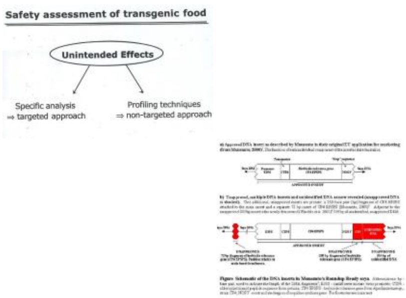
155

Safety: Random integration, Insertional mutagenesis



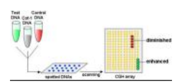
161

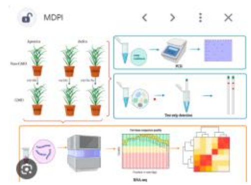
156



157

Detection of unintended effects in vitro, in vivo





158

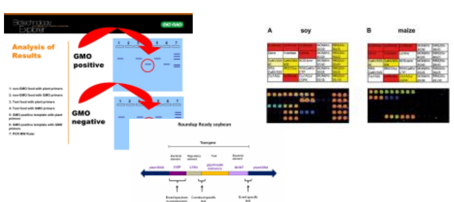
Toxicology Assesment: Difficulties Animal Feeding Studies Whole Foods

- **Small doses to be fed (bulk, satiety)**
- **Nutritional imbalance of the diet**
- **Many confounding factors**
- **Small safety margins, if any**

Insufficient sensitivity for specific endpoints

159

GMO tests: PCR, primers, areas, array



160

Umwelt Sicherheit LMOs

161

Cloning, Definition

Cloning is the process of making an identical copy of something

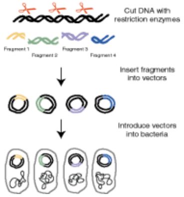
In biology, it collectively refers to processes used to

-- copies of DNA Fragments (molecular cloning)
-- cells (cell cloning)
-- organism

The term also covers when organisms such as bacteria, insects or plants reproduce asexually.

162

DNA cloning:



To clone a piece of DNA, DNA is cut into fragments using restriction enzymes that recognize specific sequences of bases in DNA. The fragments are pasted into vectors that have been cut by the same restriction enzyme. Vectors (e.g., plasmids or viruses) are needed to transfer and maintain DNA in a host cell.

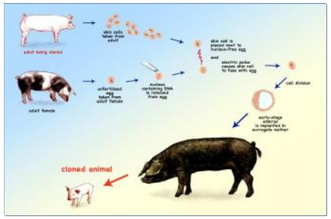
163

Reproductive Cloning

Reproductive cloning is a technology used to generate an animal that has the same nuclear DNA as another currently or previously existing animal. Dolly was created by reproductive cloning technology. In a process called "somatic cell nuclear transfer" (**SCNT**), scientists transfer genetic material from the nucleus of a donor adult cell to an egg whose nucleus has been removed. The reconstructed egg containing the DNA from a donor cell must be treated with chemicals or electric current in order to stimulate cell division. Once the cloned embryo reaches a suitable stage, it is transferred to the uterus of a female host where it continues to develop until birth.

164

Reproductive Cloning



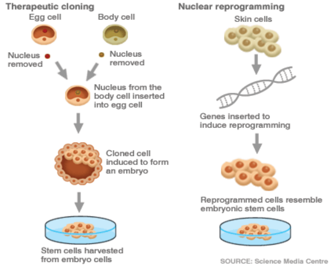
168

165

Therapeutic Cloning

Therapeutic cloning, also called "embryo cloning," is the production of human embryos for use in research. The goal of this process is not to create cloned human beings, but rather to harvest stem cells that can be used to study human development and to treat disease. Stem cells are extracted from the egg after it has divided for 5 days.
The extraction process destroys the embryo, which raises a variety of ethical concerns. Many researchers hope that one day stem cells can be used to serve as replacement cells to treat heart disease, Alzheimer's, cancer, and other diseases.

166



167

New Objectives

Conventional Transgenic Approaches

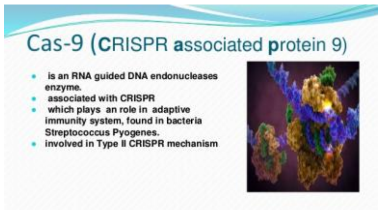
Drawbacks:

- Random insertion of transgene
- Not suitable for gene targeting or precise gene mutation
- Difficult to perform gene replacement or create allelic variation
- Introduction of undesirable DNA fragments (T-DNA, selection markers)
- Extensive regulatory requirements
- Public concerns over transgenic crops

New technology is much needed:

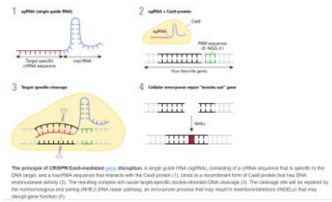
- To precisely and efficiently manipulate genome for crop improvement
- To reduce regulatory hurdles and public concerns

168



169

CRISPR/CAS9



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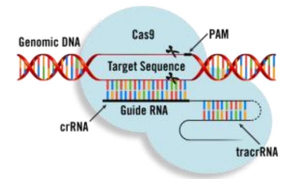
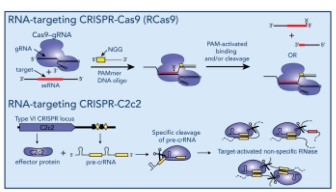


171

Targeting RNA

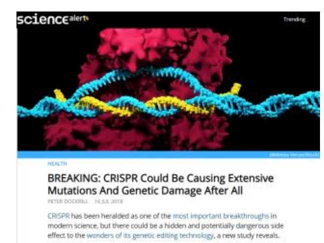


172

CRISPR-Cas9

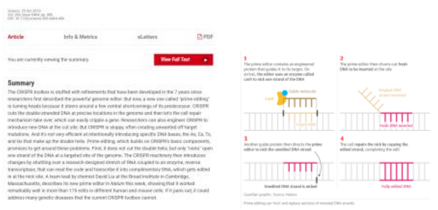
173

CRISPR-Cas9 makes mutation



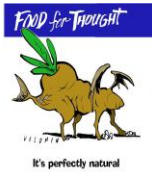
174

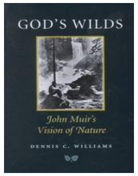
Prime editing: brand new gene editing tool could fix most harmful DNA mutations in humans and plants



175

Values: Food production and conservation of Nature: What is NATURE ?





176

What to protect why ?

INTERMEDIATE

ENVIRONMENTAL ETHICS | Lead Editor: Ben A. Minteer

Ethics of Wildlife Management and Conservation: What Should We Try to Protect?

By: Christian Gamborg (*University of Copenhagen, Danish Centre for Forest, Landscape and Planning*), Clare Palmer (*Texas A&M University, Philosophy Department*) & Peter Sandoe (*University of Copenhagen, Danish Centre for Bioethics and Risk Assessment*) © 2012 Nature Education

Citation: Gamborg, C., Palmer, C. & Sandoe, P. (2012) Ethics of Wildlife Management and Conservation: What Should We Try to Protect? *Nature Education Knowledge* 3(10):8

What should we protect when managing and conserving wildlife? There's no single answer. Competing values, and different prioritizations of values create ethical dilemmas and disagreements.

177

Values of Nature

Box 1. Alternative Values Assigned to Nature

Nature tends to be valued for multiple different reasons. There is little agreement over terminology, but we can distinguish at least three different types of value:

(i) Utilitarian value (or instrumental value): refers to the many uses that humans derive from nature. These uses include services such as decomposition, pollination, climate regulation, water purification, and recreation [21]. Here it is the function of nature that is valued [22]. Utilitarian value is often associated with monetary valuation [7].

(ii) Intrinsic value (or inherent value): refers to the perceived value of nature irrespective of humans. The view is that nature has a right to exist regardless of function ('existence value') and that it is morally right to conserve nature aside from human interests [22]. People commonly object to converting intrinsic value into monetary value: nature is valued for what it is, rather than for what it does, so its value is not open to quantification or monetary transaction [2,5,22].

(iii) Non-use value: refers to the value of nature to humans even when there is no direct use. Humans place non-use value on knowing that nature continues to exist and can be bequeathed to future generations, possibly for future use [21]. There are similarities between intrinsic and non-use values in that both value nature irrespective of human use (e.g., existence value), but non-use value is distinguished in that the value is regarded as being to humans rather than regardless of human interests. Since non-use value is based on human interests (like utilitarian value) it is open to quantification (unlike intrinsic value) and has been used in assessments of ecosystem services, including the UK National Ecosystem Assessment [21].

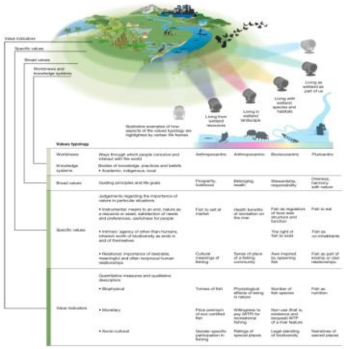
178

Values of Nature

Value	Definition	Function
Utilitarian	Practical and material exploitation of nature	Physical sustenance/security
Naturalistic	Direct experience and exploration of nature	Curiosity, discovery, recreation
Ecologistic-Scientific	Systematic study of structure, function	Knowledge, understanding, observational skills
Aesthetic	Physical appeal and beauty of nature	Inspiration, harmony, security
Symbolic	Use of nature for language and thought	Communication, mental development
Humanistic	Strong emotional attachment and "love"	Bonding, sharing, cooperation, companionship
Moralistic	Spiritual reverence and ethical concern for nature	Order, meaning, kinship, altruism
Dominionistic	Mastery, physical control, dominance over nature	Mechanical skills, physical prowess, ability to subdue
Negativistic	Fear, aversion, alienation from nature	Security, protection, safety, awe

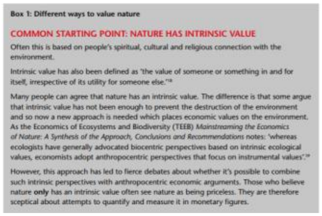
https://www.youtube.com/watch?v=q8AZHtF2f50

179



180

Economy and nature, Value an intrinsic value?



Box 1: Different ways to value nature

COMMON STARTING POINT: NATURE HAS INTRINSIC VALUE

Often this is based on people's spiritual, cultural and religious connection with the environment.

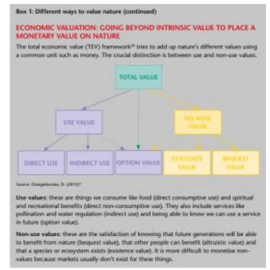
Intrinsic value has also been defined as 'the value of someone or something in and for itself, irrespective of its utility for someone else.'[18]

Many people can agree that nature has an intrinsic value. The difference is that some argue that intrinsic value has not been enough to prevent the destruction of the environment and so now a new approach is needed which places economic values on the environment. As the Economics of Ecosystems and Biodiversity (TEEB) *Mainstreaming the Economics of Nature: A Synthesis of the Approach, Conclusions and Recommendations* notes: 'whereas ecologists have generally advocated biocentric perspectives based on intrinsic ecological values, economists adopt anthropocentric perspectives that focus on instrumental values'.[19]

However, this approach has led to fierce debates about whether it's possible to combine such intrinsic perspectives with anthropocentric economic arguments. Those who believe nature **only** has an intrinsic value often see nature as being priceless. They are therefore sceptical about attempts to quantify and measure it in monetary figures.

181

Monetary value



Box 1: Different ways to value nature (continued)

ECONOMIC VALUATION: GOING BEYOND INTRINSIC VALUE TO PLACE A MONETARY VALUE ON NATURE

The total economic value (TEV) framework[20] tries to add up nature's different values using a common unit such as money. The crucial distinction is between use and non-use values.

Use values: these are things we consume like food (direct consumptive use) and spiritual and recreational benefits (direct non-consumptive use). They also include services like pollination and water regulation (indirect use) and being able to know we can use a service in future (option value).

Non-use values: these are the satisfaction of knowing that future generations will be able to benefit from nature (bequest value), that other people can benefit (altruistic value) and that a species or ecosystem exists (existence value). It is more difficult to monetise non-values because markets usually don't exist for these things.

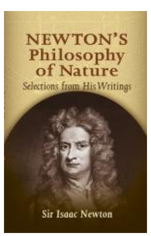
182

Rise of natural science and nature

Francis Bacon, 1561 – 1626

"Nature, to be commanded, must be obeyed"

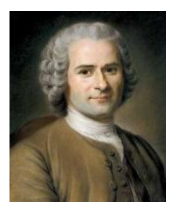
183



Newton (1642) was intensely curious and deeply committed to understanding the natural world. His pursuit of knowledge wasn't just limited to mathematics and physics, but also extended into areas like alchemy, theology, and the study of the Bible. He spent a significant amount of time trying to unlock what he saw as the hidden, underlying principles governing the universe.

184

Return to eden

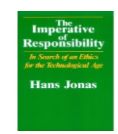


Jean-Jacques Rousseau
1712-1778

Rousseau postulierte einen Menschen, der im Naturzustand den Einklang mit der Natur sucht

185

Property and responsibility



"Handle so, daß die Wirkungen deiner Handlungen verträglich sind mit der Permanenz echten menschlichen Lebens auf Erden."

186

Frühzeit und Antike

•Schon in frühen Kulturen gab es Formen des Naturschutzes, meist aus **praktischen oder religiösen Gründen**.

- In vielen indigenen Kulturen galten bestimmte Tiere, Pflanzen oder Landschaften als **heilig** und wurden deshalb geschützt.
- In der Antike betonten Philosophen wie **Aristoteles** oder **Plinius der Ältere** die Ordnung und Schönheit der Natur – allerdings sah man die Natur meist als **Ressource für den Menschen**.

Mittelalter

•Der Mensch stand im Zentrum der Schöpfung („Gott gab dem Menschen die Erde zur Nutzung “).
•Dennoch gab es **kirchlich geprägte Schutzgedanken**, etwa in Form von Klostergärten oder Jagdverordnungen, die Tiere und Wälder indirekt schützten.
•In einigen Regionen wurden **Heilige Haine oder Quellen** als Orte des Schutzes bewahrt.

187

19. Jahrhundert – Romantik und erste Naturschutzbewegungen

•In der Zeit der **Industrialisierung** und der **Romantik** erwachte eine neue **emotionale Beziehung zur Natur**.

•Dichter und Denker wie **Goethe**, **Rousseau** und **Humboldt** betonten die Schönheit, Vielfalt und Eigenwert der Natur.
•In den USA setzte sich **Henry David Thoreau** (Autor von *Walden*, 1854) für ein einfaches Leben in Harmonie mit der Natur ein.

•**Erste Nationalparks** entstanden:
- 1872: **Yellowstone National Park** (USA) – der erste weltweit.
- In Deutschland: **Heimat- und Naturschutzbewegung** um 1900, z. B. Gründung des **Bund Naturschutz in Bayern (1913)**.

188

20. Jahrhundert – Vom Naturschutz zum Umweltschutz

•Nach den beiden Weltkriegen gewann der Naturschutz als **wissenschaftliche und politische Bewegung** an Bedeutung.
•Gründung von **Naturschutzgebieten**, **Nationalparks** und internationalen Organisationen (z. B. **IUCN** 1948).

•In den 1960er und 1970er Jahren wuchs das Bewusstsein für **Umweltverschmutzung** und **Ressourcenverbrauch**:

- 1962: *Silent Spring* (dt. *Der stumme Frühling*) von **Rachel Carson** – Auslöser der modernen Umweltbewegung.
- 1972: **UN-Konferenz in Stockholm** – Beginn der internationalen Umweltpolitik.
- Entstehung von **Umweltorganisationen** wie **Greenpeace** (1971) und dem **World Wide Fund for Nature (WWF)**.

189

Gegenwart – Nachhaltigkeit, Klimaschutz und Biodiversität

•Heute steht der Naturschutz im Kontext globaler Herausforderungen wie **Klimawandel**, **Artensterben** und **Ressourcenknappheit**.

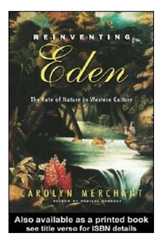
•Konzepte wie:
- **Nachhaltige Entwicklung** (seit dem Brundtland-Bericht 1987),
- **Biodiversitätsschutz** (UN-Konvention 1992),
- **Klimaschutzabkommen von Paris (2015)**

zeigen, dass der Naturschutzgedanke heute **global, ökologisch und sozial vernetzt** gedacht wird.

•Bewegungen wie **Fridays for Future** oder **Extinction Rebellion** bringen diesen Gedanken in die Öffentlichkeit.

190

The problem of land use, transformation and Conservation



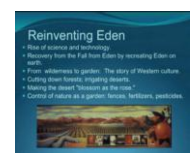
Carolyn Merchant

Conservation history,
Univ. of Berkley

https://www.youtube.com/watch?v=HSZuyPA5-1Y

191

Carolyn Merchant



https://www.youtube.com/watch?v=HSZuyPA5-1Y&t=2543s

192

Carolyn Merchant

https://www.youtube.com/watch?v=pqa1akoQIJE

193

Farming values, middle ages autark?

194

Landuse and property

conservation : expolitation

use : property

195

Nature and property

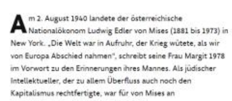
Science 13 December 1968:
Vol. 162. no. 3859, pp. 1243 – 1248

Articles
The Tragedy of the Commons

Garrett Hardin
professor of biology, University of California, Santa Barbara.

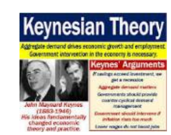
When a resource is held "in common," with many people having "ownership" and access to it, Hardin reasoned, a self-interested "rational" actor will decide to increase his or her exploitation of the resource since he or she receives the full benefit of the increase, but the costs are spread among all users.

196



197

Keynesians believe that, because prices are somewhat rigid, fluctuations in any component of spending—consumption, investment, or government expenditures—cause output to change. If government spending increases, for example, and all other spending components remain constant, then output will increase.



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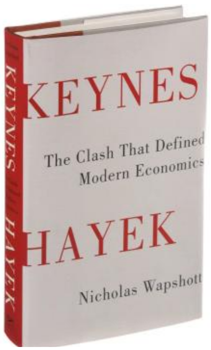


As Keynes stood to the left, so Mises stood to the right—and for the right. While Keynes would arm the government with extraordinary peacetime powers—oblivious to the Actonian principle that power cor-rupts—Mises called for limited, non-interventionistic government.

199

Nature and property. Public goods

Industrial and Corporate Change
Pp. 131-159

OSTROM, E. © 1995 Oxford University Press

research-article

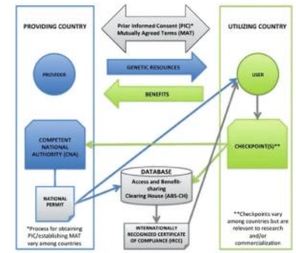
Self-organization and Social Capital (building public goods)

ELINOR OSTROM

(Workshop in Political Theory and Policy Analysis, Indiana University Bloomington, IN 47408–3895, USA)

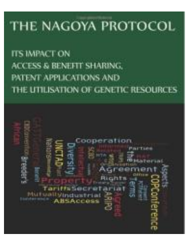
200

Benefit sharing, genetic ressources



201

Access and benefit sharing



202

RIO 1992 Diversity, sustainability and equal access to natural ressources

203

UN: sustainability: Agenda 21

Agenda 21

Agenda 21 is a comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations System, Governments, and Major Groups in every area in which human impacts on the environment.

Agenda 21, the Rio Declaration on Environment and Development, and the Statement of principles for the Sustainable Management of Forests were adopted by more than 178 Governments at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janerio, Brazil, 3 to 14 June 1992.

The Commission on Sustainable Development (CSD) was created in December 1992 to ensure effective follow-up of UNCED, to monitor and report on implementation of the agreements at the local, national, regional and international levels. It was agreed that a five year review of Earth Summit progress would be made in 1997 by the United Nations General Assembly meeting in special session.

The full implementation of Agenda 21, the Programme for Further Implementation of Agenda 21 and the Commitments to the Rio principles, were strongly reaffirmed at the World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa from 26 August to 4 September 2002.

Agenda 21

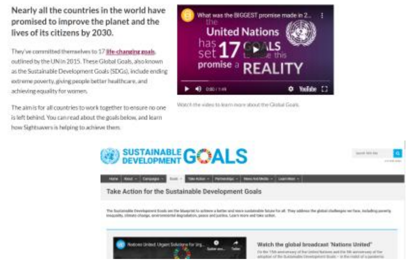
Other Global Agreements and Commitments

204

The eight MDGs – reduce poverty and hunger; achieve universal education; promote gender equality; reduce child and maternal deaths; combat HIV, malaria and other diseases; ensure environmental sustainability; develop global partnerships – **failed** to consider the root causes of poverty and overlooked gender inequality as well as the holistic nature of development. The goals made no mention of human rights and did not specifically address economic development. While the MDGs, in theory, applied to all countries, in reality they were considered targets for poor countries to achieve, with finance from wealthy states. Conversely, every country will be expected to work towards achieving the SDGs.

205

UN 2015, 2020



206

Sustainable Development Goals (SDG)

207

Agenda 2030

- „Globale Zukunftsziele für nachhaltige Entwicklung“
- 25. September 2015: Gipfeltreffen in New York
  Verabschieden der Agenda 2030 durch 193 Mitgliedsstaaten der UN
- Globaler Rahmen für die Nachhaltigkeitspolitik der kommenden 15 Jahre
- Kernstück: SDG‘s (Sustainable Development Goals)

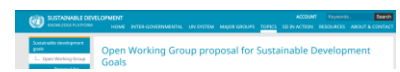
208

Ziel 15: Landökosysteme schützen

1. Nachhaltige Bewirtschaftung der Wälder
2. Bekämpfung von Wüstenbildung & Bodendegradation
3. Verlust an biologischer Vielfalt stoppen

- Bsp: bis 2020 Entwaldung beenden & geschädigte Wälder wiederherstellen
- Finanzielle Mittel aus allen Quellen für die Erhaltung & nachhaltige Nutzung der biologischen Vielfalt & Ökosysteme aufbringen und deutlich erhöhen
- Bis 2030 Degradationsfläche auf null senken

209



1) End poverty in all its forms everywhere
2) End hunger, achieve food security and improved nutrition, and promote sustainable agriculture
Advertisement
3) Ensure healthy lives and promote wellbeing for all at all ages
4) Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5) Achieve gender equality and empower all women and girls
6) Ensure availability and sustainable management of water and sanitation for all
7) Ensure access to affordable, reliable, sustainable and modern energy for all
8) Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all
9) Build resilient infrastructure, promote inclusive and sustainable industrialisation, and foster innovation
10) Reduce inequality within and among countries
11) Make cities and human settlements inclusive, safe, resilient and sustainable
12) Ensure sustainable consumption and production patterns
13) Take urgent action to combat climate change and its impacts (taking note of agreements made by the UNFCCC forum)

14) Conserve and sustainably use the oceans, seas and marine resources for sustainable development
15) Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation, and halt biodiversity loss
Advertisement
16) Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
17) Strengthen the means of implementation and revitalise the global partnership for sustainable development

210

WTO

Location: Geneva, Switzerland
Established: 1 January 1995
Created by: Uruguay Round negotiations (1986-94)
Membership: 149 countries (11.12.2005)
Budget: 169m Swiss francs, 2005
Secretariat staff: ~600
Head: Director-General Pascal Lamy

Functions:

- Administering WTO trade agreements
- Forum for trade negotiations
- Handling trade disputes
- Monitoring national trade policies
- Technical assistance and training for developing countries
- Cooperation with other international organizations

211

What is the WTO?

- forum for negotiations
- agreed rules and commitments
- … with basic principles for trade
- … and dispute settlement
- member-driven
- supporting Secretariat

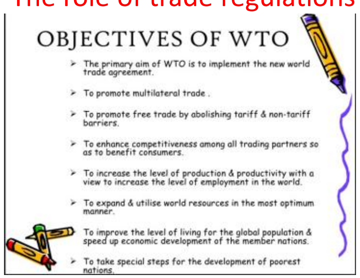
212

TRIPS: Main features (1)

- Coverage of TRIPS
  Areas of intellectual property covered:
  - copyright and related rights
  - trademarks including service marks;
  - geographical indications including appellations of origin;
  - industrial designs;
  - patents including the protection of new varieties of plants;
  - the layout-designs of integrated circuits; and
  - undisclosed information, including trade secrets and test data.

213

The role of trade regulations



OBJECTIVES OF WTO

- The primary aim of WTO is to implement the new world trade agreement.
- To promote multilateral trade .
- To promote free trade by abolishing tariff & non-tariff barriers.
- To enhance competitiveness among all trading partners so as to benefit consumers.
- To increase the level of production & productivity with a view to increase the level of employment in the world.
- To expand & utilise world resources in the most optimum manner.
- To improve the level of living for the global population & speed up economic development of the member nations.
- To take special steps for the development of poorest nations.

214

2001 Doha Declaration: TRIPS

- Emphasized that TRIPS should be supportive of public health
  - See separate declaration
- September 2003 deadline for negotiations on wine and spirit GI registration
- TRIPS Council reviews to consider biological diversity, traditional knowledge and development objectives

DOHA DEVELOPMENT AGENDA

215

TRIPS: Main features (2)

- Enforcement Provisions
  - General Principles applicable to IPRs
  - Specifies Procedures that must be available
- Dispute Settlement
  - Part of the integrated Dispute Settlement System of the WTO
  - No unilateral action by Members allowed

216

TRIPS Basic Principles (1)

- Freedom to determine the appropriate method of implementing the Agreement (Art. 1.1)
- **National treatment (Art. 3)**
- **Most-favoured nation treatment (MFN) (Art. 4, 5)**
- Exhaustion of rights (Art. 6); see (WT/MIN(01)/DEC/2)
- Objectives (Art. 7); see WT/MIN(01)/DEC/2
- Principles (Art. 8); see WT/MIN(01)/DEC/2

217

TRIPS: Basic principles (2)

- National treatment
  - forbids discrimination between a Member's own nationals and the nationals of other Members
- Most-Favoured-Nation Treatment
  - forbids discrimination between the nationals of other Members

218

SPS Agreement, Article 2.1.

All countries have rights to take Sanitary and Phytosanitary (SPS) Measures for protection of human, animal and plant life and health

219

SPS measures:

- Must be based on scientific evidence and risk assessment
- Must not create any sort of unjustified barriers and
- Must not create any restrictions in international trade.

220

Definition of an SPS Measures

To protect	***From***
• animal or plant life	• pests, • diseases or • disease-causing organisms

221

Beneficiaries of the SPS Agreement:

- The consumers,
- The exporters of agricultural products,
- The importers of food and other agricultural products.

222

Appropriate level of sanitary or phytosanitary protection:

- **The level of protection deemed appropriate by the country establishing a sanitary or phytosanitary measure to protect human, animal or plant life or health within its territory.**

Many countries refer to this concept as the "acceptable level of risk".

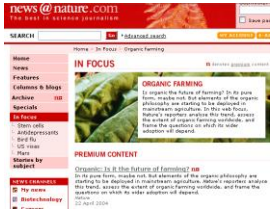
223

SPS a critical perspective

- Can trade- limitations restricted to sanitary and phytosanitay aspects ensure local biodiversity threatened by global trade (see problem of exotic species, see global homogenisation of diversity).

224

Organic farming; Nature: Elements for mainstream farming ?



76

225

Entstehungskontext des Biolandbaus

1920-1950

- Biolandbau als Antwort auf Krisen
  - Grosse Wirtschaftskrise der 1930er Jahre
  - Ökonomischer Zwang zur Produktivitätssteigerung
  - Verschuldung, Abhängigkeit
  - Ökologische Krise
- Lebensreformbewegung («zurück zur Natur»)
  - für Aussteigerinnen, Visionäre und rebellische Bauern
- Von Bio-Pionieren entwickeltes Landbausystem gilt bis heute als Leitbild für eine nachhaltige Land- und Ernährungswirtschaft
  - Zusammenschluss in Organisationen
  - wissenschaftliche Erkenntnisse und Praxiserfahrungen als Basis
  - Markt orientiert sich an Konsumentenbedürfnis
  - umweltschonend und tiergerecht

226

Entstehungskontext des Biolandbaus

- Hohes Bevölkerungswachstum durch Industrialisierung
  - Wissen über Prozesse im Boden und über Nährstoffkreisläufe gering
  - Suche nach technischen und wissenschaftlichen Lösungen zur Steigerung der landwirtschaftlichen Produktivität
- Erfindungen zur Steigerung der Nahrungsmittelproduktion
  - 1828 Carl Sprengel: Minimumgesetz (knappster Nährstoff limitiert Wachstum)
  - 1849 Justus von Liebig: Mineralstofftheorie, Erfinder von künstlichem Phosphatdünger,
  - 1910 Haber-Bosch-Verfahren: synthetische Stickstoffherstellung
- Landwirtschaft im Wandel
  - Industrialisierung, Motorisierung der Betriebe
  - Pflanzenzucht, Kunstdünger, Wachstumsregler und Pestizide

227

Pioniere in der Geschichte des Biolandbaus

Dr. Rudolf Steiner *1861; †1925

- Besondere Leistungen
  - Gründer des biologischen-dynamischen Landbaus
  - Gründer der Anthroposophie

- Leben und Werk
  - Studium in Wien: Mathematik, Naturwissenschaft (Lehrveranstaltungen in Literatur, Philosophie und Geschichte)
  - Promotion zum Doktor der Philosophie an der Universität Rostock
  - Herausgeber der naturwissenschaftlichen Schriften J. W. von Goethes
  - Aufbau der Anthroposophie: Vortragsreisen in Berlin und ganz Europa zu Pädagogik, Kunst, Medizin, Theologie, Landwirtschaft (>5000 Vorträge)
  - Beginn der Waldorf-Schulbewegung in Stuttgart (CH: Steinerschule)
  - Vortragsreihe für Landwirte: «Geisteswissenschaftliche Grundlagen zum Gedeihen der Landwirtschaft» (1924)
  - Gründung der Anthroposophischen Gesellschaft

228

Attending the First Organic Agriculture Course: Rudolf Steiner's Agriculture Course at Koberwitz, 1924

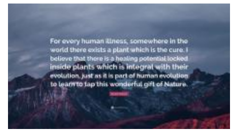
Rudolph Steiner (1861-1925)

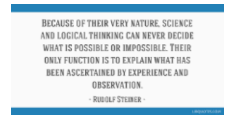
In the early 1920s, Rudolf Steiner, an Austrian philosopher, gave a series of lectures on the "Spiritual Foundations for the Renewal of Agriculture" which inspired the development of Biodynamic agriculture.

Biodynamic farming has much in common with other organic approaches, such as emphasizing the production and use of compost and excluding of the use of synthetic inputs.

Methods unique to Biodynamics include the use of fermented herbal and mineral preparations as compost additives and field sprays and the use of an astrological planting calendar.

229

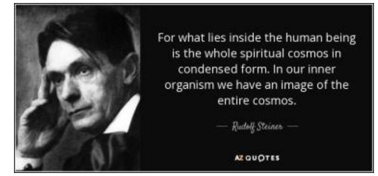




Rudolf Steiner

230

Rudolf Steiner



https://www.youtube.com/watch?v=6-54MuLF_z8

231

Steiner sah sich als **Fortsetzer und Vertiefer von Goethes Erkenntnisweg**.
Während Goethe intuitiv ahnte, dass Natur und Geist zwei Seiten einer Einheit sind, versuchte Steiner, diese Ahnung in ein **bewusstes, methodisches System** zu überführen.
Das führte ihn später zu seiner eigenen Geisteswissenschaft, der Anthroposophie, die auf einem erweiterten Erkenntnisbegriff beruht.

Das gemeinsame Ziel: Erweiterung des Bewusstseins

Sowohl Goethe als auch Steiner glaubten, dass der Mensch durch bewusste Schulung seiner Wahrnehmung zu einer tieferen Wahrheit gelangen kann.
Sie verstanden Erkenntnis nicht als kalte Analyse, sondern als **innere Verwandlung**: Der Mensch erkennt die Welt, indem er **sich selbst verwandelt**.

Diese Haltung steht im Gegensatz zur mechanistischen Weltanschauung der Aufklärung, die die Natur oft als Objekt verstand.

232

Er nahm die **dialektische Bewegung des Denkens** bei Hegel auf, aber verband sie mit Goethes Idee des **lebendigen Erkennens**.
So entstand sein Konzept des **„lebendigen Denkens"**, das in der *Philosophie der Freiheit* (1894) zur vollen Entfaltung kommt.

Steiner übernahm also Hegels Grundidee, dass Denken die Welt erschließt, aber er verwandelte sie in eine **Erkenntnispraxis**, die nicht nur intellektuell, sondern **innerlich erfahrbar** ist.

Daraus entstand die **Anthroposophie** – eine Weiterführung des deutschen Idealismus in den Bereich des **geistigen Erlebens und der spirituellen Wissenschaft**.

Steiner verbindet Spiritualität mit Evolution: Die Materie ist eine vergeistigte Form göttlicher Aktivität.Die Erde und der Mensch entwickeln sich gemeinsam als Stufen göttlicher Selbstoffenbarung. Gott ist nicht fertig, sondern entwickelt sich durch die Welt hindurch.

233

Steiner and thereafter

The beginning of organic farming could trace back to 1924 in Germany with Rudolf Steiner's course on Social Scientific Basis of Agricultural Development, in which his theory considered the human being as part and parcel of a cosmic equilibrium that he/she must understand in order to live in harmony with the environment. Therefore, a balance must be struck between the spiritual and material side of life (Herrmann and Plakolm 1991).
H. Pfeiffer applied these theories to agriculture and gave birth to biodynamic agriculture (Kahnt 1986). It was developed at the end of the 1920s in Germany, Switzerland, England, Denmark and the Netherlands (Herrmann and Plakolm 1991; Kahnt 1986; Diercks 1986)

234

Pioniere in der Geschichte des Biolandbaus

Dr. Hans Müller *1891; †1988, Maria Müller *1899; †1969

- Besondere Leistungen
  - Gründerpaar des organisch-biologischen Landbaus als eigene Richtung (zusammen mit Hans Peter Rusch)
  - Eröffnung Hausmutterschule und Bildungsstätte «Möschberg» BE

Maria Müller
- Aufarbeitung der Literatur org. Landbaus und der Landbauwissenschaften
- Leitung Hausmutterschule und Bildungsstätte «Möschberg»

235

Historie der biologischen Landwirtschaft

Dr. Hans Müller (1891-1988)

Hans Müller war Biologe und Pädagoge.

Seine Doktorarbeit mit dem Titel „Wie kommt das Leben auf den Fels…?" wies bereits auf seine Leidenschaft, die dem Boden galt, hin – und der Fruchtbarkeit, die durch das Leben darin entstehen konnte. Mit einer wachsenden Gruppe von schweizerischen, später auch österreichischen und deutschen Bauern erprobte und verfeinerte er mit Hilfe seiner Frau und später mit Hans Peter Rusch die „Humuswirtschaft„,wie er die Landbaumethode zunächst nannte, die ohne Agrochemikalien und synthetischen Dünger auskam.

1932: Gründung der Landbauschule auf dem Möschberg im Emmental, daraufhin rege Lehr- und Bildungstätigkeit für Jugend und Erwachsene. Zitat: „Freiheit ist nur da, wo der bäuerliche Mensch sich der Verantwortung bewußt wird gegenüber dem, was ihm in seinem Boden … zur Hut für kommende Geschlechter – für die Heimat schlechthin,… anvertraut ist." (Hans Müller)

236

Dr. Hans Peter Rusch (1906 – 1977)

Hans Peter Rusch war Arzt, Mikrobiologe und Humusforscher. Er arbeitete ab den 50er Jahren intensiv mit dem Ehepaar Müller zusammen. Gemeinsam wurde über Jahrzehnte Boden,- Humus- und Düngungsforschung betrieben, und daraus gemeinsam eine Landbaumethode entwickelt. Aus der „Humuswirtschaft" wurde die „organisch-biologische Landwirtschaft." Die Ergebnisse von Rusch´s Forschungen waren klare Erkenntnisse über ideale Bodenbearbeitung, organische Düngung, die notwendige Qualität organischer Dünger und Pflege der Bodenflora und –fauna, die den „Kreislauf der organischen Substanz", wie Rusch es nannte, erst ermöglicht. Rusch entwickelte einen mikrobiologischen Bodentest, den „Rusch-Test", der ihm gestattete, Aussagen über potenzielle und zukünftige Bodenfruchtbarkeit abzuleiten und der bei allen damaligen Landwirtschaften der Müller´schen Bauerngruppen angewandt wurde.

237

Pioniere in der Geschichte des Biolandbaus

Mina Hofstetter *1883; †1963

- Besondere Leistungen
  - Landw. Experimente auf ihrem viehlosen Betrieb
  - Publikationen, Vorträge, Kurse (Lebensreformbewegung)
  - Lehrstätte für biologischen Landbau auf ihrem Hof

- Ihre Kerngedanken waren
  - Gesunde Nahrung aus gesundem Boden
  - Mehr Qualität statt Quantität
  - Nur oberflächliche Bodenbearbeitung (da Boden lebendiger Organismus)
  - Bodenbedeckung so oft als möglich
  - Kompost ist der ideale Dünger
  - Steinmehl ist ein wertvoller Bodenverbesserer
  - Gründüngung an Stelle von Brache

238

Australias demeter farm

Australia's original Demeter Farm (1934-1954)

239

The Farm as Organism:
The Foundational Idea of Organic Agriculture

John Paull

School of Geography and Environmental Studies, University of Tasmania

Archived at http://orgprints.org/10138

Page 14

Elementals – Journal of Bio-Dynamics Tasmania (2006) #83, 14-18

240

Organic farming

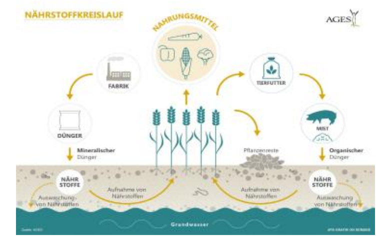
Previou Next End

241

Grundgedanken biol. LW

242

Konventionelle Landwirtschaft



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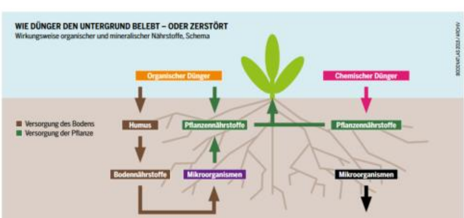
Düngen biol. LW



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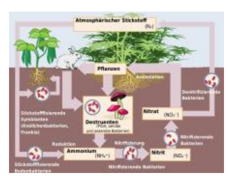
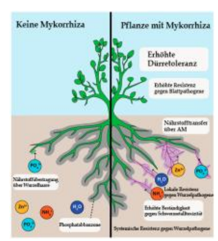
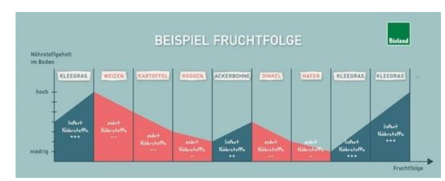




245

Biol. LW Fruchtfolge



246

Etappen in der Entwicklung des Biolandbaus

1950-2000 Marktwirtschaftliche Organisationen

- 1946 Gründung AVG (heute: AV-AG) Biogemüse AV-AG in Galmiz
- 1947 Gründung SGBL (heute: Bioterra) Bioterra iOrganisation für den Bio- und Naturgarten in der Schweiz
- 1954 Eintragung Schutzmarke «Demeter»
- 1972 Gründung Biofarm
- 1981 Gründung VSBLO (heute: BIO SUISSE) Eintragung Schutzmarke «Knospe»

- Vermarktung von Bioprodukten entwickelte sich erst nach gesetzlichen Schutz der Kennzeichnung von Bioprodukten

247

Etappen in der Entwicklung des Biolandbaus

1970-2000 Politische Verankerung von Bio

1971	Dr. Hans Müller fordert rechtliche Anerkennung des Begriffes «Bio»
1973	Gründung Forschungsinstitut für biologischen Landbau (FiBL)
1976	1. Kongress der International Federation of Organic Agriculture (IFOAM)
1980	erste gemeinsame Richtlinien des Biolandbaus in der Schweiz
1981	Gründung VSBLO (heute: BIO SUISSE) Eintragung der Schutzmarke «Knospe»
1991	EU-Bioverordnung tritt in Kraft (auf Grundlage der Richtlinien der IFOAM und des Codex alimentarius)
1993	Bund definiert Mindestanforderungen für Bio bezügl. Direktzahlungen
1997	CH-Bioverordnung tritt in Kraft
2000	13. Wissenschaftskonferenz der IFOAM, organisiert durch FiBL

248

Initiative von Pionieren wächst zur Bewegung

Forschungsinstitut, internationale Dachorganisation

- FiBL, heute eine der weltweit führenden Forschungseinrichtungen zur biologischen Landwirtschaft (Gründung 1973)
- Stärken
  - interdisziplinäre Forschung, Innovationen mit Landwirten und Lebensmittelindustrie
  - lösungsorientierte Entwicklungsprojekte und rascher Wissenstransfer
- IFOAM, internationale Dachorganisation der Bioorganisationen mit etwa 800 Mitgliedern in 120 Ländern (Gründung 1972)

Bilder: FiBL, IFOAM

249

Initiative von Pionieren wächst zur Bewegung

Erste Richtlinien und Dachverband (Bio Suisse)

- Bio-Verbände Demeter, Biofarm, SGBL Bio (später: Bioterra) und Progana vereinen sich
- Erstellung gemeinsamer Richtlinien für Schutz und Kontrolle des biologischen Landbaus (unter Leitung des FiBL)
- weltweit erste Bio-Richtlinien entstehen in der Schweiz (1980)

- erfolgreiche Zusammenarbeit der Bio-verbände: Gründung der heutigen Bio Suisse (Dachverband der Schweizer Biolandbau-Organisationen, Name ab 1997)

Bilder: Bio Suisse

250

Initiative von Pionieren wächst zur Bewegung

Zertifizierung: garantierte Qualität, seriöser Handel

- bio.inspecta (Gründung 1998)
- Ziel: Unterstützung von Landwirtschafts-betrieben und Unternehmen der Lebensmittelbranche in der nachhaltigen Entwicklung und der Stärkung Ihrer Marktposition

Bilder: bio.inspecta, Bio Test Agro

251

Initiative von Pionieren wächst zur Bewegung

Einstieg der Grossverteiler führt zu Bio-Boom

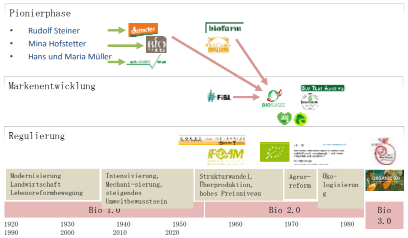
- Einstieg von Coop (1994)
  - Einstieg von Coop als Detailhändlerin in den Bio-Markt und zunehmendes Interesse der Konsumenten führen zu Bio-Boom
  - Parallel dazu Einführung von Direktzahlungen des Bundes an Biolandwirte

Bilder: Coop, Migros

252

Übersicht: Meilensteine in der Bio-Geschichte

Personen, Organisationen und Meilensteine



253

Übersicht: politische Verankerung von Bio

Anerkennung der Biorichtlinien bringt gesetzl. Schutz

Private Richtlinien (Demeter 1954, Bio Suisse 1980)

EU-Bioverordnung (1991) ↔ CH-Bioverordnung (1997)

IFOAM Richtlinien (IFOAM 1980) ↔ Codex alimentarius (FAO, WHO 1962)

- privatrechtlich
  - private Biorichtlinien für Schweizer Produkte über Mindestanforderungen der CH-Bioverordnung hinaus
- staatlich
  - EU-Bioverordnung und CH-Bioverordnung sind fast gleichwertig
- international
  - Codex al.: lebensmittel-rechtliche Bestimmungen in Mitgliedsstaaten
  - IFOAM: int. Biorichtlinien

254

Übersicht: Agrarsysteme im Vergleich

Zeitliche Entwicklung und Ökologisierungsgrad

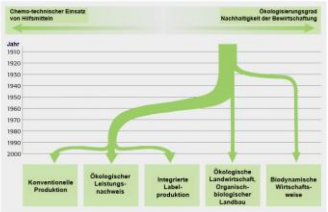


Bild: «Biologischer Landbau» LmZ (O. Schmid, R. Obrist)

255

Organic 1.0

Pioneers from Around the World
Organic 1.0 was started by numerous pioneers, who observed the problems with the direction agriculture was taking at the end of the 19th century and beginning of the 20th century. They saw the need for a radical change.

Lady Eve Balfour was one of these pioneers. She believed the characteristics of truly sustainable agriculture can be summed up by the word "permanence".

256

Organic 2.0

Norming and Performing
Organic 2.0 started in the 1970s when the writings and agricultural systems developed by our pioneers were codified into standards and then later into legally-mandated regulatory systems.

It marks a time where awareness of organic farming increased considerably and the market for organic produce grew significantly. There is more and more evidence highlighting the positive impacts of organic on a range of important issues including consumer health, biodiversity, animal welfare and the improved livelihoods of producers.

Despite increasing success, certified organic agriculture has not reached 1% of global agricultural land. At the same time there is increasing awareness that organic can be a solution to global challenges such as soil contamination, loss of biodiversity and climate change. It is time to position organic as a modern, innovative system that can bring true sustainability to food and farming systems.

257

Bio 3.0

Mit Bio zu einer modernen nachhaltigen Landwirtschaft

- Ziele
  - Weiterentwicklung des Biolandbaus ab 2015

- Bio/Organic 3.0
  - Ist ein Diskussionspapier für die zukünftige Entwicklung der Biobewegung
  - Ist die 3. Phase der Biobewegung (siehe nächste Folie)
- Wer
  - IFOAM
  - Bioland, Naturland, Bio Suisse, Bio Austria (alle Verbände > 28'000 Mitglieder)
  - Forschungsinstitut für biologischen Landbau FiBL (D, A, CH)

Quelle: Diskussionspapier Bio 3.0 (Niggli et al., 2015)

258

Organic 3.0

Organic 1.0 was started by our numerous pioneers, who observed the problems with the direction that agriculture was taking at the end of the 19th century and the beginning of the 20th century and saw the need for a radical change.

Organic 2.0 started in the 1970s when the writings and agricultural systems developed by our pioneers were codified into standards and then later into legally-mandated regulatory systems.

Organic 3.0 is about bringing organic out of its current niche into the mainstream and positioning organic systems as part of the multiple solutions needed to solve the tremendous challenges faced by our planet and our species.

MANIFESTING ORGANIC 3.0

Organic 3.0 forms from the top down and the bottom up: We work collectively toward a common framework that emerges out of the diversity of like-minded initiatives from around the world. IFOAM - Organics International and its network, while striving to unite these efforts, also leads with its own initiatives:

259

Bio 3.0
Entwicklungsphasen der biologischen Landwirtschaft

Bio 1.0	Bio 2.0	Bio 3.0
Organic 1.0	*Organic 2.0*	*Organic 3.0*
Eine Idee wird geboren	Aus der Idee wird ein weltweiter Standard	Garant für eine nachhaltige Landwirtschaft und Ernährung jenseits der Nische
1900 bis 1970	**1970 bis 2015**	**2015 bis**
Zurück zur Natur. Lebensreform. Der Landwirtschaftliche Kurs. Organisch-biologischer Landbau. Die Grenzen des Wachstums.	Verbandsrichtlinien IFOAM-Richtlinien EU-Ökoverordnung. Codex Alimentarius Harmonisierung zwischen 80 staatlichen Verordnungen. Weltweiter Handel mit Ökoprodukten	Umfassende Innovationskultur. Ständige Verbesserung in Richtung Beste Praxis. Transparente Integrität. Allianzen und Partnerschaften.

Quelle: Diskussionspapier Bio 3.0 (Niggli et al., 2015)

260

Bio 3.0
Wettbewerb der Agrarsysteme steht erst am Anfang (1)

- Landwirtschaft muss sich ändern, weil zentrale gesellschaftliche Erwartungen nicht erfüllt werden
  - Steigender Pestizideinsatz trotz integriertem Pflanzenschutz und neuen Techniken zur Pestizidreduktion (z.B. GVO)
  - Industrialisierung der Tierhaltung trotz Tierwohlinitiativen
  - Verlust an Artenvielfalt trotz internationalen Abkommen, Vertragsnaturschutz
  - Verlust an Boden und Bodenqualität

Wettbewerbsziele	Nachhaltigkeit, konsequente Kreislaufsysteme, artgerechte Tierhaltung, Klimawandel, Systemdienstleistungen, Ressour-ceneffizienz, Urbanisierung, Verbrauchererwartungen usw.
Bisherige Konzepte der Lösungssuche	Standortanpassung, Aquaponik, Urban Farming, Vertical Agriculture, Robotik und Biotechnologie
«Wettbewerbsjury»	Verbraucher Landwirte Wissenschaft und Politik

Quelle: Diskussionspapier Bio 3.0 (Niggli et al., 2015)

261

Bio 3.0
Wettbewerb der Agrarsysteme steht erst am Anfang (2)

Teilnehmer	Verschiedene Agrarsysteme Biolandbau bisher zu wenig beachtet
Lösungen aus dem Biolandbau	standortangepasstes Fruchtfolgekonzept, betriebliche Stoff- und Energiekreisläufe, biologischer Pflanzenschutz, vorbeugende Tiergesundheitsstrategien, regionale Eiweissfutterversorgung mit Flächenbindung, usw.

- Biolandbau hat
  - 40 Jahre Entwicklungs- und Erfahrungsvorsprung
  - Systemansatz für Landwirtschaft und Ernährung
- Biolandbau soll
  - Eigene Schwachstellen angehen
  - Referenz werden für weltweit funktionierenden Systemansatz in der Landwirtschaft

Quelle: Diskussionspapier Bio 3.0 (Niggli et al., 2015)

262

Bio 3.0
Herausforderungen

- Schwaches Wachstum der **landwirtschaftlichen Erzeugung** (hauptsächlich in Europa, wo die absatzstärksten Märkte liegen)
- Ungenutztes oder fehlendes Potential des Biolandbaus für eine **nachhaltige Ernährungssicherheit**
- Zunehmende Konkurrenz durch andere **Nachhaltigkeitsinitiativen**
- **Transparenz und Sicherheit** in den Wertschöpfungsketten
- Zu verbessernde differenzierte **Kommunikation mit Verbrauchern**

Quelle: Diskussionspapier Bio 3.0 (Niggli et al., 2015)

263

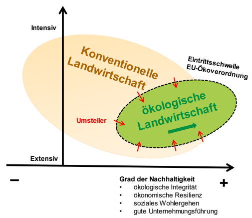
Bio 3.0
Rahmenbedingungen Weiterentwicklung Biolandbau

Quelle: Diskussionspapier Bio 3.0 (Niggli et al., 2015)

264

Bio 3.0

Erhöhte Produktivität dank ökologischer Intensivierung



- Biolandbau kann Produktivität steigern dank noch besserer Nutzung betriebseigener Kreisläufe und Ressourcen (Nachhaltigkeit erhalten).
- Konventionelle Landwirtschaft kann nur dann ökologisch nachhaltiger werden, wenn betriebsfremde Abhängigkeiten von Stoffflüssen und Mitteln (Dünger, PSM) reduziert werden.

Quelle: Diskussionspapier Bio 3.0 (Niggli et al., 2015)

265

Bio 3.0

Dynamisches Entwicklungskonzept: «Beste Praxis»

- **Beste Praxis:** Weitergehende Leistungen (Richtlinien Bioverbände, private Labels) bedeutend für Marketing und Kommunikation (Nische)
- **Staatliche Ökoregelung:** Genau definierte Mindestanforderungen für den Biolandbau als Modell für die ganze Landwirtschaft (Innovationsstrategie)

Quelle: Diskussionspapier Bio 3.0 (Niggli et al., 2015)

266

IFOAM

HISTORY

The humble beginnings of IFOAM – Organics International trace back to a meeting in Versailles, France in 1972. Roland Chevriot of Nature et Progrès envisioned the need for Organic Agriculture movements to coordinate their actions and to enable scientific and experimental data on organic to cross borders. In order to realize this vision, he invited organic pioneers including Lady Eve Balfour, founder of the UK Soil Association, Kjell Arman from the Swedish Biodynamic Association and Jerome Goldstein from the Rodale Institute to join him in Versailles to set the International Federation of Organic Agriculture Movements (IFOAM) in motion. See Roland Chevriot's invitation

267

Important and impressive international network: IFOAM

International Federation of Organic Agriculture Movements:

- "It all started in 1972 when the President of the French farmers' organization, Nature et Progrès conceived of a worldwide appeal to come together to ensure a future for organic agriculture"
- "By the 80s, IFOAM had leaders in the US, attracted involvement from African agents of organic agriculture, and launched a unique and fruitful relationship with the Food and Agriculture Organization of the United Nations (FAO)"
- "..producing **standards** which provided a model for numerous major laws and voluntary standards, (Codex Alimentarius, EU, FAO)"
- By 2014: 732 affiliates (members, associates and supporters) in 114 countries.
- Source: www.ifoam.org

268

IFOAM'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)*.

269

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

"..one of IFOAM's founders, Eve Balfour, said that the characteristics of truly sustainable agriculture can be summed up with the word, "permanence"

270

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.

271

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.

272

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.

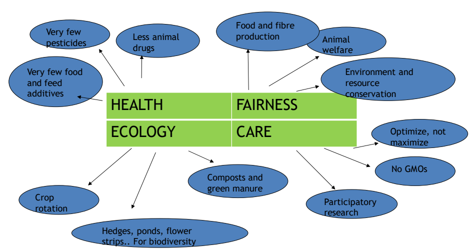
273

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.

274

Principles and practices



275

Codex Alimentarius - Organically Produced Foods

Table of Contents

Joint FAO/WHO Food Standards Programme
CODEX ALIMENTARIUS COMMISSION

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
WORLD HEALTH ORGANIZATION
Rome, 2001

For further information on the activities of the Codex Alimentarius Commission, please contact:

Secretariat of the Joint FAO/WHO Food Standards Programme Food and Agriculture Organization of the United Nations Viale delle Terme di Caracalla 00100 Rome, Italy

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Telex:	625852 or 625853 FAO I
E-mail:	Codex@fao.org

276

277

Action plan for organic production in the EU

In March 2021, the Commission launched an organic action plan for the EU. The action plan sets out to achieve the European Green Deal target of 25% of agricultural land under organic farming by 2030.

The plan is comprised of 23 actions divided across three axes.

– Axis 1: stimulate demand and ensure consumer trust;
– Axis 2: stimulate conversion and reinforce the entire value chain;
– Axis 3: organics leading by example: improve the contribution of organic farming to environmental sustainability.

278

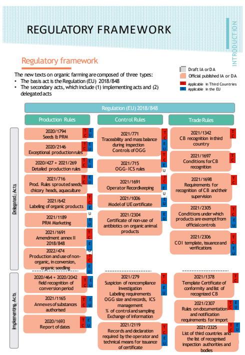
EU Regulations

Latest

New organic legislation is applicable from 1 January 2022, following the postponement of its implementation for a year. The rules reflect the changing nature of this rapidly growing sector. The new regulation is designed to ensure fair competition for farmers whilst preventing fraud and maintaining consumer trust through the following:

– production rules are simplified through the phasing out of a number of exceptions and opt outs;
– the control system is strengthened thanks to tighter precautionary measures and robust checks along the entire supply chain;
– producers in third countries will have to comply with the same set of rules as those producing in the EU;
– organic rules cover a wider list of products (e.g. salts, cork, beeswax, wool, etc) and have additional production rules (e.g. deer, rabbits and poultry);
– certification will be easier for small farmers thanks to a new system of group certification;
– there will be a more uniform approach to reducing the risk of accidental contamination from pesticides.

279



280

Organic production and products

PAGE CONTENTS

Products covered by EU organics rules
Organic production rules
Rules on livestock
Rules for the food chain
Permitted substances in organic production
Rules on wine, aquaculture and hydroponics
Organic plant reproductive material databases

Products covered by EU organics rules

European Union organic farming rules cover agricultural products, including aquaculture and yeast. They encompass every stage of the production process, from seeds to the final processed food. This means that there are specific provisions covering a large variety of products, such as:

– seeds and propagating material such as cuttings, rhizome etc. from which plants or crops are grown;
– live or unprocessed agricultural products;
– feed;
– processed agricultural products for use as food.

In addition, Annex I to Regulation (EU) 2018/848 provides for a list of new products which are closely linked to agriculture that are now also in the scope of the organic legislation. This includes salts, cork stoppers of natural cork, essential oils, raw cotton, raw wool, and beeswax.

EU regulations on organic production exclude products from fishing and hunting of wild animals but include harvest of wild plants when certain natural habitat conditions are respected. There are specific rules for plans, livestock, processed food and wine, yeast, aquaculture and more.

Regulation (EU) 2018/848 on organic production and labelling of organic products

Legislation for the organics sector

281

Organic production rules

Producing organically means respecting the rules on organic farming. These rules are designed based on general and specific principles to promote environmental protection, maintain the biodiversity of Europe and build consumer trust in organic products. These regulations govern all areas of organic production and are based on a number of key principles, such as:

– prohibition of the use of GMOs;
– forbidding the use of ionising radiation;
– limiting the use of artificial fertilisers, herbicides and pesticides;
– prohibiting the use of hormones and restricting the use of antibiotics to only when necessary for animal health.

This means that organic producers need to adopt different approaches to maintaining soil fertility and animal and plant health including:

– crop rotation;
– cultivation of nitrogen fixing plants and other green manure crops to restore the fertility of the soil;
– prohibition of use of mineral nitrogen fertilisers;
– to reduce the impact of weeds and pests, organic farmers choose resistant varieties and breeds and techniques encouraging natural pest control;
– encourage the natural immunological defence of animals;
– in order to maintain animal welfare and health, organic producers need to prevent overstocking.

282

Rules on livestock

Livestock farmers must also fulfil specific conditions if they wish to market their products as organic. These rules include respect for animal welfare and feeding animals in accordance with their nutritional needs, and are designed to protect the animals' health and environment. These rules also help to build public trust as they ensure that organically farmed animals are kept separate from non-organic. Examples of rules which apply to livestock farmers include:

Abiding by organic principles

- Non-organically raised animals may be not brought onto holdings unless for breeding purposes and then must comply with specific rules.
- Farmers have to provide 100% organic feed to their animals in order to market their products as organic.
- The feed should primarily be obtained from the farm where the animals are kept or from farms in the same region.
- Cloning animals and or transferring embryos is strictly forbidden.
- Growth promoters and synthetic amino-acids are prohibited.
- Suckling mammals must be fed with natural, preferably maternal, milk.
- Natural methods of reproduction must be used, artificial insemination is however allowed.
- Non-organic feed materials from plant origin, feed materials from animal and mineral origin, feed additives, certain products used in animal nutrition and processing aids can only be used if they

283

Rules for the food chain

The rules cover all stages of production, preparation and distribution (from primary production to storage, processing, transport, distribution and supply to the final consumer). This means that all organic products in the EU follow strict rules from the farm to fork.

The specific provisions for processing organic food and feed include:

- the separation of processed organic products in time and space from non-organic ones;
- a minimum organic content of 95% of organic agricultural ingredients and strict conditions for the remaining 5% to be labelled as organic using the organic logo;
- clear rules on labelling and on which products can and cannot use the organic logo;
- specific limits to the substances which can be added to food and feed and a limited list of approved additives and processing aids to be used in organic production.

284

Permitted substances in organic production

One of the objectives in organic production is to reduce the use of external inputs. Any substance used in organic agriculture to fight pests or plant diseases must be pre-approved by the European Commission.

Additionally, specific principles guide the approval of external inputs such as fertilisers, pesticides, and food additives so that only substances and compounds listed as approved in specific legislation can be used in organic production.

Processed food shall be produced mainly from agricultural ingredients only (added water and cooking salt are not taken into account). They may also contain:

- preparations of micro-organisms and enzymes, mineral trace elements, additives, processing aids and flavourings, vitamins, as well as amino acids and other micronutrients added to foodstuffs for specific nutritional purposes can be used but only when authorised under organic rules;
- substances and techniques which reconstitute properties that are lost in processing or storage, that correct any negligence in the processing, or that otherwise may be misleading on the true nature or the products, shall not be used;
- non-organic agricultural ingredients can only be used if they are authorised within the annexes to the legislation or have been provisionally authorised by an EU country.

And above all, any substance listed for use in organic agriculture must be compliant with horizontal EU rules and then thoroughly assessed and approved by the European Commission for use in organics.

285

Wine

Specific rules are set for organic wine-making, including a technical definition of organic wine which is consistent with the organic objectives and principles.

Organic wine has to be made with organic grapes and yeast. However, there are a number of other restrictions that also apply. These include:

- a prohibition on the use of sorbic acid and desulphurisation;
- the level of sulphites in organic wine must be lower than their conventional equivalent (depending on the residual sugar content).

Aquaculture

There are also specific rules governing the organic aquaculture sector. Key features include:

- strict maximum stocking densities;
- water quality requirements;
- rules that specify that biodiversity should be respected, and which do not allow the use of induced spawning by artificial hormones;
- handling minimised to avoid stress and physical damage;
- the provision that organic feeds should be used, supplemented by fish feeds derived from sustainably managed fisheries;
- special provisions are made for bivalve mollusc production and for seaweed.

286

Hydroponics and Aquaponics

EU rules do not allow for plants grown hydroponically to be marketed as organic except when they grow naturally in water. This is because organic production is only possible when plants are grown naturally in soil. This regulation also applies to plants that are grown in an aquaponics system.

However, fish which are grown in an aquaponics system can be sold as organic if the relevant legislation for organic aquaculture is followed.

Organic plant reproductive material databases

All plants or crops marketed as organic need to be grown from plant reproductive material (seeds, rhizomes etc.) which also conforms to organic standards.

However, it is sometimes difficult for farmers to find appropriate sources of organic plant reproductive material. Therefore, EU countries maintain organic plant reproductive material databases to better connect farmers with suppliers.

287

The organic logo

In March 2000 the European Commission introduced a logo bearing the words 'Organic Farming - EC Control System' [Regulation (EEC) No 2092/91 to be used on a voluntary basis by producers whose systems and products have been found on inspection to satisfy EU regulations

Consumers buying products bearing this logo can be confident that:

- *At least 95% of the product's ingredients have been organically produced*
- *The product complies with the rules of the official inspection scheme*
- *The product has come directly from the producer or preparer in a sealed package*
- *The product bears the name of the producer, the preparer or vendor and the name or code of the inspection body*

288

Organic Farming Information System (OFIS)

- Import authorisations that the Member States have granted to third countries (according to Article 11(6) of Regulation (EEC) no 2092/91)
- Authorisations to use agricultural ingredients that cannot be found from the organic production method (according to Article 3 of Regulation (EEC) N° 207/93 defining the content of Annex VI to Council Regulation (EEC) N° 2092/91).

OFIS: http://europa.eu.int/comm/agriculture/ofis_public/index.cfm

289

Labeling

- Article 5
- 1. The labeling and advertising of a product specified in Article 1 (1)

(a) may refer to organic production methods only where:

(b) such indications show clearly that they relate to a method of agricultural production

(c) the product was produced in accordance with the rules laid down in ►**M10** Article 6 ◄ or imported from a third country under the arrangements laid down in Article 11

(d) the product was produced or imported by an operator who is subject to the inspection measures laid down in Articles 8 and 9

290

Inspection system

- Article 8

1. Any operator who produces, prepares or imports from a third country products as specified in Article 1 for the purpose of marketing them shall:

(a) notify this activity to the competent authority of the Member State in which the activity is carried out; such notification shall include the information specified in Annex IV

(b) submit his undertaking to the inspection system referred to in Article 9

2. Member States shall designate an authority or body for the reception of notifications

3. The competent authority shall ensure that an updated list containing the names and addresses of operators subject to the inspection system is made available to interested parties

291

Imports from third countries

- Article 11

1. Without prejudice to Article 5, products as specified in Article 1 which are imported from a third country may be marketed only where:

(a) they originate in a third country appearing in a list to be drawn up by a Commission decision in accordance with the procedure laid down in Article 14 and were produced in a region or a production unit and under the inspection of an inspection body specified, where appropriate, in the decision concerning the third country in question

(b) the competent authority or body in the third country has issued a certificate of inspection stating that the lot designated in the certificate:

— was obtained within a system of production applying rules equivalent to those laid down in ►**M10** Article 6 ◄, and

— was subject to a system of inspection recognized as equivalent in accordance with paragraph 2 (b)

292

Imports from third countries

- Article 11

6. (a) By way of derogation from paragraph 1, the importer(s) in a Member State shall be authorized by the competent authority of the Member State to market until ►**M15** 31 December 2005 ◄, products imported from a third country not included in the list

Due to an amending of the regulation since the 20 September 2005, the new date for this deadline changed to:

31 December 2006

Products that originate from these countries are allowed into the EU as equivalent: **Argentina, Australia, Costa Rica, Israel, Switzerland and New Zealand**

293

Free movement within the Community

- Article 12

Member States may not, on grounds relating to the method of production,to labelling or to the presentation of that method, prohibit or restrict the marketing of products as specified in Article 1 that meet the requirements of this Regulation

However, with regard to the rules referred to in Annex I, part B, concerning livestock production, Member States may apply more stringent rules to livestock and livestock products produced within their territory, provided that these rules are in compliance with Community law and do not prohibit or restrict the marketing of other livestock and livestock products that meet the requirements of this Regulation

294

Types of Pesticides

- **Synthetic** – manufactured in lab – sold by chemical company
- **Organic** – products of living organisms
- **Inorganic** – minerals mined from the earth
- **Biorational** – all of the above – low toxicity and low impact on the environment

7/10/2016

295

Pesticide

- A pesticide is a chemical used to kill pests.
- Pest is any organism that threatens human directly by creating annoyance or indirectly by damaging our crops .

296

Classification of Pesticide

- Insecticide: To kill insects.
- Herbicide: To kill herbs.
- Weedicide: To kill weeds.
- Fungicide: To kill Fungi.
- Bactericide: To kill Bacteria.
- Acaricide/Miticide: To kill Mites.
- Nematocide: To kill Nematodes.
- Rodenticide: To kill Rodents.

297

Classification based on Toxicity

- Toxicity refers to "degree to which a substance can damage an organism."
- It is measured in LD50 and LC50.

- Oral toxins: kill through oral cavity or Stomach.
- Dermal toxins: kill through Skin.
- Respiratory toxins: kill through respiratory System.

298

Classification based on Mode of Entry

- How a chemical enters into the insect body cavity?

- Stomach poison.
- Contact Poison.
- Systemic Poison.
- Fumigant Poison.
- Trans-laminar Poison.

299

Classification based on Mode of Action

- How a pesticide acts after entering in body of insect?

- Nerve Poison.
- Muscle Poison.
- Physical Poison.
- Metabolic Poison.

300

Classification based on chemical structure

- Based on chemical structure Pesticides are of five types:
1. Organochlorine (DDT, Chlordane).
2. Organophosphate (Profenofos, Chloropyrifos).
3. Carbamates (Carbaril, Carbosulfan, Carbofuran).
4. Pyrethrides (Bifenthrine, Lambda-cyhalothrine).
5. New chemistry (Imedacloprid, Acetamiprid, Leufenuron, Amamactin etc.).

301

Classification based on Formulation

- Formulation is the mixture of active and inactive ingredient in a specific proportion for specific purposes.

- Solid Formulations
- Liquid Formulations
- Gas Formulations

302

Solid Formulations

- Soluble Powder
- Wet-able Powder
- Dust
- Granules
- Baits
- Slow Release Tablets

303

Liquid Formulations

- Emulsifable Concentrate
- Flow-able Concentrates
- Aerosol
- Solution
- Low Concentrate
- High Concentrate
- Ultra Low Volume

304

Gas Formulations

- Fog
- Smoke

305

Qualities of a Good Pesticide

- Highly potent.
- Quick Knockdown Effect.
- Broad Spectrum Activity.
- Cheap.
- Compatible with other pesticides.
- Non inflammable/ Non corrosive.
- Not off taste the crop.
- Easy Formulation.
- Optimum Residue Persistence.
- Least environmental pollution.
- Non-Phototoxic.
- Low possibility of insect Resistance.
- Activation in insects.
- Safe for beneficial Insects.

306

Precautions

- Pesticides are chemicals use them carefully.
- Wear gloves, cowboy shoes and mask while application.
- Wear the straps properly and keep lance at ıft. to the height of the plant.
- Only use a pesticide according to recommended dose.
- Do not make mixture of any kind of pesticides unless it is recommended.
- When using Herbicides/Weedicides spray a row only once as these chemicals can burn plants.
- After application wash the tank properly.
- In case of any personnel accident, take the victim to a doctor immediately along with pesticide bottle.

307

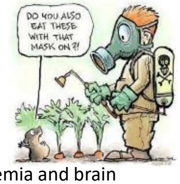
Hazards

- Killing of natural enemies.
- Insect Resistance problems.
- Residual hazards.
- Upsetting of natural balance.
- Air pollution—water pollution—Soil pollution.
- Hazards to personnel and domestic animals.
- High cost of pesticides, labour, Maintenance of equipments.

308

Synthetic Pesticides – Human Body

- Lower IQ
- Impaired thyroid function
- Birth defect
- Reduced birth weight
- Increased food allergies*
- Higher incidences of leukemia and brain tumors

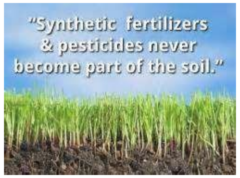


7/10/2016

309

Synthetic Pesticides - Environment

- High crop yields
- Contaminate
  - Soil and air
  - Water
  - Plants and animals
  - Agricultural runoff
- Create need for synthetic fertilizers
- Travel hundreds of miles from location



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310

Why is Organic Better?

- Avoids synthetic pesticides
- Prevents chemicals in the groundwater
- Doesn't effect the wildlife
- Reduces fossil fuel consumption
- Offsets greenhouse gasses
- Improves soil quality
- Tastes better

USDA ORGANIC

7/10/2016

311

Organic Pesticides

- Organic farmers use natural pesticides
- 25% of organic crops - pesticide residues
- Conventionally grown fruits and veggies 4X more likely to contain pesticide residue
- Natural chemicals flunked Ames test.

312

313

Reduce Pesticides in Food

- Eat organic
- Invest in a good water filtration system
- Grow your own
- Eat locally (ask farmer about pest control methods)
- Look for fair trade certification
- Speak up to corporations
- Include fermented foods in your diet
- Wash fruits and veggies
- Peal fruits and veggies
- Eat meat and dairy products that contain less fat

7/10/2016

314

Herbicide mode of action classification[1] with example herbicides

Group	Mode of Action	Family[2]	Common name	Trade name
1	ACC-ase inhibitor	'fops'	quiazalofop	Assure II
		'dims'	clethodim	Select
2	ALS inhibitors	sulfonylurea	nicosulfuron	Accent
		imidazolinone	imazethapyr	Pursuit
		-	flumetsulam	
3	Mitosis inhibitors	dinitroalinine	trifluralin	Treflan
4	Synthetic auxins	phenoxy	2,4-D	many
		-	dicamba	Clarity
5	Photosystem II inhibitor[3]	triazine	atrazine	many
6	Photosystem II inhibitor[3]	-	bromoxynil	Buctril
9	EPSPS inhibitor	-	glyphosate	Roundup
10	Glutamine synthetase inhibitor	-	glufosinate	Ignite
13	Carotene inhibitor	-	clomozone	Command
14	PPO inhibitors	diphenylether	fomesafen	Reflex
		-	flumioxazin	Valor
15	Lipid inhibitors	acetamide	metolachlor	Dual
		-	dimethenamid-P	Outlook
19	Auxin transport inhibitor	-	diflufenzopyr	Status
22	Photosystem I inhibitor	bipyridilliums	paraquat	Gramoxone
27	HPPD inhibitor	triketones	tembotrione	Laudis
		-	mesotrione	Callisto

[1]Weed Science Society of America Mechanism of Action. Only groups used in corn and soybean included in the table.
[2]Family name listed for groups with multiple herbicides.
[3]Group 5 and 6 herbicides bind at different locations of the same target site.

315

Bioherbizides

Figure 2

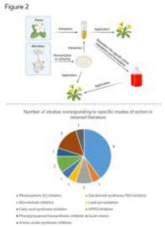
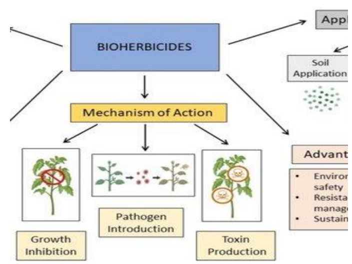


Figure 2. Schematic of bioherbicide synthesis and production from plant and microbial sources (top), and distribution of modes of action identified in the review on the physiological action of bioherbicides for weed control (bottom). Created in BioRender. Available online at: https://BioRender.com/ns703i0.

316



317

Bioherbicides

Bioherbicide is a biologically based control agent for weeds .

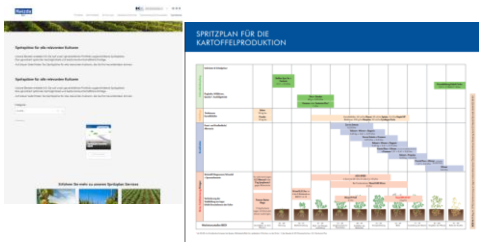
Bioherbicides may be compounds and secondary metabolites derived from microbes such as fungi, Bacteria or protozoa; or Phytotoxic plant residues, extracts or single compounds derived from other plant species.

•

Microorganism	Target weed	Ecosystem	Commercial product
Bipolaris sorghicola	*Sorghum halepense*		Biopolaris
Colletotrichum gleosp-orioides aeschynomene	*Aeschynomene viriginica*	Rice, soybean	Collego
Colletotrichum gloeos-porioides f.sp. *malva*	*Malva pusilla*	Wheat, horticultural crops	Biomal, Mallet
Colletotrichum gloeosp-orioides f.sp. *cuscutae*	*Cuscuta* sp.	Soybean	Lubao
Colletotrichum truncatum	*Sesbania exaltata*	Soybean, Cotton, rice	Coltru
Colletotrichum coccodes	*Abutilon theophrasti*	Maize, soybean	Velgo
Phytopthora palmivora	*Morrenia odorata*	Citrus groves	De Vine
Alternaria cassiae	*Cassia obtusifolia*	Soybean	CASST
Alternaria destruens	*Dodders*	Cranberry	Smolder
Puccinia canaliculata	*Cyperus esculentus*	Rice, horticultural crops	Dr.Biosedge

318

Der Spritzplan bestimmt die Gift Menge



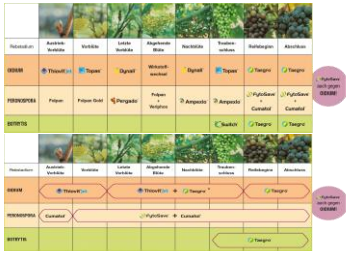
319

SPRITZPLAN FÜR konventionellen/BIOLOGISCHEN WEINBAU

Oidium″ can refer to a genus of fungi that causes powdery mildew

The peronospora: what is it and which crops attack ...Peronospora is a genus of plant pathogens that cause the disease known as downy mildew

Botrytis is a genus of fungi, most notably the species Botrytis cinerea, commonly known as grey mould



320

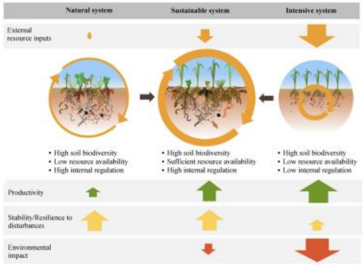
BT Mais ?

The plant itself produces the insecticidal protein derived from the soil bacterium Bacillus thuringiensis (Bt). This means the protective substance is present in the plant's tissues throughout the season, not applied as an external chemical spray at intervals.
Reduced Spraying: Farmers who plant Bt maize generally conduct fewer conventional insecticide treatments. Studies have shown that on some Bt maize fields, additional insecticide use against the targeted pest is not necessary, compared to conventional maize which might require a specific treatment at the optimal time.
Target Specificity: The Bt proteins are highly specific to certain insect groups (e.g., caterpillars and some beetles), posing no significant risk to humans, pets, livestock, or other animals.
Fewer Mycotoxins: By effectively controlling insect damage, Bt maize also reduces the incidence of ear molds that produce harmful mycotoxins (carcinogenic substances), thereby improving grain quality and health benefits.
In summary, the use of Bt maize is a strategy to reduce the overall application of synthetic chemical insecticides by integrating the pest control mechanism directly into the plant itself.

321

Gesunder Boden/ Healthy soil

322



323

Bodengesundheit

Definition:	Voraussetzung:
• Fähigkeit lebenden Bodens innerhalb natürlicher/bewirtschafteter Ökosystemgrenzen zu funktionieren • Produktivität von Pflanzen und Tieren aufrechtzuerhalten • Wasser- und Luftqualität zu erhalten/verbessern • Gesundheit von Pflanzen und Tieren zu fördern	• Verständnis der Zusammensetzung • Eigenschaften und Funktionen von Bodenorganismen • ihrer ökologischen Wechselwirkungen

324

Warum ist Bodengesundheit wichtig?

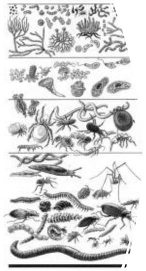
- Lebensraum für eine Vielzahl von diversen Organismen
  - einer der artenreichsten Lebensräume der Erde
- Durch Zusammenarbeit der Pflanzenwurzeln, ihre Mikrobiome und Bodenmikrobiota
  - Erweiterung der Nährstoffverfügbarkeit
  - Prävention von Krankheiten und Seuchen
  - Kohlenstoffspeicherung
  - Verbesserung der Bodenstruktur und Wasserhaltevermögen

325

Bedeutung der Bodenbiodiversität

- Veränderungen der Zusammensetzung der Bodenmikroorganismen und Verlust mancher Arten:
  - kann zu Verlust mancher Funktionen führen
- Bodenbiodiversität: wichtig für viele Ökosystemfunktionen
  - Pflanzenwachstum und – nährstoffe
  - Nährstoffmineralisierung
  - Nährstoffretention
  - Zersetzung
  - Ökosystemstabilität, Widerstandsfähigkeit (auch gegenüber Krankheiten, Seuchen)

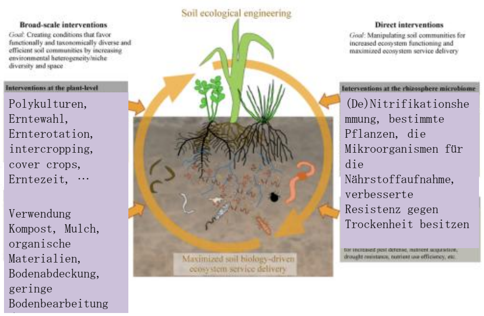
326



Strategie: Soil ecological engineering

- Gezielte Manipulation der Bodenlebensgemeinschaften auf verschiedenen Levels
- Ziel: Verbesserung von Bodenfunktionen, sodass die Ökosystemleistungen des Bodens optimiert werden
- Broad scale Eingriffe: schaffen Bedingungen für das Gedeihen von diversen Bodenlebensgemeinschaften
- Direkte Eingriffe: gezielte Manipulation von Bodenorganismen für eine bestimmte Funktion
- Spezifische Bereiche brauchen noch mehr Forschung.

327



328

Spezifische Empfehlungen I

- Für die Verbesserung der landwirtschaftlichen Nachhaltigkeit bei gleichzeitig hoher Produktivität
- von Landwirten anwendbar
  - Praktikabilität & Akzeptanz von Landwirte sind wichtig für die erfolgreiche Umsetzung
  - häufig kurzfristige Erhöhung der Kosten -> jedoch langfristige positive Effekte
  - Staat -> Anreiz

329

Spezifische Empfehlungen II

Bekannte Maßnahmen	Ökosystemleistungen
moderate Reduzierung des Düngemitteleinsatzes Erhöhung der Gülleausbringung	erhöhen die Effizienz der Nährstoffnutzung reduzieren den Nährstoffverlust fördern Sie die Bodenfruchtbarkeit
Ernterotation	lösen die Umweltprobleme von Monokulturen reduziert die externen Kosten der intensiven Landwirtschaft
verstärkter Einsatz von stickstofffixierenden Pflanzen (Bohnen, Hülsenfrüchte) in Rotationen	Verringerung des Düngemitteleinsatzes und Verringerung des Fußabdrucks der Düngung
Anstelle eines einzigen Genotyps -> Aussaat von Sortenmischungen	Erntequalität erhöhen Ertragsstabilität und Widerstandsfähigkeit gegenüber Klimawandel, Schädlingen und Wetterextremen
Verbesserung der Bodenbiodiversität, der Kohlenstoffspeicherung im Boden und der Bodenqualität (reduzierte Bodenbearbeitung, Deckfrüchte usw.)	fördern die Bodengesundheit und die Mehrfachfunktion des Bodens

330

Biologische Landwirtschaft und Insekten

- Verbot: Pestizide, Herbizide, synthetische Dünger
- Ziel: Verbesserung der Biodiversität

→ Höhere Artenvielfalt Pflanzen und Insekten (Bestäuber)

https://de.dreamstime.com/pestizide-rgb-farbsymbol-stoffe-zur-bek%C3%A4mpfung-von-sch%C3%A4dlingen-aus-schadpflanzen-schutz-hof-und-garten-vor-insekten-isolierte-image215927790

331

- **Aufgaben:**
  - natürliche Schädlingskontrolle
  - Bestäubung
  - Verbesserung der Bodenstruktur etc.
- **Ursachen der Artenvielfaltsreduktion:**
  - Intensivierung der Landwirtschaft
  - Pestizideinsatz
  - Klimawandel
  - künstliches Licht etc.

332

Verbesserung der Artenvielfalt durch Insekten

- **Grundlagen:**
  - Meisten Bedecktsamer durch v.a Insekten bestäubt
  - Intensivierung der Landwirtschaft→ Abnahme Pflanzen- und Tierartenvielfalt
- **Studie:**
  - Vergleich 20 biologischer Weizenfelder mit 20 konventionellen

  → Betrachtung Ackerwildkräuter
  - Aufteilung in insect-pollinated und non-insect pollinated; Rand und Mitte

https://www.derstandard.at/consent/tcf/story/2000059253067/wie-genome-editing-die-landwirtschaft-veraendert

333

Ergebnis

- Steigerung der Artenvielfalt durch biologischen Anbau unabhängig von Bestäubungstyp
- Am Rand stärkere Artenvielfalt
- Insect-pollinated-Arten am stärksten vom biologischen Anbau profitiert

https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.fao.org%2F3%2Fi3821e%2Fi3821e.pdf&psig=AOvVaw2DRUGtu15_7z11sC1xZoKY&ust=1673808406948000&source=images&cd=vfe&ved=0CBAQjRxqFwoTCMjy17Tcx_wCFQAAAAAdAAAAABAD

334

Ursache für mehr insect-pollinated Arten

- Größere Anziehung von Bestäubern auf biologischen Feldern
  - → **Feedbackmechanismus** zwischen Pflanzen- und Bestäubervielfalt
  - → **Problem:** Voranschreitende Intensivierung der Landwirtschaft→ Disruption der Pflanzen-Bestäuberbeziehung

- Keine Schädigung von Insekten durch Pestizide

335

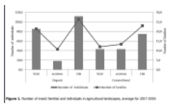
Verbesserung der Artenvielfalt von Insekten

- Zusätzliche Ressourcen (Pollen etc.)
- Kein Einsatz Pestizide
- Feedbackmechanismus
- Komplexität der Landschaft
- Höhere Lebensmittelspezialisierung der Insekten

→ 10,5% mehr Artenvielfalt in biologischer Landwirtschaft

336

Studie



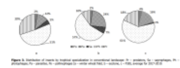
- **Studie**: Vergleich Winterweizenfelder mit Waldschutzstreifen (biologisch vs. konventionell)
- **Ergebnis**: Höchste Zahl an Insekten (Individuen/Familien) im Waldschutzstreifen
- **Biologische Felder:** doppelte Anzahl Individuen; 1,8x mehr Familien

Grabovska, Lavrov, V., & Rozputnii, O. (2020). Effect of organic farming on insect diversity. Ukrainian Journal of Ecology, 10(4), 96-101.

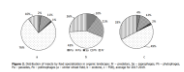
337

Insektenarten

- Insekten (v.a Phytophagen) wandern von konventionellen Feldern in Waldschutzstreifen
- Mehr Parasiten, Fressfeinde in konventionellen Feldern



konventionell



biologisch

Grabovska, Lavrov, V., & Rozputnii, O. (2020). Effect of organic farming on insect diversity. Ukrainian Journal of Ecology, 10(4), 96-101.

338

Treibhausgase und biol LW
Klimarelevanz der Landwirtschaft

- Treibhausgas (THG)-Emission

Hauptemissionsquellen der Landwirtschaft

THG	Faktor*	Entstehung
CO2 Kohlendioxid	1	Verbrennung fossiler Brennstoffe, Verkehr
CH4 Methan	23-28	Abbau organ. Materials unter Luftausschluss Ö: 71% stammen aus der LW
NO2 Lachgas	265-298	Abbau stickstoffhaltiger Verb.

- Ö Anteil Landwirtschaft an THG-Emission **10%**

339

[Untersuchungen: Haas et al. 1995; Nemecek et al. 2005]

Einsparung bis **30% CO2**
bis zu **40% fossiler Energie**
Bis zu **60% geringere CO2 Emission /ha**

im Vergleich Bio und Konventionell

340

Vergleich der Emissionen und des Energieeinsatzes zwischen Biolandbau und konventioneller Landwirtschaft unter der Berücksichtigung von 40 % geringeren Erträgen im Biolandbau (verändert nach Haas et al. 1995).

341

- Anstreben **effizienter Umgang** mit **fossiler Energie**

Erzeugung regenerativer Energie

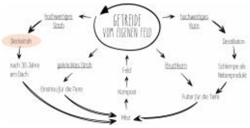
- Biomasse zur Biogasgewinnung
- Anbau Energiepflanzen -> **Mischanbau**

Wirtschaftlichkeit bei geringen Flächenertrag auch kritisch gesehen

342

Biodynamik und Demeter

- Regelungen gleich wie bei der Biolandwirtschaft
- Unterscheidungsmerkmale
  - Hofkreislauf
  - Arbeiten nach kosmischen Rhythmen
  - Biodynamische Präparate
  - Züchtung samenfester Sorten
- – Ganzheitliches Konzept



Quelle: http://www.thauerboeck.com/unser-beitrag-zum-klimaschutz/cradle-to-cradle-kreislauf-getreide2//

343

Demeter

- Bioanbauverband, gegründet 1932 in Deutschland
- Verwendung Demeter-Zeichen nur für Vertragspartner
- Lückenlose Überprüfung – vom Anbau bis zur Verarbeitung
- Leitsatz ist Voraussetzung für verantwortliches Handeln
- Kennzeichnung „Demeter" rechtlich geschützt

Quelle: https://www.livona.de/wiki/bio-siegel/demeter-bio-siegel/

344

Qualitätssicherung von Demeter

- Zweijähriger Anbau zur Anerkennung
- Demeter-Qualität wird laufend überprüft
- Stichproben werden durchgeführt
- Gesetzliche Bestimmungen
  - Verordnung (EWG) 834/2007
  - Verordnung 889/2008
- Verbreitung von Demeter weltweit

345

Verwendete Präparate

- Abstimmung mit Mondphasen und Planetenposition
- Hauptmerkmal für biodynamische Produktion
- Verbindlich vorgeschrieben
- Kauf der Präparate auch möglich
- Ziel ist die Verstetigung der Erträge
- Begriff „Harmonisieren"

Quelle:https://www.google.at/search?q=pr%C3%A4parate+demeter&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiQk4it5ITfAhXJyYUKHZ7sBIMQ_AUIDigB&biw=1440&bih=716#imgrc=aSLIOKGKxG_F_M:

346

Verwendete Präparate

„Feld- und Spritzpräparate"

- Hornmistpräparat
  - Kuhhorn gefüllt mit Kuhmist
  - Kräftigung des Bodens
- Hornkieselpräparat
  - Kuhhorn gefüllt mit Bergkristall
  - Wirkt auf oberirdische Pflanzenorgane

„Düngerzusatzpräparate"

- Werden dem Stallmist oder Kompost zugegeben
- Bsp.: Schafgaben Blüten, Löwenzahn, Eichenrinde

347

Acker- und Pflanzenbau

- Ausgewogene Fruchtfolgengestaltung
- „Düngen heißt, den Boden verlebendigen"
- Intensivierung biologische Vorgänge im Boden
- Schutz der Integrität der Pflanze
- Transparenz bei der Züchtung
- Gentechnik ist ausnahmslos verboten

348

Viehhaltung

- Für das Tierwohl gelten hohe Standards
- Integrität und natürliche Entwicklung soll gefördert werden
- Enthornung bei Rindern nicht erlaubt
- Futter wird selbst erzeugt
- Tiermehle, Zusatzstoffe und Medikamente sind verboten
- Produktqualität steht an 1. Stelle

Quelle: https://www.derbund.ch/schweiz/standard/der-staenderat-haelt-kuhhoerner-fuer-zu-gefaehrlich/story/13219813?track

349

Vergleich der Anbauweisen

Erzeuger / Kriterien	Konventionelle Landwirtschaft		Naturland	Bioland	demeter
Max. Hennen pro Gebäude	keine Beschränkung	20.000	12.000	6.000	3.000
Anzahl von erlaubten Lebensmittel-Zusatzstoffen	über 300	47	22	23	13
Schweine pro Hektar	keine Beschränkung	14	10	10	10
Legehennen pro Quadratmeter	10	6	6	6	4,4
Enthornung von Rindern	erlaubt ohne Betäubung	erlaubt	Nicht empfohlen	Zulässig im Ausnahmefall	Nicht erlaubt
Bio-Futter	keine Vorschrift	95%	100%	100%	100%
Einsatz von Gentechnik	erlaubt	bis zu 5%	nein	nein	nein

350

Kritik & Diskussion

- Ideen ohne wissenschaftliche Forschungsweisen entwickelt
- Wirkung eine Frage des Glaubens (?)
- Durch Untersuchungen keine Rückschlüsse auf spezifischen Beitrag
- Keine Beweise für positive Pflanzenentwicklung und Qualität

351

Ertraege

352

VERGLEICH DER ERTRÄGE
ökologische Landwirtschaft vs. konventionelle Landwirtschaft

1. Comparing the yields of organic and conventional agriculture [Seufert et al., 2012]
2. The crop yield gap between organic and conventional agriculture [de Ponti et al., 2012]
3. Comparison of organic and conventional crop yields in Austria [Brückler et al., 2018]

353

Comparing the yields of organic and conventional agriculture

Ergebnis:

25% niedrigere Erträge im Durchschnitt bei ökologischer Landwirtschaft

Erträge variieren

- je nach Fruchtfamilie und Fruchtart
- je nach System und unterschiedliche Anwendungen

[Seufert et al., 2012]

354

Comparing the yields of organic and conventional agriculture

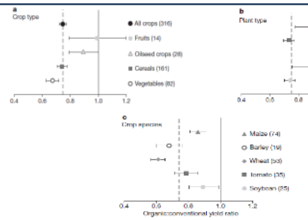


Figure 1. Influence of different crop types, plant types and species on organic-to-conventional yield ratios. a-c, Influence of crop type (a), plant type (b) and crop species (c) on organic-to-conventional yield ratios. Only those crop types and crop species that were represented by at least ten observations and two studies are shown. Values are mean effect sizes with 95% confidence intervals. The number of observations in each class is shown in parentheses. The dotted line indicates the cumulative effect size across all classes.

[Seufert et al., 2012]

355

Comparing the yields of organic and conventional agriculture

Gründe für die Unterschiede in den Erträgen:

- Hülsenfrüchte und mehrjährige Pflanzen vs. Nicht-Hülsenfrüchte
- Stickstoff-Bereitstellung
- pH-Wert – Phosphor
- Wissen/Erfahrungen und gute Bewirtschaftung
- Wasserbereitstellung

[Seufert et al., 2012]

356

The crop yield gap between organic and conventional agriculture

Ergebnis:

20% niedrigere Erträge im Durchschnitt bei ökologischer Landwirtschaft

Standardabweichung: 21%

Erträge variieren

- – je nach Fruchtfamilie
- – je nach Region

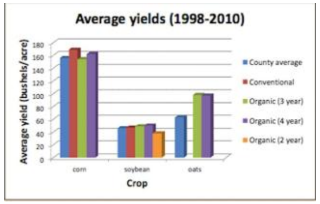
[de Ponti et al., 2012]

357

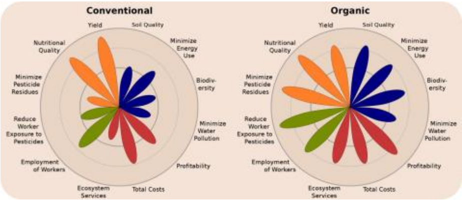
Product unite / crop	Unite	Yield in % on a organic farm	Yield in % on a conventional farm
Wheat	t/ha	60	100
Vegetable (extensive crops)	t/ha	80	100
Vegetables (intensive crops)	t/ha	50	100
Potato	t/ha	30-70	100
Sugar beet	t/ha	80-100	100
Pasture (intensive)	Energy unit/ha	60-70	100
Leguminousus, i.e. Alfalfa	Energy unit/ha	80-100	100
Corn, silage corn	Energy unit/ha	50-80	100

Source: Priručnik za organsku proizvodnju za poljoprivredne proizvođače, Food and Agriculture Organization of United Nations (FAO), Biotehnički fakultet, Podgorica, 2011, p.104.

358



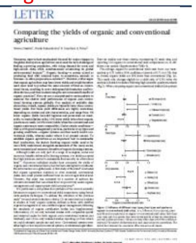
359



360

Comparing the yields of organic and conventional agriculture

- Meta-Analyse
- Kriterien festgelegt
- 66 Studien



[Seufert et al., 2012]

361

Comparison of organic and conventional crop yields in Austria

Ergebnis:

Cerealien: 35% Hackfrüchte: 27 – 49% Ölsaaten: 7 – 43%

niedrigere Erträge im Durchschnitt bei ökologischer Landwirtschaft

Standardabweichung: 33,8 – 60%

Erträge variieren

– je nach Frucht
– je nach Region

[Brückler et al., 2018]

362

The World of Organic Agriculture: Key Indicators

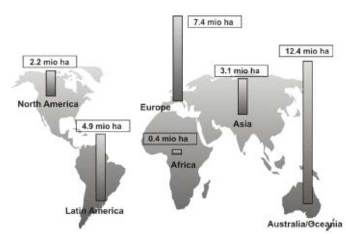
Organic Agriculture 2014: Key Indicators and Leading Countries

Indicator	World	Leading countries
Countries with data on certified organic agriculture	[illegible]	
Organic agricultural land	[illegible]	[illegible]
Share of total agricultural land	[illegible]	[illegible]
Further, non-agricultural organic areas (mainly wild collection)	[illegible]	[illegible]
Producers	[illegible]	[illegible]
Organic market size	[illegible]	[illegible]
Per capita consumption	[illegible]	[illegible]
Number of countries with organic regulations 2012	[illegible]	
Number of IFOAM affiliates	[illegible]	[illegible]

Source: FiBL and IFOAM; for total global market: Organic Monitor

363

Biolandbau weltweit: 30,4 Mill. ha



© SOEL, Source: FiBL Survey 2008

364

Farmers' motives for conversion: Changing with time

Motive	Early conv. 1995 or before	Convert. 2000 to 2002	Sign.
Food quality	62.2	41.7	**
Soil fertility, less pollution problems	51.1	27.1	**
Ideology, philosophy	40.0	25.0	
Professional challenges	33.3	45.8	
Health risks (pesticides etc.)	24.4	33.3	
Animal welfare	22.2	33.3	
Profitability	11.1	37.5	***
Natural conditions (soil, climate, etc.)	8.9	10.4	
Organic farming payments	6.7	35.4	***
Income stability	2.2	2.1	

Percentage of farmers ranking the motive as one of the three most important motives

Source: Flaten et al., «Risk and risk management in organic farming», project 2002-05, NILF-Bioforsk. http://orgprints.org/6124/

365

Farmers' reasons for opting out

- Certification and control is too bureaucratic (and expensive)
- Organic standards: Complicated, irrational, change frequently
- Organic standards become stricter with time
- Animal welfare is cost-demanding
- Agricultural policy is risky (not predictable)
- Organic financial support is too low
- Plant production has problems with weeds and nutrient supply
- Difficulties to obtain 100% organic feed
- Hard to sell and achieve premium price for vegetables
- High employment and salaries increase off-farm employment

Source: Løes et al., «Reasons for opting out of certified organic production in Norway», project 2007-08, NILF-Bioforsk. http://orgprints.org/10629/

366

Subsistence Farming

Subsistence farming, form of farming in which nearly all of the crops or livestock raised are used to maintain the farmer and the farmer's family, leaving little, if any, surplus for sale or trade. Preindustrial agricultural peoples throughout the world have traditionally practiced subsistence farming. Some of these peoples moved from site to site as they exhausted the soil at each location. As urban centres grew, agricultural production became more specialized and commercial farming developed, with farmers producing a sizable surplus of certain crops, which they traded for manufactured goods or sold for cash.

Subsistence farming persists today on a relatively wide scale in various areas of the world, including large parts of sub-Saharan Africa. Subsistence farms usually consist of no more than a few acres, and farm technology tends to be primitive and of low yield.

367

Agroecology

Agroecology is sustainable farming that works with nature.

Ecology is the study of relationships between plants, animals, people, and their environment - and the balance between these relationships.

Agroecology is the application of ecological concepts and principals in farming.

Agroecology promotes farming practices that:

- **Mitigate climate change** - reducing emissions, recycling resources and prioritising local supply chains.
- **Work with wildlife** - managing the impact of farming on wildlife and harnessing nature to do the hard work for us, such as pollinating crops and controlling pests.
- **Put farmers and communities in the driving seat** - they give power to approaches led by local people and adapt agricultural techniques to suit the local area - and its specific social, environmental and economic conditions.

https://www.youtube.com/watch?v=6Reh7c2-ewI

368

Low input sustainable agriculture (LISA)

369

Neue Wirtschaftsformen

Community Supported Agriculture
CSA

370

Marktwirtschaft in der Landwirtschaft führt weder zu gesunden Hoforganismen noch zu gesunden lebensspendenden Lebensmitteln, wie die letzten 200 Jahre der landwirtschaftlichen Entwicklung deutlich gezeigt haben.

Die Idee, dass Profiterwartung in Verbindung mit Wettbewerb auf dem Markt Qualitätsprodukte erzeugt, hat sich in der Landwirtschaft nie bestätigt.

371

Was ist Solidarische Landwirtschaft?

- Teilung von Verantwortung und Risiko in der Landwirtschaft
- Brüderliche Organisation des Wirtschaftsprozesses
  - Zwischen Landwirten und Konsumenten
  - Zwischen den Konsumenten untereinander

372

Brüderliches Wirtschaften

„Das Heil einer Gesamtheit von zusammenarbeitenden Menschen ist um so größer,
je weniger der Einzelne die Erträgnisse seiner Leistungen für sich beansprucht, das heißt,
je mehr er von diesen Erträgnissen an seine Mitarbeiter abgibt,
und je mehr seine eigenen Bedürfnisse nicht aus seinen Leistungen,
sondern aus den Leistungen der anderen befriedigt werden. “

Soziales Hauptgesetz (Rudolf Steiner)

Achte darauf, dass es den anderen gut geht,
dann geht es dir automatisch gut.
Achte darauf, dass es der Erde, den Pflanzen, Tieren und Menschen gut geht, dann geht es dir automatisch gut.

373

Wie funktioniert SoLaWi?

- Ca. 300 Menschen können vom Hof versorgt werden – nach ihren Bedürfnissen
- Diese Menschen finanzieren die Landwirtschaft für jeweils ein Wirtschaftsjahr – nach ihrem finanziellen Leistungsvermögen

374

Was stellt der Hof zur Verfügung?

- Gemüse & Kartoffeln
- Getreide & Getreideprodukte
- Brot
- Milch, Käse & andere Molkereiprodukte
- Fleisch & Wurst
- Obst
- Bildung

375

Was wird möglich:

- Landwirtschaft in Freiheit – ohne ökonomischen Zwang
- Vielfalt von Betriebszweigen
  und Vielfalt in den Betriebszweigen
- SoLaWi ist kein Selbstzweck, sondern eine Methode,
- ein Vehikel, das die Verwirklichung der besonderen Hofindividualität möglich macht.

376

Netzwerk
Solidarische Landwirtschaft (SoLaWi)

- attac Sommer-Universität 2010 in Hamburg
- Erstes Treffen Oktober 2010 in Kassel
  Einladungen an Betriebe und andere Aktive
- Zweites Treffen Februar 2011 in Fulda
  Stauten und Definitionen beschlossen
- Gründungstreffen des Netzwerks Juli 2011 in Kassel

377

Einigung auf die Höhe der Produktionskosten in der Landwirtschaft. Diese Kosten werden von den Konsumenten gemeinschaftlich aufgebracht.

- Das Geld ist nicht für die Lebensmittel, sondern es ist für die Landwirtschaft
- Die Lebensmittel sind gratis!
- Die Bauern haben kein Geld

378

Verlässliche Verhältnisse zwischen ihnen, die längerfristig und verbindlich angelegt sind.

- Mitgliedschaft für ein Jahr/Saison erzeugt ökonomische Sicherheit für den Hof.
- Mitglieder identifizieren sich mit „ihrem“ Hof.

379

Freiheit von ökonomischem Zwang in der landwirtschaftlichen Produktion.

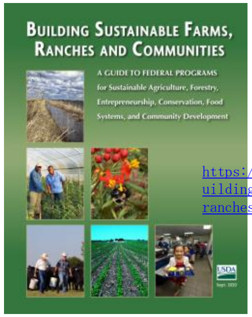
- Die Bauern können sich auf’s Ackern konzentrieren, sie müssen nicht versuchen, Geld zu verdienen
- Nur was wirklich gebraucht wird, wird auch produziert.
  - Keine Überschussproduktion
  - Der Produktionsmaßstab wird nicht von Ökonomie bestimmt.
  - Qualität ist der Maßstab, nicht die Erntemengen

380

Ökologischer Mehrwert für die bewirtschaftete Natur und deren Pflege und Entwicklung.

- Haltung gefährdeter Rassen
- Anlegen von Hecken und Teichen
- Humusaufbau mit neuen Methoden
- Größere Vielfalt auf dem Betrieb
  - Mehr Produktionszweige
  - Größere Produktvielfalt

381



SARE Sustainable Agriculture Research and Education

https://www.sare.org/resources/building-sustainable-farms-ranches-and-communities/

382

1) Landwirtschaft in Entwicklungsländern
   - Verschiedene nicht-zertifizierte Bewirtschaftungsweisen
   - Umstellung auf zertifiziert ökologischen Landbau
   - Entwicklung des öko-Landbaus
   - Ökologische Landwirtschaft
   - Probleme und Herausforderungen

383

Landwirtschaft in Entwicklungsländern

- Ist wesentlicher Entwicklungsfaktor und der größte Wirtschaftssektor
- Beschäftigt die meisten Arbeitskräfte
- Flächenmäßig die größte Landnutzungsform
- Wachstumsbremsen:
  - Auswirkungen des Klimawandels
  - rasch zunehmende Bodendegradation und –erosion
  - Verstärktes Auftreten von Schädlingen
  - Weltweit spürbarer Mangel an nutzbarem Was
  - Verteuerung landwirtschaftlicher Produktions
  - Verringerung der Arten- und Sortenvielfalt

384

Verschiedene nicht-zertifizierte Bewirtschaftungsweisen

- folgen den Prizipien oder Ideen von IFOAM:
- Traditionelle Landwirtschaft
- Organic-by-default oder de
- integrierte Landwirtschaft

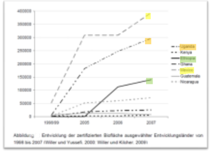
385

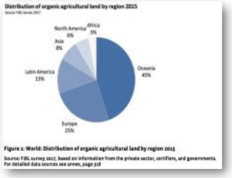
Umstellung auf zertifiziert ökologischen Landbau

- Traditionelle Landwirtschaft hat Potential für öko-Bewirtschaftung
- Kleinbauern benötigen eine Kombination verschiedener Anreize:
  - Hauptmotiv: Wirtschaftlicher Vorteil
  - Nahrungssicherheit
  - Senkung der Bodenerosion
- Grundvoraussetzung: ausreichender und sicherer Zugang zu produktiven, natürlichen Ressourcen sowie zu Infrastruktur und Transportsystemen
- Es bedarf an intensiver Betreuung und Unterstützung während der Umstellungsphase
- Zunächst Ernteeinbußen
- Oft längerer Zeitraum, um ein ökologisches Gleichgewicht herzustellen

386

Entwicklung des öko-Landbaus in Entwicklungsländern





387

388

Fairer Handel

- Beginn in den 1960er Jahren
- Forderung von fairen Sozialbedingungen bei der Erzeugung in Entwicklungsländern
- Fokus: wirtschaftliche und soziale Sicherheit sowie Gerechtigkeit
- Spielregeln sind die Fairtrade-Standards

389

Fairtrade-Standards

Ökologie

- Umweltschonender Anbau
- Schutz natürlicher Ressourcen
- Verbot von Pestiziden
- Kein gentechnisch verändertes Saatgut
- Förderung des Bio-Anbaus durch einen Bio-Aufschlag auf den Preis

Ökonomie

- Bezahlung von Fairtrade-Mindestpreis
- Rückverfolgbarket des Produkts durch einen Nachweis über Waren- und Geldfluss
- Transparente Handelsbeziehungen

Soziales

- Bezahlung von Fairtrade-Mindestpreis
- Rückverfolgbarket des Produkts durch einen Nachweis über Waren- und Geldfluss
- Transparente Handelsbeziehungen
- Verbot von Kinderarbeit

390

Positive Effekte von Fairtrade

- Bessere Handelsbedingungen
- Entscheidungen demokratisch
- Unterstützung verantwortlicher und umweltfreundlicher Produktionsmethoden
- Förderung kleinbäuerlicher Familien
- Stärkung der Frauenrolle

- Produzenten erhalten einen höheren Preis
- Erfüllung der grundlegenden Bedürfnisse
- Überwindung von Armut und Unterernährung

391

Kritikpunkte von Fairtrade

- Etikettenschwindel
- Greenwashing
- In Mischprodukten müssen nur 20% fair sein
- Fairtrade-Produkte sind nur für den Export bestimmt
- Produzenten sind abhängig von Mindestabnehmern

392

Fairtrade labels

- „Fairer Handel" ist nicht wie „bio" oder „öko" gesetzlich geschützt
- Entwicklung von neuen Marken und Gütesiegeln

393

Ethische Werte, Fairer Handel und Ökologischer Landbau

- Fairer Handel unterscheidet sich vom ökologischen Massenmarkt
- Ethische Werte verursachen zusätzliche Kosten
- Konsumenten sind häufig bereit, einen höheren Preis zu zahlen
- Zusammenarbeit von Fairem Handel und Ökologischer Landwirtschaft

394

Darf so etwas bio sein?

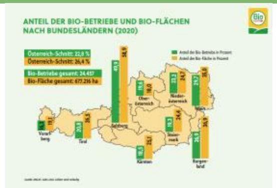
- Naturschutzverbände zweifeln z.B. beim Ananas-, Soja oder Zuckerrohranbau
- „bio"= ökologische Produktionsmethoden

395

BIOLOGISCHE LANDWIRTSCHAFT & REGIONALITÄT

396

Zahlen und Fakten



397

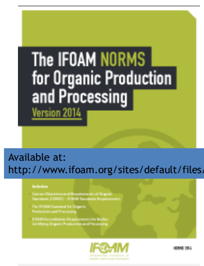
BIOLOGISCHE LANDWIRTSCHAFT?

REGIONALE LANDWIRTSCHAFT?

398

399

Certification and standards



Available at:
http://www.ifoam.org/sites/default/files/ifoam_norms_version_july_2014.pdf

400

The IFOAM Norms form the basis of the Organic Guarantee System of IFOAM - Organics International.

They are composed of three parts.

- Firstly, the Common Objectives and Requirements of Organic Standards (COROS) - IFOAM Standards Requirements.
- Secondly, the IFOAM Standard for Organic Production and Processing.
- Thirdly, the IFOAM Accreditation Requirements for Bodies Certifying Organic Production and Processing.

Here you can find the current version of the IFOAM Norms, approved by the membership of IFOAM - Organics International in July 2014. The document was edited in 2017, and in October 2019, however with no major content changes. The document includes new versions of the IFOAM Standard (Version 2.0) and the IFOAM Accreditation Requirements (Version 2.0).

The IFOAM Norms are the basis for approval of certification bodies under the IFOAM Accreditation Program.

https://www.youtube.com/watch?v=Po6gs2050mQ
https://www.youtube.com/watch?v=dXKULgDdm4Y

https://www.youtube.com/@ifoamorganics/videos

401

402

CONTEN T

INTRODUCTION

2

403

BACKGROUND

INTRODUCTION

Why a Technical Handbook?

On 1st January 2022, the new European Organic Regulation (EU) 2018/848, has come into force.

In order to allow you to take note of the main changes and impacts for your activity, this practical handbook provides you with technical information dedicated to the new regulation.

This handbook is a 'living document' and likely to be updated regularly according to the secondary acts still to be published by the European Union.

It aims to guide any operator in the transition to the new European Organic Regulation.

Structure of the Handbook

This handbook introduces the regulatory changes to date and is organized by topic. For each topic, technical sheets allow to identify at a glance the evolutions and impacts of the new European Organic Regulation.

Some evolutions have not yet all been acted upon within the Regulation: changes are therefore still to be expected. Any information that still requires the publication of secondary acts will be highlighted in this way.

***Note:** The handbook details the evolutions between the new European Organic Regulation, Regulation (EU) 2018/848 and the previous requirements defined in the Regulation (EC) No. 834/2007 and Control Bodies' Organic Standards (CBOS - standards equivalent to the previous EU organic regulation, and referenced in third countries; see "Transition to the New Regulation").*

4

404

INTRODUCTION

BEFORE

Two ways for products outside the EU to being recognized as organic according to EU:

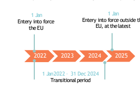
- *Coming from countries whose regulation is considered as equivalent*
- *To be certified by a Control Body (CB) recognized and supervised by the European Commission. The standards used by the CB must be validated as equivalent to the EU regulation (Control Body Organic Standard CBOS)*

In order to simplify this handbook, when we refer to the former EU organic regulation, we will use the regulatory reference of R(EC) 834/2008 and 889/2008 and not of the different CBOSs.

TRANSITION TO THE NEW REGULATION

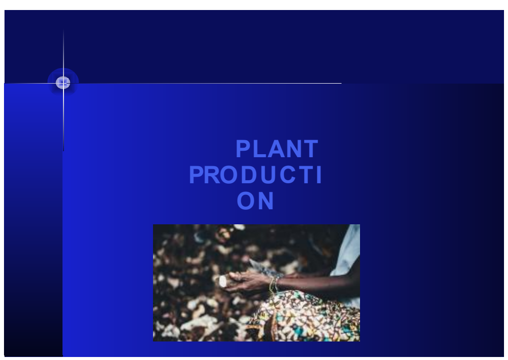
ARTICLE 46 OF Regulation (EU) 2018/848

In regard to countries outside the EU, a transitional period is suggested by the European Commission for the transition from equivalent CB organic standards (CBOS) to the new regulation, where full compliance is requested: between 1 January 2022 and 31 December 2024. This means in practice that you will have to obtain certification according to the new European regulation by 31 December 2024 at the latest to continue exporting your products to Europe. Beyond this date, at the end of the transitional period, all equivalent standards (CBOS) listed in Annex II of Regulation (EU) 2021/2325 will no longer be recognized by the European Commission. Only certification according to the new European regulation will be recognized for exporting organic products to Europe.



The CBs willing to operate outside the EU must obtain the prior agreement of the Commission to be able to offer you compliant certification according to the new Regulation (EU) 2018/848. Once validated, the Commission will publish in an official secondary act the list of control bodies «recognized for compliance».

405



406

Bio 3.0

IFOAM Best Practice Guideline

- **International Federation of Organic Agriculture Movements**
- **Auch in Zukunft:** Kerndokument für die globale Diskussion über Nachhaltigkeit
- für Landwirtschaft und Wertschöpfungsketten
- innerhalb und ausserhalb der Biobranche

Quelle: IFOAM

407

Basically, it is all a question about values

- There is a fight about the term sustainability
- Sustainability is something everyone wants
- Sustainability is a normative word: Related to values, attitudes
- We have to reflect about our values and attitudes, and be open and honest about our goals and visions
- There is no such thing as an «objective» researcher
- Research has to be reliable; which is not the same as «objective»
- Working to promote organic food and farming does not mean that your research is not as reliable as research made by people claiming a «neutral» position

408

Herausforderungen

1. Produktion von gesundem, ausreichendem, sicherem und preiswertem Essen für 9-11 Milliarden Menschen
2. Reduktion der Umweltbelastung und Treibhausemissionen
3. Entwicklung von neuen Lebensmittelketten
4. Anpassung an den Klimawandel und das Reduzieren der Treibhausgase
5. Schutz für Böden, Wasser, Luft, Biodiversität und Landschaften
6. Berücksichtigen von laufend auftauchenden Sitten, Essgewohnheiten, Lifestyles und Konsumentenbedürfnisse

409

Pflanzenbau: Bodenfruchtbarkeit

Biomasse in 1 Hektare Boden

- 1 Hektare Boden (Grünland) ernährt

oberirdisch
bis zu 2.5 Kühe
(Gesamtgewicht ca. 1.5t)

unterirdisch
bis 3 Mio. Regenwürmer
(Gesamtgewicht bis 1t)

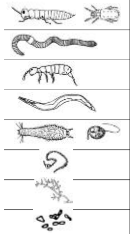
unterirdisch
übrige Bodenlebewesen (Gesamtgewicht bis 5t)

Bild: FiBL

410

Pflanzenbau: Bodenfruchtbarkeit

Lebewesen in einer Handvoll Gartenerde



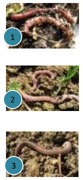
0,2 mm bis wenige cm	100	Insekten und Milben
20 –180 mm	110	Gliederwürmer
0,3 – 9 mm	250	Springschwänze
bis 2 mm	25'000	Fadenwürmer
bis 200 µm	7'500'000	Protozoen
5 – 50 µm	12'500'000	Algen
5 – 50 µm	100'000'000	Pilze
1 – 2 µm	125'000'000	Bakterien

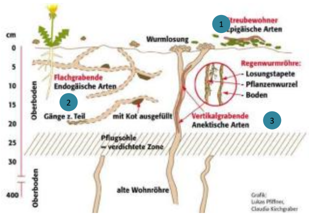
411

Pflanzenbau: Bodenfruchtbarkeit

Regenwürmer: Baumeister fruchtbarer Böden

- Drei ökologische Arten





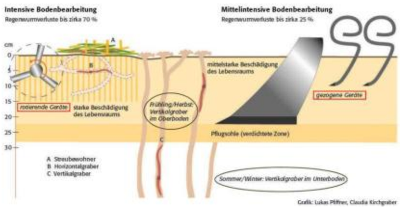
Fotos: L. Pfiffner, FiBL.

Grafik: L. Pfiffner, C. Kirchgraber, FiBL

412

Pflanzenbau: Bodenfruchtbarkeit

Schonung der Regenwürmer



Grafik: L. Pfiffner, C. Kirchgraber, FiBL

413

Pflanzenbau: Bodenfruchtbarkeit

Knöllchenbakterien: erhöhte Stickstoffaufnahme

- Knöllchenbakterien (z.B. Rhizobien)
  – Bei allen Leguminosen (Schmetterlingsblütlern)
  – Eigenversorgung mit Stickstoff
  – Anreicherung von Stickstoff im Boden zugunsten von Folgefrüchten

- Knöllchenbakterien empfindlich
  – Hemmung durch anorganische Dünger (leicht lösliche Nitrat- und Ammoniakstickstoffdünger)

- Knöllchenbildung an Wurzeln
  – nicht nur bei Leguminosen
  – verschiedene Bakteriengattungen (Rhizobien, Actinomyzeten, …)

Tiefrote Färbung im Knöllchen-innern bedeutet hohe Aktivität

Foto: K.-P. Wilbois, FiBL

414

Pflanzenbau: Bodenfruchtbarkeit
Symbiose mit Knöllchenbakterien

- Schritte bis zur Symbiose
  - Freilebende Rhizobienzelle erkennt Wurzelhaar
  - Berührung, Einkrümmung und Infektion des Wurzelhaares
  - Bildung Infektionssack und -schlauch, Zellteilung, Knöllchenbildung

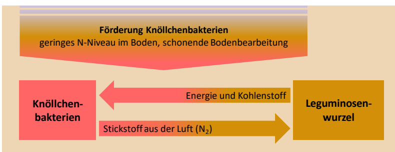


Bild: FiBL

415

Pflanzenbau: Bodenfruchtbarkeit
Mykorrhiza-Pilze: verbesserte Nährstoffaufnahme

- Mykorrhiza-Pilze
  - machen Symbiosen mit >80% aller Pflanzen
  - vergrössern die Aufnahmefläche der Wurzeln um ein Vielfaches

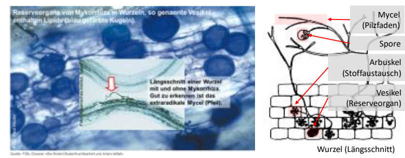


Bild: P. Mäder, FiBL

416

Pflanzenbau: Bodenfruchtbarkeit
Symbiose mit Mykorrhiza-Pilzen

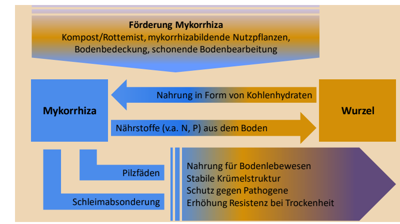


Bild: FiBL

417

Pflanzenbau: Bodenfruchtbarkeit
Einflüsse und Faktoren der Bodenfruchtbarkeit

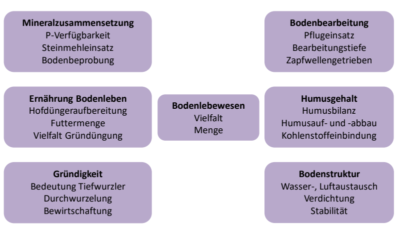


Bild: T. Alföldi, FiBL

418

Pflanzenbau: Bodenfruchtbarkeit
Humuswirtschaft im Biolandbau

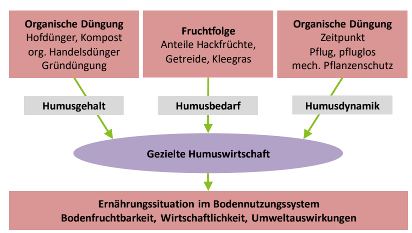
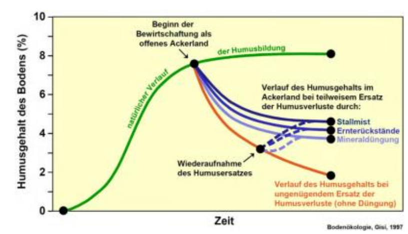


Bild: nach T. Alföldi 1999, FiBL

419

Pflanzenbau: Bodenfruchtbarkeit
Humusbildung in Abhängigkeit von Bewirtschaftung



Bodenökologie, Gisi, 1997

420

Pflanzenbau: Bodenfruchtbarkeit

Förderung der Bodenfruchtbarkeit

Schonende, effektive Bodenbearbeitung	Struktur-, humusmehrende Bewirtschaftung
Nur bei trockenem Boden	Hoher Kleegrasanteil
Keine schweren Maschinen	Zwischenkulturen
«Flach wenden, tief lockern»	Ausbringen von Kompost
Ansaatverfahren (Direkt-, Streifen, Mulchsaat)	Einarbeiten org. Material
Keine schnell rotierende, schneidende Bodenbearbeitungsgeräte	Möglichst ganzjährige Bodendeckung
	Keine leichtlöslichen Dünger und Pestizide

Fotos: FiBL

421

Pflanzenbau: Bodenfruchtbarkeit

Wirkungen mehrjähriger Kleegraswiesen

Boden-krümelung	Weniger Verschlämmung, weniger Verdunstung, weniger Erosion
Unterboden-lockerung	Bessere Tiefendurchwurzelung, Nutzung Bodenwasser in grösserer Tiefe
Stickstoff-akkumulation	Bessere Stickstoffversorgung der Folgefrüchte
Humus-akkumulation	Bessere Befahrbarkeit des Bodens, Regeneration Regenwurmpopulation, Bildung von Ton-Humus-Komplexen
Unkraut-regulierung	Unterdrückung von Samen- und Wurzelunkräutern

Quelle: nach Kahnt, 1983

422

Pflanzenbau: Bodenfruchtbarkeit

Durchwurzelung des Bodens

- Zwecke der Durchwurzelung des Bodens
  - Bodenschichten in verschiedenen Tiefen aufschliessen
  - Humusbildung (Wurzelausscheidungen und absterbende Pflanzenwurzeln)
  - «Fütterung Bodenlebewesen»
- Wurzelbild Kleegrasmischung

- Wurzelbild Ackerkulturpflanzen

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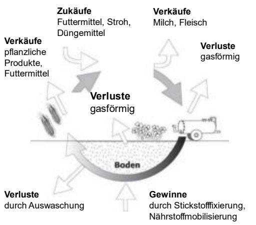
423

Pflanzenbau: Nährstoffversorgung

Nährstoffkreisläufe



- Biolandbau
  - Möglichst geschlossene Nährstoffkreisläufe anstreben
  - «Abfallprodukt» wird zum Betriebsmittel (Futter, Dünger, usw.)
- **Vorteile**
  - Geringe Inputs von Aussen
  - Geringere Kosten
  - Weniger Energie für Düngerherstellung und Transporte

424

Pflanzenbau: Nährstoffversorgung

Interpretation und Massnahmen Bodenanalysen

	zu hoch	zu tief
Humusgehalt	Keine Massnahmen (standortabhängig)	Langjährige Kunstwiese Gründüngung Rottemist, Kompost
pH-Wert	Kalkhaltige Düngemittel meiden	Kalkdüngung Bodenverdichtung vermeiden
Phosphor	Zurückhaltung mit Hühnermist, Kompost, Schweinegülle und Volldünger	Mist und Schweinegülle anstatt Rindergülle P-reiche Handelsdünger
Kalium	Weniger Rindergülle	Mehr Rindergülle Kalium-Ergänzungsdünger (Bedarfsnachweis ab bestimmter Menge)
Magnesium		Kalimagnesia Dolomitsteinmehl

425

Pflanzenbau: Nährstoffversorgung

Nährstoffgehalte in einem Mineralboden

- Im Boden oftmals genügend Nährstoffe
- Durch verschiedene Massnahmen Nährstoffe pflanzenverfügbar machen

Foto: H. Dierauer, FiBL

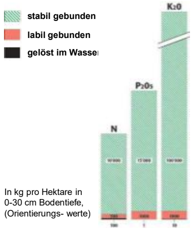


Bild: FiBL

426

Pflanzenbau: Nährstoffversorgung

Indirekte Nährstoffversorgung

- Biolandbau
  - Verzicht auf leichtlösliche, synthetische Handelsdünger
  - Beitrag von Fruchtfolge und Kulturmassnahmen zur Nährstoffversorgung umso wichtiger

Bild: FiBL

427

Pflanzenbau: Nährstoffversorgung

Verbesserung bei Nährstoffunterversorgung

langfristig	kurzfristig
Fruchtfolge abwechslungsreich mind. 20% Kleegras Starkzehrer nach Umbruch	**Zugabe organischer Dünger** mit leicht verfügbarem Stickstoff
Grundbodenbearbeitung Erschliessung des Bodens durch Wurzeln	**Bewässerung** (bei Trockenheit Aktivität Bodenorganismen eingestellt)
Förderung Bodenleben schonende Bodenbearbeitung org. Düngung, Gründüngung	**Hacken** (bringt Luft in Boden, Aktivierung Bodenorganismen)

Bild: FiBL

428

Pflanzenbau: Nährstoffversorgung

Stickstoffversorgung verschiedener Betriebstypen

- Tabelle zeigt üblichste Stickstoffquellen der Betriebstypen

	Grünland-betrieb	Gemischter Betrieb	Ackerbau-betrieb	Gemüsebau-betrieb
Eigene Hofdünger	xx	xx		
Zufuhr Hofdünger/ Kompost			x	x
Kompostherstellung		x	x	x
org. Handelsdünger			x	xx
Naturwiese	xx	x		
Kunstwiese		xx	x	x
Gründüngung		x	xx	x
Körnerleguminosen		x	xx	

429

Pflanzenbau: Düngung

Effekte organischer Düngung

Förderung Bodenleben	Stabile Bodenstruktur	Phytosanitäre Wirkung
Hohes Wasser-speichervermögen	**Bodenpflege durch organische Düngung**	Hohes Nährstoff-speichervermögen
Leichte Bodenbearbeitbarkeit	Rasche Bodenerwärmung	Verminderte Erosionsanfälligkeit

- Nur organische Dünger/Düngung im Biolandbau
  - Stapelmist, Rottemist, Mistkompost, Gülle, Grüngutkompost
  - Anbau von Kleegraswiesen, Leguminosen, Gründüngungen
  - Zukauf von organischen Handelsdüngern (Hornmehl, Federmehl, usw.)

430

Pflanzenbau: Düngung

Mist und Gülle im Vergleich

	Mist	Gülle
Nährstoffzusammensetzung	Ausgeglichen (Rindermist) P-reich (Geflügelmist)	K-reich (Rindergülle) P-reich (Schweingülle)
N-Verfügbarkeit	langsam	schnell
N-Wirksamkeit	lange	kurz
Eignung für Kopfdüngung	schlecht	gut
Bodenverbessernde Wirkung	ja	nein
Wichtigste Einsatzgebiete	Hackfrüchte, Gemüse, Wiesen (reine Grünlandbetriebe)	Wiesen, Getreide, Gemüse (bei langer Vegetationszeit)
Verteilgenauigkeit	gut (mit Feinstreuer)	gut (mit Schleppschlauch)
Transportierbarkeit	gut (am Hang erschwert)	kurze Distanzen gut

Fotos: FiBL

431

Pflanzenbau: Düngung

Kompost und Stapelmist im Vergleich

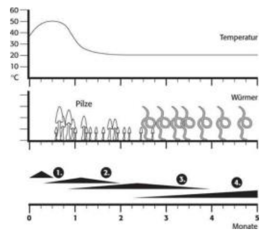
Kompost	Stapelmist
Vorteile	
› Länger anhaltende Wirkung › Bessere Stickstoffwirkung › Fördert Humusaufbau und Bodenleben › Tötet Unkrautsamen und Krankheitskeime › Kleinere Ausbringmenge › Krankheitsunterdrückend im Feld › Für Pflanzen gut verträglich	› Geringere Stickstoffverluste bei der Aufbereitung › Geringer Herstellungsaufwand › Rasche Stickstoffwirkung im Feld (bei stroharmem Mist)
Nachteile	
› Grössere N-Verluste bei der Aufbereitung › Langsamere Mineralisierung im Frühjahr › Hoher Aufwand für Kompostierung	› Schlechtere N-Wirkung im Feld › Stickstoffsperre (bei viel Stroh) › Evtl. Hemmung Wurzelwachstum › Schädliche Fäulnisstoffe

Kompost

432

Pflanzenbau: Düngung

Kompostierungsprozess



- ①
  Bakterien, Schimmelpilze
  Erwärmung, Beginn Abbauvorgänge
- ②
  Schimmelpilze, Hutpilze, Bakterien
  Angriff schwer abbaubarer Stoffe (Zellulose)
- ③
  Kleintiere
  Kontrolle Pilzentwicklung
- ④
  Mistwürmer
  Beginn Humifizierungsprozesse und Mineralisierung

Quelle: FiBL nach Bockemühl

433

Pflanzenbau: Düngung

Güllebelüftung

Güllebelüftung	
Vorteile	**Nachteile**
› Weniger N-Verluste beim Ausbringen › Keine Schädigung von Regenwürmern und Bodenlebewesen › Keine Verbrennungen an Pflanzen und Kopfdüngungen › Weniger Geruch › Hygienisierende Wirkung › Homogenisierung	› N-Verluste beim Belüften (Abgasung von Ammoniak) › Hohe Investitionen › Stromkosten

- Verschiedene Belüftungssysteme
- Belüftungsdauer und Intensität unterschiedlich

434

Pflanzenbau: Düngung

Fermentation, Fäulnis, Rotte

	Fermentation	Fäulnis	Rotte
Prozess	Gärung (anaerob)	Fäulnis (anaerob)	Rotte (aerob)
Bedeutung	Beimpfung **Fermentativ**: org. Säuren und Alkohol	Zufälliger Abbauprozess, bei Sauerstoffmangel **Reduktiv**	Abbau aller org. Rohstoffe **Oxidativ**
Geruch	Geruchsarm	Penetrante Gerüche	Geruchsarm, -frei
Pflanzen-verträglichkeit	Tiefer pH, anfänglich wachstumshemmend	Starke Wurzelgifte	Förderung Wurzelwachstum
Boden-verträglichkeit	Futter für Bodenleben und Regenwurm	Schädigung Bodenleben, Austreibung Regenwurm	Förderung Bodenleben, schont Regenwurm
Wirkung	Vorbehandlung für Methangasbildung, Kompostierung und Bodenrotte Werterhaltende Lagerung von Nahrungsmitteln (z.B. Silage) und org. Abfälle, geringe Energieverluste	Bildung Giftstoffe, Förderung Krankheitserreger (z.B. Clostridien) Förderung von Schädlings- und Pilzbefall durch Düngung mit Fäulnisprodukten (Mehltau, Schnecken, Drahtwürmer)	Krankheitshemmend (Bildung von Antibiotika, Vitaminen, Hemmstoffen) Rottevorgänge: Voraussetzung für Bodenfruchtbarkeit und Pflanzengesundheit

Quelle: gekürzt nach F. Abächerli et al.

435

Pflanzenbau: Düngung

Stickstoffkreislauf im Boden

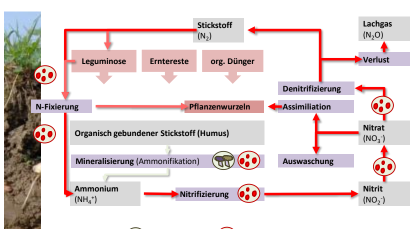


Bild: FiBL

436

Pflanzenbau: Düngung

Pflanzenverfügbarkeit von Stickstoff

- **Ammonium**
- (NH_4^+)

- Ammoniumstickstoff im Boden an Tonteile gebunden, unbeweglich
- Wurzel muss zum Nährstoff wachsen
- **Langsam pflanzenverfügbar**

- **Nitrat**
- (NO_3^-)

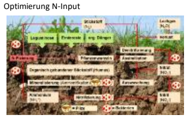
- Nitratstickstoff immer im Bodenwasser gelöst
- Passiv an Wurzel herangetragen
- **Rasch pflanzenverfügbar** und wirksam

437

Pflanzenbau: Düngung

Strategie nachhaltiges N-Management

- Optimierung N-Input



- Minimierung Nitrat-Verluste

- Optimierung N-Mineralisierung

- N-Mineralisierung ←→ N-Assimilation

438

Pflanzenbau: Düngung

«Den Boden düngen, nicht die Pflanze!»

- Boden als produktives Ökosystem betrachten
  – Bodenlebewesen setzen aus Muttergestein, Luftstickstoff und organischem Material Nährstoffe frei

- **Vorteile organischer Dünger**
  (im Vergleich zu im Biolandbau verbotenen chem.-synthetischen Düngern)
  – Keine extremen Nährstoffungleichgewichte
  – Weniger Pflanzenparasiten (da geringere N-Gehalte im Pflanzensaft)
  – Geringer Energieverbrauch zur Herstellung

Bild: FiBL

439

Pflanzenbau: Bodenbearbeitung

Ziele der Bodenbearbeitung

- Ständige Bodenbedeckung, Zwischenfruchtanbau
- Optimierung Gesamtphotosyntheseleistung
- Rasche Strohrotte
- Berücksichtigung Bodeneigenschaften bei FF-Planung
- Intensivierung Durchwurzelung
- Vermeidung Bodenverdichtung
- Förderung Humusaufbau
- Wenige Eingriffe in Boden
- Aufbau stabile Bodenstruktur
- Förderung Bodenbiodiversität
- Unkrautregulierung
- Erhaltung Bodenschichten
- Vermeidung Bodendruck

440

Pflanzenbau: Bodenbearbeitung

Bodenbearbeitungsgeräte

Pflug
Bearbeitungstiefe max. 20 cm
Massnahmen zur Unkrautregulierung

Spatenmaschine
Bei Einsatz rotierender Geräte nur mit kleiner Drehzahl
Geeignet als Pflugersatz bei geringem Unkrautdruck

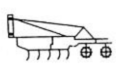
Grubber
Gerät für tiefes Lockern
Nur im Sommer und bei sehr gut abgetrocknetem Boden

Grafiken: LMZ

441

Pflanzenbau: Bodenbearbeitung

Bodenbearbeitungsgeräte



Federzinkenegge
Ideal zur Saatgutbereitung
geeignet zur Queckenbekämpfung nach der Getreideernte

Rototiller, Kreiselegge
Einarbeitung von Grünmaterial
Einsatz nur in schweren, gut abgetrockneten Böden

Bodenfräse
Nur zur oberflächlichen Einarbeitung von Pflanzenabfällen (Gemüse)
Dezimiert Regenwürmer und fördert Wurzelunkräuter

Grafiken: LMZ

442

Pflanzenbau: Bodenbearbeitung

Vor- und Nachteile des Pflügens

Pflügen	
Vorteile	**Nachteile**
› «reiner Tisch» Wirksame Unkrautbekämpfung, v.a. Wurzelunkräuter › Bessere Durchlüftung fördert mikrobielle Tätigkeit (Mineralisierung) › Saubere Einarbeitung von Zwischenfrüchten u. Ernterückständen › Schädlingsregulierung (z.B. Maiszünsler) › Frühere Bearbeitung der Böden › Grösserer Wurzelraum › Gleichmässige Anreicherung mit Kalzium und Nährstoffen › Frostgare auf schweren Böden (Zertrümmerungseffekte Winterfurche)	› Hoher Arbeitsaufwand und Energieverbrauch › Zeitweiliges Vergraben von Unkrautsamen › Vergraben von organischem Material › Höherer Humusabbau › Schädigung von Bodentieren (Regenwürmer u.a.) › Höhere Verschlämmungs- und Verkrustungsgefahr › Pflugsohlenbildung, ungünstiger Übergang Ober- /Unterboden, Verdichtungsgefahr

443

Pflanzenbau: Bodenbearbeitung

Vor- und Nachteile konservierender Bodenbearbeitung

Konservierende Bodenbearbeitung	
Vorteile	**Nachteile**
› «Vermeidung von Verlusten bei Boden und Wasser» › Mehr Humus › Förderung der Bodenfruchtbarkeit › Geringerer Eingriff in Bodenstruktur › Bessere Tragfähigkeit › Verbesserung des Wasserhaushalts › Weniger Erosion und Verschlämmung (da Bodenbedeckung) › Bessere CO_2-Rückbindung › Geringer Arbeitsaufwand › Geringer Energieverbrauch	› Oberflächenerwärmung, Abtrocknen im Frühjahr in Mulchsaaten verzögert › Probleme in niederschlagsreichen Gebieten oft Durchwuchs › Höhere Anforderungen an Management und Pflanzenbau › Unkrautregulierung anspruchsvoll ohne Herbizide

444

Pflanzenbau: Bodenbearbeitung

«Flach wenden, tief lockern!»


- **OnLand-Pflug**
  - Weniger Bodenbelastung, keine Verdichtung der Furchensohle
  - Bis max. 20cm Tiefe
  - Stützräder
- **Schälpflug**
  - Boden nicht gewendet, sondern geschält oder gehobelt
  - Bis max. 10cm Tiefe
  - Oberflächliche Stoppelbearbeitung

Fotos: H. Dierauer, FiBL

445

Pflanzenbau: Bodenbearbeitung

Bodenbearbeitungsverfahren, nach Intensität

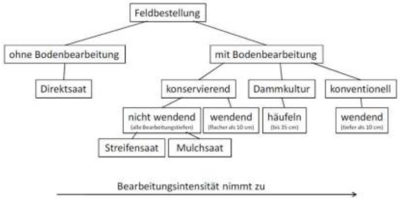


Bild: Wilhelm, 2010

446

Pflanzenbau: Bodenbearbeitung

Bodenbedeckung und Bearbeitungsintensität

Direktsaat	Streifen-frässaat	Grubber	Schälpflug	onLand-Pflug


Bodenstruktur gut
Viele Regenwürmer
Humusaufbau
Besserer Wasserhaushalt
Mehr Unkraut

«Sauberer Tisch»
Bessere Stickstoffverfügbarkeit
Mehr Verdichtungen
Mehr Erosion
Höherer Dieselverbrauch
Höhere Kosten

Fotos: FiBL

447

Pflanzenbau: Bodenbearbeitung

Vergleich Pflug – reduzierte Bodenbearbeitung

- Einfluss auf Unkraut
- Einfluss auf Bodenfrucht barkeit

Fotos: H. Dierauer, FiBL

448

Pflanzenbau: Bodenbearbeitung

Konservierende Bodenbearbeitung im Biolandbau?

- Schäden an der Bodenstruktur und Bewirtschaftungs-fehler können im Biolandbau nicht ohne weiteres korrigiert werden!

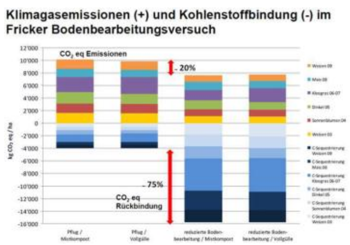
- **Wichtig im Biolandbau zu beachten**
  - Ackerfläche auf ihre Eignung prüfen
  - flach wenden, tief lockern
  - vermeiden von Strukturschäden/Verdichtungen
  - Reduktion Unkrautdruck
  - Förderung Bodenleben/Nährstoffmineralisierung
  - Berücksichtigung der natürlichen Schichtung
- **Besondere Herausforderungen**
  - Hohe Anforderung an den Betriebsleiter
  - Unkrautmanagement
  - Geduld während Umstellung
  - langjährige Kunstwiesen?

Bild: T. Alföldi, FiBL

449

Pflanzenbau: Bodenbearbeitung

CO_2-Emissionen und CO_2-Bindung



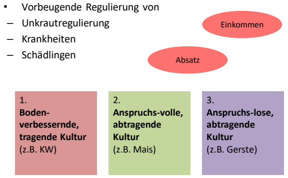
Quelle: FiBL

450

Pflanzenbau: Fruchtfolge

Grundsätze

- Ertragssicherung
- Nachhaltige Bodenfruchtbarkeit
- Hofeigene Nutztierversorgung
- Vorbeugende Regulierung von
  – Unkrautregulierung
  – Krankheiten
  – Schädlingen



Fruchtfolge (Beispiel DOK 2013-2019)
Silomais
Soja Gründüngung
Winterweizen 1 Gründüngung
Kartoffeln
Winterweizen 2
Kunstwiese I
Kunstwiese II

451

Pflanzenbau: Fruchtfolge

Fruchtfolgeregeln

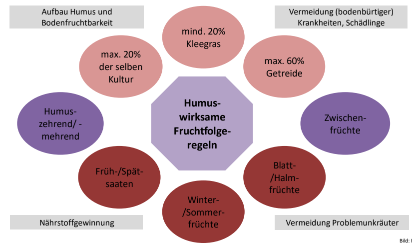
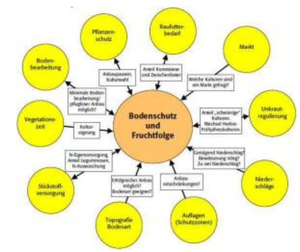


Bild: FiBL

452

Pflanzenbau: Fruchtfolge

Bodenschutz



- Bodenschutz und Fruchtfolge im Biolandbau zentral
  – Stickstoffs-verfügbarkeit und Regulierung Wurzel-unkräuter vor allem über Fruchtfolge-gestaltung und gezielte Boden-bearbeitung gesteuert

Bild: FiBL

453

Pflanzenbau: Fruchtfolge

Fallbeispiel Bodenschutz im Ackerbau

Jahr	1	2	3	4	5	Total	
Hauptkultur	**Winter-weizen**	**Silo-mais**	**Dinkel**	**Sommer-hafer/-gerste**	**Kunst-wiese**		
Winter	Grün-düngung	Dinkel	Brache nach Unkrautkur	Ansaat Kunstwiese	Ansaat Winter-weizen		
Einheit	ha	ha	ha	ha	ha	ha	%
FF-Fläche	2	2	2	2	2	10	
OA	2	2	2	2		8	
Bodenbedeckung [1]	2	2		2	2	8	**100** [1]
Grünlandanteil [2]					2	2	**20** [2]

[1] Im Winter nach Ernte Hauptkultur, gemessen an offener Ackerfläche (OA). [2] gemessen an FFF

✓ Anbaupause erfüllt. ✓ Bodenbedeckung erfüllt. ✓ Grünlandanteil erfüllt

siehe dazu Richtlinien Bio Suisse (RL 2.1.2 und 2.1.3)

454

Pflanzenbau: Fruchtfolge

Fruchtfolgebeispiele

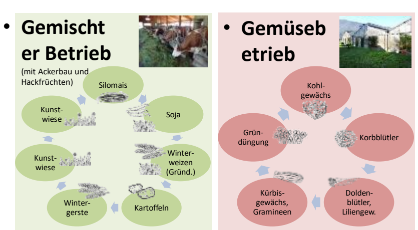


Bild: FiBL

455

Pflanzenbau: Fruchtfolge

Mischkulturen: Erbse – Gerste

- **Förderung**
- einheimische Proteinträger im Mischfruchtanbau
- **Kulturen**
- Gerste als Stützfrucht Erbse als Stickstofflieferant
- **Markt**
- Abnahme von Mischkulturen durch Mühlen

Fotos: T. Alföldi, FiBL

456

Pflanzenbau: Fruchtfolge

Vor- und Nachteile Mischkulturen

Mischkulturen mit Körnerleguminosen	
Vorteile	**Nachteile**
› höhere Erträge im Vergleich zu Reinsaaten › Bessere Ertragsstabilität › Effiziente Nutzung der Wachstumsfaktoren › Nährstoffmobilisierung/-sicherung (Leguminosen, Wurzelhorizonte) › Unkrautunterdrückung › Minderung Lagergefahr (Stützfrucht) › Abwehr von Krankheiten und Schädlingen › Erhöhung Biodiversität und Widerstandskraft (Blüten- und Wurzelmasse)	› Trennung in der Sammelstelle, höhere Kosten › Getreide hat ohne Düngung tiefe Hektolitergewichte › Eventuelle Förderung von Fruchtfolgekrankheiten?

457

Pflanzenbau: Unkrautregulierung

Vorbeugende Unkrautregulierung

Günstiger Fruchtwechsel
Mind. 20% ganzjährige Begrünung. Wechsel zwischen Hackfrüchten und Getreide.

Ausbreitung, Versamung verhindern
Frühe Regulierung. Stechen von Wurzelunkräutern Samenständer, Blüten entfernen.

Sorten- und Artenwahl
Hohe Konkurrenzkraft: schnelle Jugendentwicklung, rascher Bestandesschluss.

Düngung
Wachstumsvorteil für Kulturpflanze: zum richtigen Zeitpunkt richtige Düngung.

Saatzeitpunkt
Frühjahrskulturen erst säen, wenn Boden genügend warm.

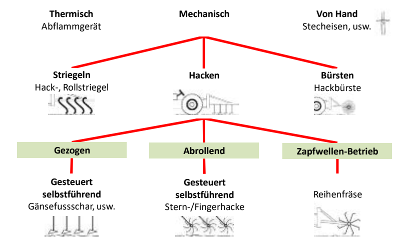
Saatdichte
Eher dicht säen: Getreide plus 10-15 %, damit stark gestriegelt werden kann.

Bild: FiBL

458

Pflanzenbau: Unkrautregulierung

Direkte Unkrautregulierung



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459

Pflanzenbau: Unkrautregulierung

Abflammen: Vor- und Nachteile

- Die Abflammtechnik wird im Biogemüsebau gebraucht.

Vorteile

Hoher Wirkungsgrad.

Keine Rückstände im Boden oder an Pflanzen.

Wirkung auch in der Reihe.

Nachteile

Hoher Energieverbrauch und CO_2-Ausstoss. Hohe Kosten.

Kann Nützlinge gefährden.

Geringe Wirkung auf Wurzelunkräuter und Gräser.

460

Pflanzenbau: Unkrautregulierung

Schäden durch Unkräuter

«Problemunkräuter konsequent bekämpfen!»

Mehrkosten
Behinderung von Pflege und Ernte, Trocknungskosten

Qualitätsverluste
Verunreinigung, Aberkennung als Saatgut, ungleiches Abreifen

Ertragsverluste
Konkurrenz um Nährstoffe, Wasser, Licht, Standraum

Arbeitsaufwand
Für die Unkrautregulierung

Übertragung von Krankheiten
z.B. Fusskrank-heiten durch die Quecke

«Früher Einsatz ist das A und O der Unkrautregulierung!»
Wirkung des Striegels bis 95 %!

Foto: H. Dierauer, FiBL

461

Pflanzenbau: Unkrautregulierung

Nutzen von Unkräutern

Unterschlupfmöglichkeit für Nützlinge
(zum Beispiel Laufkäfer, Spinnen und Kurzflügler)

Nahrungsquelle für Nützlinge
(Blattläuse, für Schwebfliegen, Florfliegen, Marienkäfer usw.)

Ablenkfutter für Schädlinge
(zum Beispiel Drahtwürmer und Schnecken)

Aufschluss von Nährstoffen
(z.T. schwer verfügbar, wie z.B. Spurenelemente)

Erosions- und Verschlämmungsschutz

Verhinderung von Auswaschung
durch Speicherung von Nährstoffen

Zeichnung: Vogelmiere aus «Die Wiesenkräuter», AMTRA

462

Pflanzenbau: Unkrautregulierung
Distelregulierung (Ackerkratzdistel)

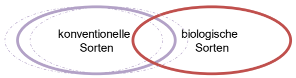
Vorbeugend	Direkt
Verdichtungen vermeiden Schonende Bodenbearbeitung Bodenlockerung mit dem Grubber Anbau Hackfrüchte Hackgeräteeinsatz im Frühjahr	**Wiederholtes Stechen, bis Reserven verbraucht** Nur bei kleinen Nestern möglich. Günstigster Zeitpunkt: März/April, bei Pflanzenhöhe 5-10 cm
Zwei- bis dreijährige KW	**Stoppelschälen nach Getreide**
Keine Wurzelverschleppung/ Samenausbreitung Gute Maschinenreinigung Keine Bodenbearbeitungsgeräte mit rotierenden Werkzeugen Entfernung Blütenköpfe vor Samenreife	**Neuansaat von Kunstwiese bei stärkerer Verseuchung** Schnelle Begrünung sicherstellen Bester Zeitpunkt August Ertragsstarke Mischung wählen Früher erster Schnitt Häufiger Schnitt

Zeichnung: Ackerkratzdistel aus «Die Wiesenkräuter», AMTRA

463

Pflanzenbau: Saatgut, Sorten, Pflanzenzüchtung
Züchtungsprogramme für Biolandbau

- **Braucht es Biosorten und Biozüchtung? Was soll an Biosorten anders sein?**
- Momentan verfügbare Sorten überwiegend aus Züchtungsprogrammen für konventionellen Anbau
  – Sorten unter Einsatz von Herbiziden und mineralischen Düngern selektiert
  – Auslese auf hohes Ertragspotential bei 'high input'-Bedingungen
- Im Biolandbau zusätzliche Merkmale entscheidend für Ertragssicherheit



464

Pflanzenbau: Saatgut, Sorten, Pflanzenzüchtung
Sortenzüchtung ganzheitlich betrachten

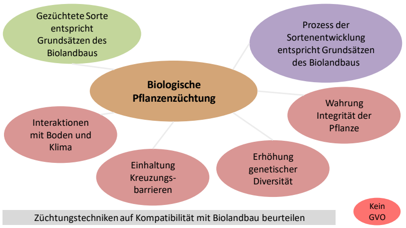


Bild: FiBL

465

Pflanzenbau: Saatgut, Sorten, Pflanzenzüchtung
Sortencheck im Biolandbau

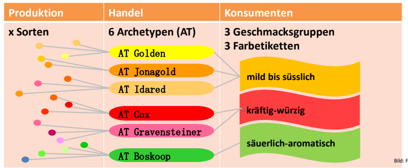
Sorteneigenschaft	Fragestellungen für Landwirte
Standort-angepasstheit	Gedeiht Sorte unter lokalen Wachstumsbedingungen?
Resistenz-eigenschaften	Anbau ohne oder mit wenigen direkten Pflanzenschutzmassnahmen möglich?
Nährstoffaneignungs-vermögen	Gute Erträge bei langsam fliessenden Nährstoffquellen?
Ertragsniveau	Angemessener Verdienst mit erwartetem Ertragsniveau möglich?
Innere/äussere Qualität	Hält innere Qualität, was äussere verspricht? Sorte vom Aussehen her verkaufbar?
Lagereigenschaften	Frische, gesunde Produkte unter machbaren Lagerbedingungen?
Jugendentwicklung	Wächst Sorte Unkraut genügend rasch davon?
Absatzlage	Sorte bei Abnehmern gefragt?
Saat-/Pflanzgut in Bioqualität	Anforderungen an Saat- und Pflanzgut erfüllt? Vermehrung auf Biobetrieb?

466

Pflanzenbau: Saatgut, Sorten, Pflanzenzüchtung
Vielfalt erhalten am Beispiel Bioäpfel

- **Konzept zur Vermarktung von Archetypen und Geschmacksgruppen von Bioäpfeln**

Vielfalt ermöglichen, Information vereinfachen



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467

Pflanzenbau: Pflanzenschutz
Allgemein

- **direkter Pflanzenschutz stark eingeschränkt**
  (durch Verzicht von chemisch-synthetischen Pflanzenschutzmittel und Beizmittel im Biolandbau)
- **Indirekter Pflanzenschutz im Vordergrund**
  Optimierter Einsatz vorbeugender Massnahmen

468

Pflanzenbau: Pflanzenschutz
Schädlingsbekämpfung im Biogemüsebau

- **Pflanzenschutzpyramide zur biologischen Schädlingsbekämpfung**

Quelle: Wyss et al. (2005) und Zehnder et al. (2007) verändert von Luka, FiBL 2012

469

Pflanzenbau: Pflanzenschutz
Schädlingsbekämpfung im Biogemüsebau (1)

- **Naturschutz und Nachhaltigkeit: Extensivierung, Aufwertung und Vernetzung der Landschaft**
- Biologischer Pflanzenschutz im Freiland beginnt bei gesamtbetrieblicher Optimierung des Ökosystems

Foto: FiBL

470

Pflanzenbau: Pflanzenschutz
Schädlingsbekämpfung im Biogemüsebau (2)

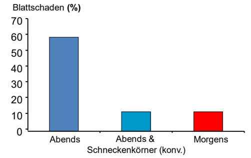
- **Sortenwahl**
  – Salat: Resistenz gegen Grosse Johannisbeerblattlaus (*Nasonovia ribisnigri*)
- **Standortwahl**
  – Windoffene Lagen zur Vorbeugung gegen Möhrenfliege

Foto: M. Koller, FiBL

471

Pflanzenbau: Pflanzenschutz
Schädlingsbekämpfung im Biogemüsebau (2)

- **Kulturmassnahmen**
- Schneckenbefall in Abhängigkeit von Bewässerung Quelle: Speiser, FiBL.



Quelle: Speiser, FiBL

Foto: T. Alföldi, FiBL

472

Pflanzenbau: Pflanzenschutz
Schädlingsbekämpfung im Biogemüsebau (2)

- **Kulturmassnahmen**
- Langzeiteffekt von Kompost im Feld

– ... Gurken in

– ... n

Proben von Parzellen **ohne** Kompost

Proben von Parzellen **mit** Kompost

Quelle: Fuchs, FiBL

473

Pflanzenbau: Pflanzenschutz
Schädlingsbekämpfung im Biogemüsebau (3)

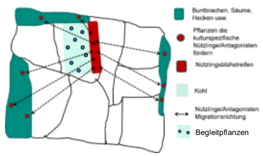
- **Funktionelle Biodiversität**
  im Kohl (ein Beispiel)
- Nützlingsförderung > Schädlingsreduktion > weniger Insektizid > höhere Biodiversität

– Welche Wildblumen locken Fressfeinde und Parasitoide von Kohlschädlingen ins Kohlfeld?
– Welche Wildblumen steigern die Leistung der Parasitoiden?
– Erreichen wir durch Wildblumen im Kohlfeld eine Schadensreduktion?

474

Pflanzenbau: Pflanzenschutz
Schädlingsbekämpfung im Biogemüsebau (3)

- **Funktionelle Biodiversität im Kohl**
- Prinzip: Anlockung von 'Nützlingen' gegen Kohlschädling
  - Entwicklung von spezifischen Wildblumenstreifen (entlang von Kohlfeldern)
  - Suche nach geeigneten Begleitpflanzen (direkt im Kornfeld)

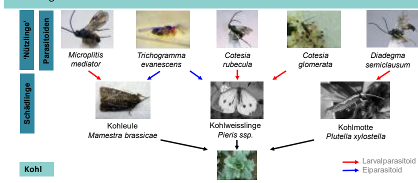


Quelle: Landschaftsschema, Luka et al., 2012.
Foto: M. Born

475

Pflanzenbau: Pflanzenschutz
Schädlingsbekämpfung im Biogemüsebau (3)

- **Funktionelle Biodiversität im Kohl**
- Nützlingsförderung > Schädlingsreduktion >
- weniger Insektizid > höhere Biodiversität



Quelle: Nützlings-Schädlings-Komplex-Schema, Luka et al. 2015
Fotos: H. Luka, FiBL

476

Pflanzenbau: Pflanzenschutz
Schädlingsbekämpfung im Biogemüsebau (4)

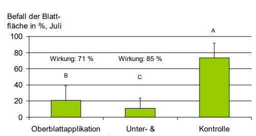
- **Biocontrol: Einsatz von Bakterien, Viren, Nützlingen u.a.**
- biologisch
  - z.B. Schlupfwespe (gegen Weisse Fliegen im Gewächshaus, schwarz parasitiert, weiss nicht

Foto: A. Vieweger, FiBL

477

Pflanzenbau: Pflanzenschutz
Schädlingsbekämpfung im Biogemüsebau (4)

- **direkte Schädlingsbekämpfung mit Insektizid**
- Grafik: *Bacillus thuringiensis kurstaki* („Delfin" 3 x) in Rosenkohl gegen Raupen (Pieris und Mamestra)
- Foto: Wirkungsverbesserung durch Dropleg-Applikation in Kohl



Quelle: Wyss, FiBL
Foto: A. Vieweger, FiBL

478

Pflanzenbau: Pflanzenschutz
Schädlingsbekämpfung im Biogemüsebau (5)

- **Physikalische Methoden und Pheromone**
  - Mechanisch: Fallen, Gelbtafel, Insektennetze, Schneckenzäune, Leimschutznetze, Leimschutzringe, Kälte- / Hitzebehandlung
  - Biotechnisch: Akustische/optische Reize, Frasslockstoffe, Frasshemmstoffe, Sexualduftstoffe, Verwirrungstechnik

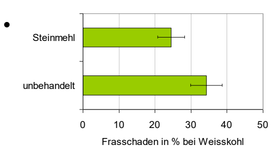
Foto: E. Wyss, FiBL

479

Pflanzenbau: Pflanzenschutz
Schädlingsbekämpfung im Biogemüsebau (5)

- **Direkte Schädlingsbekämpfung mit Insektizid**

•



Fotos: M. Koller, A. Vieweger, FiBL

480

Pflanzenbau: Pflanzenschutz
Pflanzengesundheit im Bioobstbau

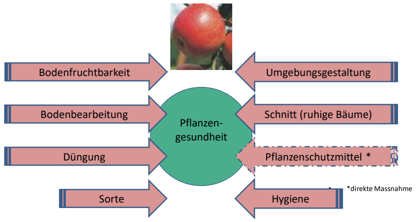


Bild: FiBL

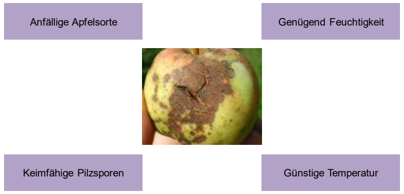
481

Pflanzenbau: Pflanzenschutz
Krankheitsregulierung im Biokernobstbau

Wichtigste Pflanzenschutzmittel oder Pflanzenstärkungs-mittel gegen Krankheiten	Kupfer	Schwefel	Tonerde-Präparate	Kalium Bi-Karbonat	Hefepräparat (*Aureobasidium pullulans*) z.B. Blossom Protect	Laminarin (Vacciplant)
Schorf	X	X	X	X		(X)
Mehltau		X	X			
Feuerbrand			(X)		X	(X)
Marssonina			X			
Regenflecken				X		
Lagerkrankheiten			X			

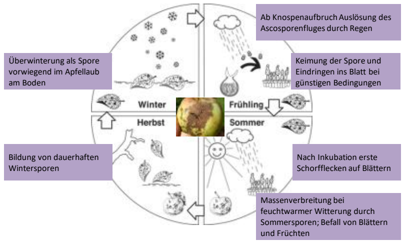
482

Pflanzenbau: Pflanzenschutz
Voraussetzungen für eine Schorfinfektion



483

Pflanzenbau: Pflanzenschutz
Entwicklung des Schorfpilzes



484

Pflanzenbau: Pflanzenschutz
Massnahmen zum Sporenabbau (z.B. Schorf)

- Optimale Applikationstechnik (Wirkung kontrollieren, siehe Foto)
- Pflanzenschutzbehandlung mit Hilfe des RIMpro-Warnsystems (siehe nachstehende Folien)

- Keine stark anfälligen Sorten
- Abtrocknung fördern durch windoffene Standorte, Pflanzabstände und lockeren Kronenaufbau

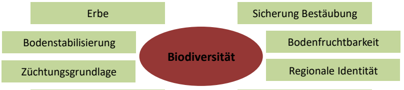
- Kompost fördert Aktivität der Mikroorganismen und Laubabbau
- frühes Hacken im Frühling: Einarbeitung Laub, rascher Abbau
- **90%-iger Abbau des überwinterten Laubes bedeutet 90%-ige Erhöhung des Pflanzenschutzerfolges**

- Laub ab Blattfall mehrmals mulchen, zerkleinerte Blätter von Regenwürmern und Mikroorganismen schneller zersetzt und abgebaut
- Reihenputzer oder Laubsauger

Fotos: A. Häseli, FiBL

485

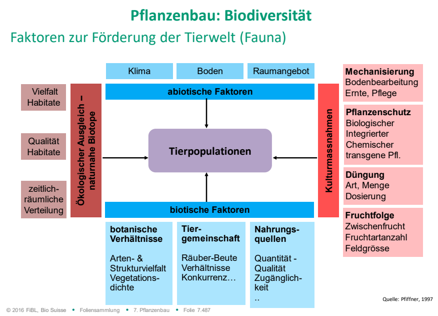
Pflanzenbau: Biodiversität
Als Basis von Ökosystemdienstleistungen



... ist wertvoll, macht Freude, ist interessant und stiftet regionale Identität

Fotos: L. Pfiffner, FiBL

486



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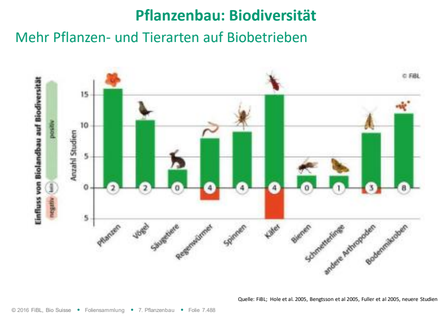

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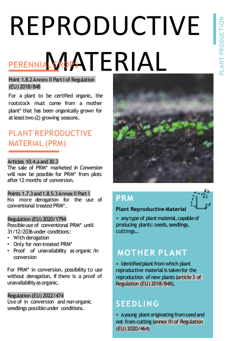

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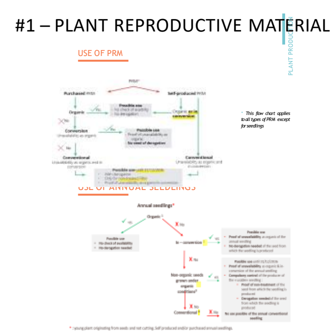

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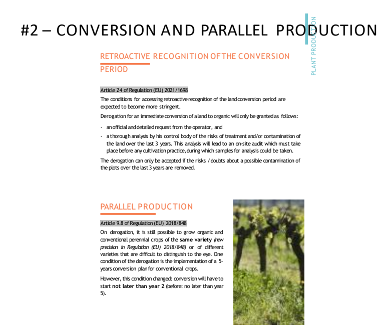

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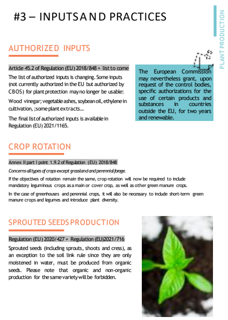


#3 – INPUTS AND PRACTICES

PLANT PRODUCTION

AUTHORIZED INPUTS

Article 45.2 of Regulation (EU) 2018/848 + list to come

The list of authorized inputs is changing. Some inputs (not currently authorized in the EU but authorized by CBOS) for plant protection may no longer be usable:

Wood vinegar; vegetable ashes, soybean oil, ethylene in cultivation, ;some plant extracts...

The final list of authorized inputs is available in Regulation (EU) 2021/1165.

The European Commission may nevertheless grant, upon request of the control bodies, specific authorizations for the use of certain products and substances in countries outside the EU, for two years and renewable.

CROP ROTATION

Annex II part I point 1.9.2 of Regulation (EU) 2018/848

Concerns all types of crops except grassland and perennial forage.

If the objectives of rotation remain the same, crop rotation will now be required to include mandatory leguminous crops as a main or cover crop, as well as other green manure crops.

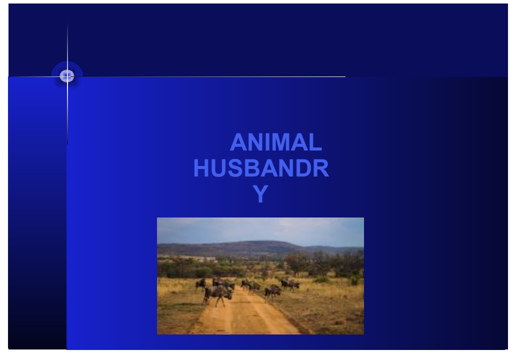
In the case of greenhouses and perennial crops, it will also be necessary to include short-term green manure crops and legumes and introduce plant diversity.

SPROUTED SEEDS PRODUCTION

Regulation (EU) 2020/427 + Regulation (EU)2021/716

Sprouted seeds (including sprouts, shoots and cress), as an exception to the soil link rule since they are only moistened in water, must be produced from organic seeds. Please note that organic and non-organic production for the same variety will be forbidden.

493



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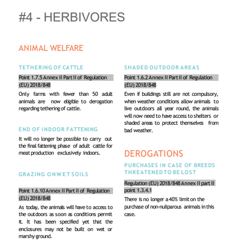


#4 - HERBIVORES

ANIMAL HUSBANDRY

ANIMAL WELFARE

TETHERING OF CATTLE

Point 1.7.5 Annex II Part II of Regulation (EU) 2018/848

Only farms with fewer than 50 adult animals are now eligible to derogation regarding tethering of cattle.

END OF INDOOR FATTENING

It will no longer be possible to carry out the final fattening phase of adult cattle for meat production exclusively indoors.

GRAZING ON WET SOILS

Point 1.6.10 Annex II Part II of Regulation (EU) 2018/848

As today, the animals will have to access to the outdoors as soon as conditions permit it. It has been specified yet that the enclosures may not be built on wet or marshy ground.

SHADED OUTDOOR AREAS

Point 1.6.2 Annex II Part II of Regulation (EU) 2018/848

Even if buildings still are not compulsory, when weather conditions allow animals to live outdoors all year round, the animals will now need to have access to shelters or shaded areas to protect themselves from bad weather.

DEROGATIONS

PURCHASES IN CASE OF BREEDS THREATENED TO BE LOST

Regulation (EU) 2018/848 Annex II part II point 1.3.4.1

There is no longer a 40% limit on the purchase of non-nuliparous animals in this case.

495

#4 - HERBIVORES

ANIMAL PRODUCTION

NUTRITION

STRENGTHENING FEED AUTONOMY

Point 1.9.1.1 Annex II Part II of Regulation (EU) 2018/848

The proportion of feed coming from the farm itself or , if not possible, produced in regional cooperation remains at 60% initially, but will increase to 70% as from 1 January 2024.

MILK REPLACER BEFORE WEANING

Point 1.4.1.g Annex II Part II of Regulation (EU) 2018/848

If animal feeding with maternal milk is not possible, the organic milk replacer must be 100% organic (i.e. must not contain synthetic chemical components authorized as additives, or components of plant origin, including orga nic components, before weaning).

LESS FEED IN CONVERSION FROM OUTSIDE

Point 1.4.3 Annex II Part II of Regulation (EU) 2018/848

Maximum of 25% of 2nd year conversion feed (C2) not coming from the own farm (30% so far).

Maximum of 25% of accumulated 2nd year in-conversion feed from outside the farm and 1st year self-produced in-conversion feed (perennial forage, protein crops) (30% so far).

Feed from the own farm in the second year of conversion may always make up 100% of the ration.

496

#5 - PORK

ANIMAL HUSBANDRY

NUTRITION

STRENGTHENING FEED AUTONOMY

POINT 1.9.3.1 ANNEX II PART II OF THE Regulation (EU) 2018/848

The proportion of food coming from the own farm or, if this is not possible, produced in regional cooperation, is increased to 30% (20% so far).

LESS FEED IN CONVERSION FROM OUTSIDE

POINT 1.4.3.1 ANNEX II PART II OF Regulation (EU) 2018/848 »

Maximum of 25% of 2nd year conversion feed (C2) not coming from the farm (30% so far).

Maximum of 25% of accumulated 2nd year in- conversion feed from outside the farm and 1st year self- produced in-conversion feed (C1) (perennial forage, protein crops) (30% so far).

The share of 1st year self-produced in-conversion feed (C1) still is maintained at 20%.

MILK REPLACER BEFORE WEANING

Point 1.4.1 Annex II Part II of Regulation (EU) 2018/848

If animal feeding with maternal milk is not possible, the organic milk replacer must be "100% milk". It must not contain synthetic chemical components authorized as additives, or components of plant origin, including organic components, before weaning.

NON-ORGANIC PROTEIN FEEDS: ONLY FOR YOUNG PIGLETS

1.9.3.1.C Annex II Part II of Regulation (EU) 2018/848

It will still be possible to use non-organic protein feeds up to a maximum of 5% in the ration per 12- month period, provided that there is no organic protein feed available, and that it is prepared without chemical solvents as it is today. On the other hand, they must be intended only for piglets of 35 kg maximum. The possibility to use non- organic protein feed should end on 31 December 2026, after a review by the European Commission in 2026.

497

#5 - PORK

ANIMAL HUSBANDRY

ANIMAL WELFARE

REARING ON WET SOILS

Point 1.6.10 Annex II Part II of Regulation (EU) 2018/848

As today, the animals will have to access to the outdoors as soon as conditions permit. It has been specified yet that the pens may not be built on wet or marshy ground.

SHADED OUTDOOR AREAS

Point 1.6.2 Annex II Part II of Regulation (EU) 2018/848

Even if buildings still are not compulsory, when weather conditions allow animals to live outdoors all year round, the animals will now need to have access to shelters or shaded areas to protect themselves from bad weather.

HARD SURFACE FOR OUTDOOR SPACES

Regulation (EU) 2020/464 - Article 11

At least half of the minimum surface area of indoor and outdoor spaces shall be hard surface (without grating or grid).

MUTILATION

Regulation (EU) 2018/848 Annex II part II point 1.7

Tooth trimming is no longer allowed.

GROUP LIVING

Regulation (EU) 2018/848 Annex II part II point 1.9.3.2.d

Sows must be kept in groups.

FARROWING PERIOD AND LACTATION

Regulation (EU) 2018/848 - Annex II part II - point 1.9.3.2.d)

At the end of pregnancy and during lactation, sows may be isolated. However, they must be able to move freely in their pen. If their movement must be restricted, it must not exceed a short period.

Regulation (EU) 2018/848 - Annex II part II - point 1.9.3.2.e)

A few days before farrowing, straw or any other natural material is made available to the sows for the construction of nests.

498

#5 - PORK

ANIMAL HUSBANDRY

DEROGATIONS

PURCHASES IN CASE OF BREEDS THREATENED TO BE LOST

Regulation (EU) 2018/848 Annex II part II point 1.3.4.1

There is no longer a 40% limit on the purchase of non-nuliparous animals in this case.

DENSITY

Regulation (EU) 2020/2146 - Article 3 point 4

It will be possible to derogate from the rules on maximum stocking density in buildings and the minimum areas of indoor and outdoor spaces in case of disaster situations, such as earthquakes or floods destroying pastures or buildings.

PURCHASES OF ANIMALS

Regulation (EU) 2018/848 Annex II part II point 1.3.4.4

All requests for purchases of non-organic animals are subject to derogation after consultation of the database set up by the competent authority in EU, or by other relevant authority in third countries.

The animals must not exceed 35 kg.

499

#6 - POULTRY

ANIMAL HUSBANDRY

NON ORGANIC ANIMALS

NON-ORGANIC CHICKS

POINT 1.3.4.3 OF ANNEX II PART II AND ARTICLE 53.1 of Regulation (EU) 2018/848

It will still be possible to purchase non-organic chicks under 3 days old for the creation and renewal of the flock, but this derogation should end on 31 December 2036.

NON-ORGANIC PULLETS

Non-organic pullets under 18 weeks of age, only complying with the feeding and prophylaxis rules of organic farming (Article 42.b of Regulation (EC) 889/2008), may no longer be used. The rearing of pullets over 3 days old must therefore comply with the organic specifications and in particular the housing conditions and indoor and outdoor densities.

ANIMAL PRODUCTION

STRENGTHENING FEED AUTONOMY

POINT 1.9.4.2 ANNEX II PART II of Regulation (EU) 2018/848

The proportion of food coming from the farm itself or, if this is not possible, produced in regional cooperation, is increased to 30% (20% so far).

LESS FEED IN CONVERSION FROM OUTSIDE

POINT 1.4.3.1 ANNEX II PART II of Regulation (EU) 2018/848

Maximum of 25% of 2nd year conversion feed (C2) not coming from the farm (30% currently).

Maximum of 25% of accumulated 2nd year in- conversion feed from outside the farm and 1st year self-produced in-conversion feed (perennial forage, protein crops) (30% so far).

Self-produced feed in the second year of conversion may always make up 100% of the ration.

500

#6 - POULTRY

ANIMAL HUSBANDRY

NUTRITION

NON-ORGANIC PROTEIN FEEDS: ONLY FOR YOUNG POULTRY POINT

1.9.4.2.C.III ANNEX II PART II AND ARTICLE 53.4 of Regulation (EU) 2018/848

It will still be possible to use non-organic protein feeds up to a maximum of 5% in the ration per 12-month period, provided that there is no organic protein feed available, and that it is prepared without chemical solvents (same as so far). On the other hand, they must be intended only for young poultry. The possibility to use non- organic protein feed should end on 31 December 2026, after a review by the European Commission in 2026.

LACK OF FOOD IN THE OUTDOOR AREA

POINT 1.9.4.4.I ANNEX II PART II of Regulation (EU) 2018/848

When feed is no longer naturally available in the open air (snow, aridity...), roughage must be brought to the animals.

HOUSES

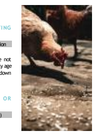
PERCH AND/OR RAISED RESTING PLATFORM

ARTICLE 15.5 AND ANNEX I PART IV of Regulation (EU) 2020/464

This type of accommodation should be available not only for layers, but also for all poultry from an early age except ducks and geese. The dimensions are laid down in Regulation (EU) 2020/464.

PENS MAY NOT BE BUILT ON WET OR MARSHY GROUND

ANNEX II PART II POINT 1.6.10 of Regulation (EU) 2018/848



501

#6 - POULTRY

ANIMAL HUSBANDRY

HOUSES

MULTI-TIERED SYSTEMS

ARTICLE 15.4 of Regulation (EU) 2020/464

Multi-tiered systems may only be used for Gallus gallus species, with the exception of poultry for fattening: i.e. for breeding Gallus gallus, laying hens, pullets for future egg production, future breeding pullets and male chickens of laying breeds.

There must be no more than 3 levels, including the ground, and access to the different levels and outdoor areas must be easily possible for all birds.

STOCKING DENSITY

ANNEX I PART IV of Regulation (EU) 2020/464

Minor changes for minimum surfaces per bird in houses and on outdoor areas:

Addition of categories of poultry: male pullets and chickens of laying breeds, breeding hens and chickens, capons and poulards

Fattening poultry: the number of animals per m² will no longer be considered as today for the minimum stocking density, but only the live weight per m² (21 kg /m²).

Mobile poultry houses: minimum density of 30 kg live weight/m² instead of 16 birds/m² (for houses of less than 150 m²).

BARRIER-FREE ACCESS TO THE ENTRY/EXIT POP-HOLES

Regulation (EU) 2020/464 - Article 15.1.c and e and Annex I Part IV

No obstacle must prevent access to pop-holes, moreover, for pop-holes at height, a ramp must be provided

Calculation for the dimensions of the pop-holes leading to the outside will now be made in relation to the minimum surface area of the building

ACCESS TO OPEN AIR AREAS

POINT 1.9.4.4.E OF PART II ANNEX II of Regulati on (EU) 2018/848

Poultry should have continuous daytime open-air access from as early an age as practically possible. A definition of «early age» is currently under consideration.

502

#6 - POULTRY

ANIMAL HUSBANDRY

ANIMAL WELFARE

Points 1.9.4.3 and 1.7.8 Annex II Part II of Regulation (EU) 2018/848

It is clearly stated that plucking of live poultry is prohibited.

The beak can still be trimmed by way of derogation if it is done during the first three days of life.

OPEN-AIR SPACES

CONVERSION FOR OUTDOOR RUNS AND OPEN-AIR SPACES

POINT 1.7.5.B ANNEX II PART I of Regulation (EU) 2018/848

It will still be possible to convert land in just one year, but the new regulation no longer provides for conversion in 6 months.

POULTRY KEPT IN THE OPEN AIR

POINT 1.6.2 ANNEX II PART II of Regulation (EU) 2018/848

As is already the case at present, poultry houses will not be compulsory if weather conditions allow, but the animals will then need to have access to shelters or shady places.

LAYOUT OF OUTDOOR AREAS

ARTICLE 16 of Regulation (EU) 2020/464

Outdoor areas must be provided with a wide variety of plants, trees and shrubs distributed throughout the area to allow for a balanced use of all the space available to the birds.

The open-air area should not extend beyond 150 m from the nearest entry/exit pop-hole. An extension of up to 350 m will be acceptable if the space has enough shelters from weather and predators, distributed at regular intervals (minimum 4 shelters/ha).

For geese, the presence of grass is necessary to satisfy their needs to eat grass.

Waterfowl shall have access to water to dip their head therein to clean their plumage under all circumstances (including in houses if they are temporarily confined). - Point 1.9.4.4.k Part II Annex II of Regulation (EU) 2018/848

503

#6 - POULTRY

ANIMAL HUSBANDRY

VERANDAS

THE NEW REGULATION NOW REGULATES THE USE OF VERANDAS

Point 1.6.5 Annex II Part II Regulation (EU) 2018/848.

The surface of the veranda is not take n into account in the calculation of stocking densities and mi nimum indoor areas, unless the space meets the criteria for indoor rearing: the space in question is accessible 24 hours a day, meets the a nimal welfare conditions and is covered and insulated in such a way as to pro vide conditions different from the outdoor climate - Article 15.2.c of Regulation (EU) 2020/464.

For fattening poultry, the surface of the veranda is not to be considered in the total usable surface of the poultry houses (1600 m² maximum) - Article 15.2.d of R (EU) 2020/464.

VERANDA

= An additional, roofed, non-insulated outdoor part, usually equipped with a fence or screen on its longest side, where the conditions are those of the outdoor climate. Lighting is natural and, if necessary, artificial, and the floor is covered with litter.

(Regulation (EU) 2018/848)

DIMENSION OF THE POP-HOLES

Article 15.2.b of Regulation (EU) 2020/464

The pop-holes giving access to the veranda have the following length:

- Between the poultry house and the veranda: 2 m for 100m² minimum surface of the indoor area.
- Between the veranda and the outside: 4m per 100 m² minimum surface of the indoor area.

504

#7 - BEEKEEPING

ANIMAL HUSBANDRY

BEESWAX SOON ELIGIBLE TO CERTIFICATION

ANNEX I to Regulation (EU) 2018/848

Beeswax was previously not eligible to certification because it was not regarded as an agricultural product; beeswax is now included in the scope of the new regulation and becomes an organic product fully eligible to certification. In addition to the current attestation «suitable for organic farming», it will therefore be possible to issue a certificate and certificates of inspection (COI) for organic wax. However, as long as operators are certified to an equivalent CBOS, the certification and export of organic wax is not possible.

PURCHASE OF NON-ORGANIC ANIMALS

POINT 1.3.4.2 PART II ANNEX II to Regulation (EU) 2018/848

There will be an increase in the maximum authorised threshold with the new regulation: it will be possible to renew one's apiaries up to 20% per year with non-organic queens and swarms (only 10% so far), under the same conditions as today. In any case, each year a swarm or queen may be replaced by a non-organic swarm or queen.

POLLEN FEEDING

Point 1.9.6.2 Part II Annex II to Regulation (EU) 2018/848 amended by Reg.(EU) 2020/427 and Reg.(EU) 2020/2146

Where the survival of colonies is threatened due to a situation recognized as a disaster, it will be possible to feed them with organic pollen in addition to the organic honey, sugar or sugar syrup already provided for under previous regulations.

FORAGING IN NON-COMPLIANT AREAS

Regulation (EU) 2020/2146

The possibility, for pollination purposes, of moving organic hives to non-conforming areas will now only be granted by derogation in the event of disasters that drastically reduce the sources of nectar and pollen and threaten the survival of the colony (earthquakes, fires, etc.)

505

– for all types of animal husbandry

ANIMAL HUSBANDRY

DEROGATIONS IN THE EVENT OF DISASTERS

Article 22 of Regulation (EU) 2018/848 and Regulation (EU) 2020/2146

As currently applied, by way of derogation, it will be possible to use non-organic animals or non-organic feed if a disaster situation is recognized: adverse climatic event, animal diseases, environmental incident, natural disaster, or any other catastrophic event.

New possibilities of derogation are offered: stocking density in buildings and the minimum areas for indoor and outdoor spaces (earthquakes or floods).

In case of loss of feed production (extreme weather events), using non-organic feed by way of derogation, is still possible, but: the percentage of dry matter consisting of roughage, fresh, dried or silage fodder, in the daily ration may be reduced, provided that the nutritional needs of the animal are met.

506

AQUACULTURE

507

#8 – GENERAL CHANGES

AQUACULTURE

PRODUCTION PRACTICES

PARALLEL PRODUCTION

ARTICLE 9(7) of Regulation (EU) 2018/848

It is still possible to produce organic and non-organic products simultaneously for algae and aquaculture animals.

These may be the same species, if there is a clear and effective separation between the production sites or units.

Article 25 of Regulation (EC) 889/2008 concerning the authorization to be requested from the Competent Authority in the case of simultaneous production of aquaculture animals is now deleted.

MANGROVE

POINT 1.4 OF ANNEX II, PART III of Regulation (EU) 2018/848

The destruction of mangroves is prohibited for any aquaculture production (algae, fish, molluscs, crustaceans etc.).

FERTILISATION

ANNEX II of Regulation (EU) 2021/1165

Nutrients of plant and mineral origin in Annex II of Regulation (EU) 2021/1165 may be used for land-based installations.

LABELLING

ARTICLE 32(2) of Regulation (EU) 2018/848

The EU/non-EU origin of the raw materials listed under the reference to the Control Body code when the Euroleaf logo is used can be shown as "Aquaculture" instead of "Agriculture" (the threshold for disregarding origin is increased to 5% from the previous 2%)

508

#9 – ALGAE

AQUACULTURE

SEEDS

ARTICLE 26 of Regulation (EU) 2018/848

Regular collection of young seaweed from the wild should still be carried out in order to maintain and develop the diversity of cultured stocks in closed facilities.

In European Union, a database will list the organic Plant Breeding Material (seeds) available in the Member States.

This database will not apply in Third Countries and will be replaced by a system of **attestation of unavailability.**

FOULING

Restrictions regarding fouling removal in algae production has been removed in new EU regulation.

ALGAE PROCESSING

POINT I.10 OF ANNEX II, PART III of Regulation (EU) 2018/848

Specificities on seaweed processing (Article 29(a) of R(EC) 889/2008) has been removed in new EU regulation.

Common foodstuffs rules apply for algae/seaweed processing

509

#9 – ALGAE

AQUACULTURE

WATER QUALITY

From 1 January 2022, organic seaweed production and harvesting areas must comply with at least one of the following two criteria :

CRITERIA	EXAMPLES OF DETAILS GIVEN FOR FRANCE
Have a high ecological status, corresponding to **very good ecological status**, according to the 2000/60 EC Directive. *(EU Directive will not apply directly in Third Countries (TC), however the target values described in this Directive are valid).*	The certification will be based on the ecological status of the water body transmitted every 6 years as part of the official reporting to the European Commission.
OR	
Be of equivalent quality to the A or B classified area of Regulation (EU) 2019/627 article 53 and 54 *(EU regulation will not apply directly in Third Countries (TC), however the target values described in this regulation are valid).*	The collection or cultivation area must not be close to a source of contamination, or have an unfavourable situation with regard to potential risks of contamination. For edible seaweed: - if a classification under Regulation (EU) 2019/627 has been made for the area concerned, it must be classified A or B for at least one group of molluscs (burrowing bivalves, non-burrowing bivalves); refused for groups classified C or D; **The sanitary classification is verified on the basis of the prefectoral decrees of the production zones.** -if the area has not been the subject of such a classification, the operator must implement a voluntary procedure of the same type as that leading to the classification, based on the methodologies

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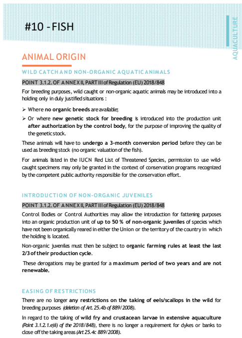

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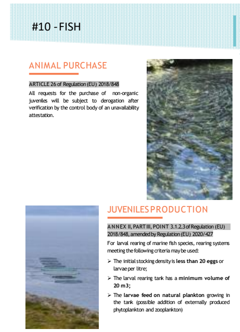

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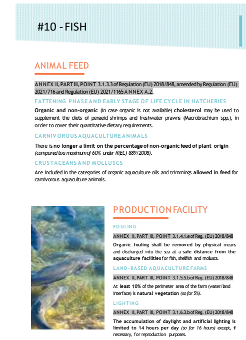

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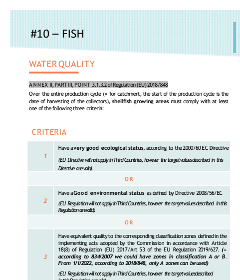

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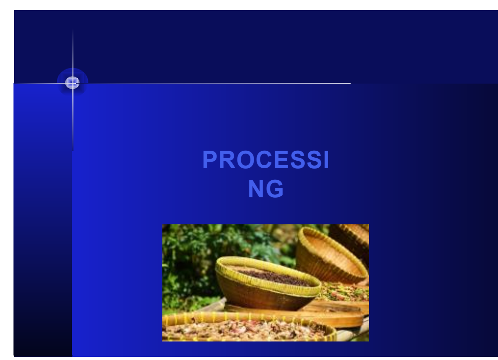

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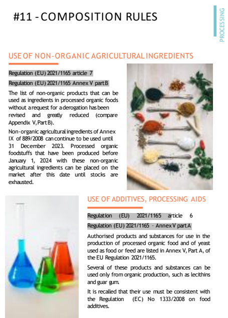

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#15 - CHANGES IN TRADE RULES WITH THIRD COUNTRIES

EXPORT

TRADE RULES ARE CHANGING

The European Commission is planning some changes regarding the Certificate of Inspection (COI) on TRACES, which apply as early as 1st January 2022. Other changes on the issuance of the COI will be applicable once your products are certified according to Regulation (EU) 2018/848 (latest by 31 December 2024).

TRANSITION PERIOD

Equivalent CB organic standard (CBOS)	NEW ORGANIC REGULATION Regulation (EU) 2018/848
SOME CHANGES RELATED TO COI ISSUANCE	ADDITIONAL CHANGES RELATED TO COI ISSUANCE
01/01/2022 Entry into force	31/12/2024 Maximum

TRANSITION PERIOD

Currently, the CBOS are recognized by the European Commission as "equivalent to the European Regulation". Thanks to this recognition, your CBOS certification allows you to export your products to the European Union until 31/12/2024 at the latest.

This "equivalence regime" will disappear with the new regulation, and **certification according to the new regulation** will be mandatory. Certification bodies will grant a certification "in compliance with Regulation (EU) 2018/848" so that you may continue to export your products to the European Union.

524

#16 – CERTIFICATE OF INSPECTION

EXPORT

01/01/2022: FIRST CHANGES APPLICABLE

Annex I of Regulation (EU) 2021/2306

ON THE CERTIFICATE OF INSPECTION (COI) TEMPLATE

- New box identifying traders, registration on TRACES
- New box indicating the estimated time of arrival in the EU
- Product category to be mentioned
- Commercial documents must be uploaded on TRACES
- Possibility to clear part of the consignment as organic through customs

➔ ***It will be possible to still be CBOS certified while using this updated COI template.***

ENHANCED VERIFICATIONS ON THE CONSIGNMENT BEFORE ISSUING THE COI

- Consistency of exported quantities
- Traceability of products and ingredients

LATEST by 31/12/2024: ADDITIONAL CHANGES

Regulation (EU) 2021/1698

MORE VERIFICATIONS ON THE CONSIGNMENT BEFORE ISSUING THE COI

- Detailed "Travel Plan" between the exporter and the EU point of entry for bulk products.
- Physical check by the certifier before export, based upon a risk assessment
- For products considered as 'high risk' by the Commission:
  - Systematic physical audit and sampling by the Control Body before export
  - The same procedure applies at the arrival of concerned products in the EU by the competent authorities.

NEW PRODUCTS ELIGIBLE FOR EXPORT TO THE EU WITH A COI

- Products in 2nd and 3rd year of conversion (Article 45.1 of Regulation (EU) 2018/848).
- New products included in the scope of the new regulations (see chapter: New products eligible to certification)

525

#17 - SPECIFIC CASE OF UNITED KINGDOM

EXPORT

BREXIT

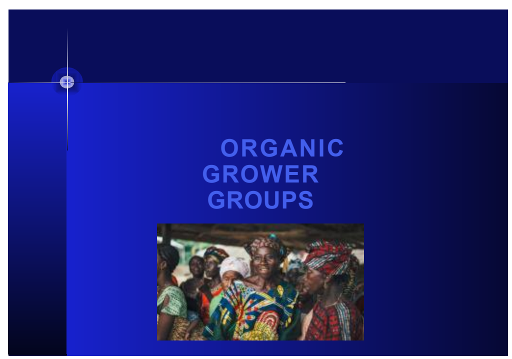
Since 1 February 2020 the United Kingdom is no longer a member of the European Union. Your current certification will still be recognized for the export to the UK, as well as the certification of products according to the new Regulation (EU) 2018/848.

IMPACTS ON EXPORT

The COI is no longer issued on TRACES, a paper GB COI, hand signed by the Control Body before exporting the products is issued instead.

A trade agreement was signed at the end of 2020 between the EU and the UK, guaranteeing mutual recognition of their respective organic regulations. With the implementation of the new EU regulation, it would be renegotiated by December 2023.

526



527

#18 – ELIGIBILITYCRITERIA

ORGANIC GROWER GROUPS

GROUP MEMBERSHIP CRITERIA

ACTIVITY

ARTICLE 36.1 of Regulation (EU) 2018/848

A **Group of Operators** may only be composed of members who are either **farmers** or **operators that produce algae or aquaculture animals,** and who in addition may be engaged in processing, preparation or placing on the market of food or feed. The following criteria need to be fulfilled:

OPTION	CRITERIA 1	CRITERIA 2
OPTION 1	- Individual certification cost OR - Standard output of organic production → Represents more than 2 % of each member's turnover	- Annual Organic Turnover < 25 000 € OR - Standard Output of Organic Production < 15 000 € per year
OPTION 2	Members who have each holdings of maximum: - 5 hectares, - 0,5 hectares, in the case of greenhouses, or - 15 hectares, exclusively in the case of permanent grassland	

(AND between Criteria 1 and Criteria 2; OR between Option 1 and Option 2)

ADDITIONAL REQUIREMENTS

ARTICLE 36.1 of REgulation (EU) 2018/848

Group of operators shall be composed of members who

- ✓ are established in a Member State or a Third Country;
- ✓ whose production activities take place in geographical proximity;
- ✓ operate a joint marketing system;
- ✓ have established a system for internal controls;
- ✓ form a legal entity as a group.

528

#18 – ELIGIBILITYCRITERIA

ORGANIC GROWER GROUPS

MAXIMUM GROUP SIZE

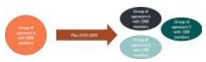
REQUIREMENT

ARTICLE 4 of Regulation (EU) 2021/279

The maximum size of a group of operators shall be **2 000 members.**

TRANSITIONAL PROVISIONS

ARTICLE 10.1 of Regulation (EU) 2021/279



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#19 – INTERNAL CONTROL RULES

ORGANIC GROWER GROUPS

INTERNAL CONTROL SYSTEM (ICS)

ARTICLE 36.1 of Regulation (EU) 2018/848 and 1.b of Regulation (EU) 2021/715

Internal Control System (ICS) shall include procedures on:

- ✓ Registration of members;
- ✓ Internal inspections (inspection records, measures in case of non-compliance, etc.);
- ✓ Approval for new members;
- ✓ Training of ICS staff and members;
- ✓ Internal traceability.

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ICS MANAGER

ARTICLE 36.1 of Regulation (EU) 2018/848 and 1.c of Regulation (EU) 2021/715

Internal Control System (ICS) manager shall :

- ✓ Verify each member's eligibility and keep the updated list of members;
- ✓ Ensure there is a written agreement between each member and the group;
- ✓ Be the liaison between members and competent authorities (e.g. in case of derogations);
- ✓ Develop ICS procedures and records;
- ✓ Check conflict of interest issues with internal inspectors;
- ✓ Ensure ICS inspectors are well trained and qualified.

530

#19 – INTERNAL CONTROL RULES

ORGANIC GROWER GROUPS

INTERNAL INSPECTOR

ARTICLE 36.1 of Regulation (EU) 2018/848 and 1.c of Regulation (EU) 2021/715

ICS internal inspector shall :

- Carry out internal inspections;
- Draft internal inspection reports;
- Submit written and signed statement on conflict of interest;
- Participate in trainings.

DOCUMENTS AND RECORDS

ARTICLE 5 of Regulation (EU) 2021/279

Group of operators and ICS staff shall keep the following documents and records:

List of members
Signed membership agreements and contracts
Internal inspections reports signed by inspectors and members
Measures taken in case of non-compliance
Training followed by inspectors and members
Traceability records
Appointment of ICS manager and inspectors

531

#20 – EXTERNAL CONTROL RULES

ORGANIC GROWER GROUPS

NUMBER OF EXTERNAL CONTROLS

ARTICLE 38.4 of Regulation (EU) 2018/848 and 7 of Regulation (EU) 2021/279

The following rules on minimum percentages apply for groups of operators :

- Minimum 5% of the members of a group, but no less than 10 members, shall be subject to re-inspection each year.
- Minimum 2% of the members of a group shall be subject to sampling each year.
- Minimum 10% of controls of groups of operators shall be carried out without prior notice each year.

GROUP OF OPERATORS CERTIFICATE

ARTICLE 35 of Regulation (EU) 2018/848

A group of operators shall not be entitled to obtain a certificate from more than one control body in relation to activities carried out in the same Third Country regarding the same category of products, including cases in which that operator or group of operators operates at different stages of production, preparation and distribution.

Members of a group of operators shall not be entitled to obtain an individual certificate for any of the activities covered by the certification of the group of operators to which they belong.

532

MAIN CHANGES

SUMMARY

SCOPE

- With the new regulation, the EU enlarged the scope of products to be certified organic:
- ✓ bool (not carded or combed);
- ✓ cotton (not carded or combed);
- ✓ silkworm cocoons;
- ✓ raw and untreated hides;
- ✓ all essential oils, even if not intended for human consumption;
- ✓ natural corks stoppers not agglomerated and without binder;
- ✓ beeswax;
- ✓ sea or mine salt;
- ✓ gums and natural resins.
- Products belonging to the same product category will be required to be certified by the same certification body (Article 35.4 and 35.7 of Regulation 2018/848).

CROP

- The derogation for conducting parallel production on perennial crops (same varieties or different but not easily distinguishable) in case of 5-year conversion plan has been changed : conversion will have to start **not later than year 2** (before: no later than year 5).
- No derogation for the use of conventional treated PRM.
- Parallel production of sprouted seeds (organic and non-organic management in the same unit) can not be carried out.
- Crop rotation must include leguminous crops as a main or cover crop, as well as other green manure crops.

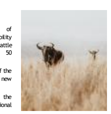
533

MAIN CHANGES

SUMMARY

ANIMAL PRODUCTION

- Herbivores: including the end of fattening in buildings and the possibility of requesting a derogation for cattle tethering in farms with less than 50 adults
- Pigs and poultry: including the end of the 5% protein feed for adults and new requirements for livestock buildings
- Rabbits: production rules set at the European level that replace the national rules



FISHAND ALGAE

- New list of nutrients usable for land-based installations in Regulation (EU) 2021/1165 Annex II
- Water quality criteria :High ecological status

Regarding fish only:

- Number of treatments : 4 max in total for all species (other conditions may apply)
- The accumulation of daylight and artificial lighting is limited to 14 hours per day
- Changes regarding animal origin/purchase (larval rearing conditions, conditions for non-organic animals introduction, etc.)
- Changes regarding feed (organic and nonorganic cholesterol, crustaceans and molluscs in carnivorous animals' feed, etc.)

534

MAJOR CHANGES

SUMMARY

PROCESSING

- The use of flavours reduced to only natural flavours of X (X defined in the processing sheet #12)
- The ban on manufactured nanomaterials
- Parallel production of sprouted seeds (organic and non-organic management in the same unit) can no longer be carried out.

INTERNAL CONTROL SYSTEM

- Group of operators shall be composed of members who are farmers or operators that produce algae or aquaculture animals; they have to fulfill certain criteria in regard to size, turnover and certification costs.
- The maximum size of a group of operators shall not exceed 2 000 members.
- Minimum 10% of all official (external) controls of groups of operators shall be carried out without prior notice each year. Minimum 2% of the members of a group shall be subject to sampling each year. Minimum 5% of the members of a group, but no less than 10 members, shall be subject to re-inspection each year.

535