Landwirtschaft und Umwelt

Haslberger Alexander
Univ Vienna
update 10/2023

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

Webs


Alexander G. Haslberger

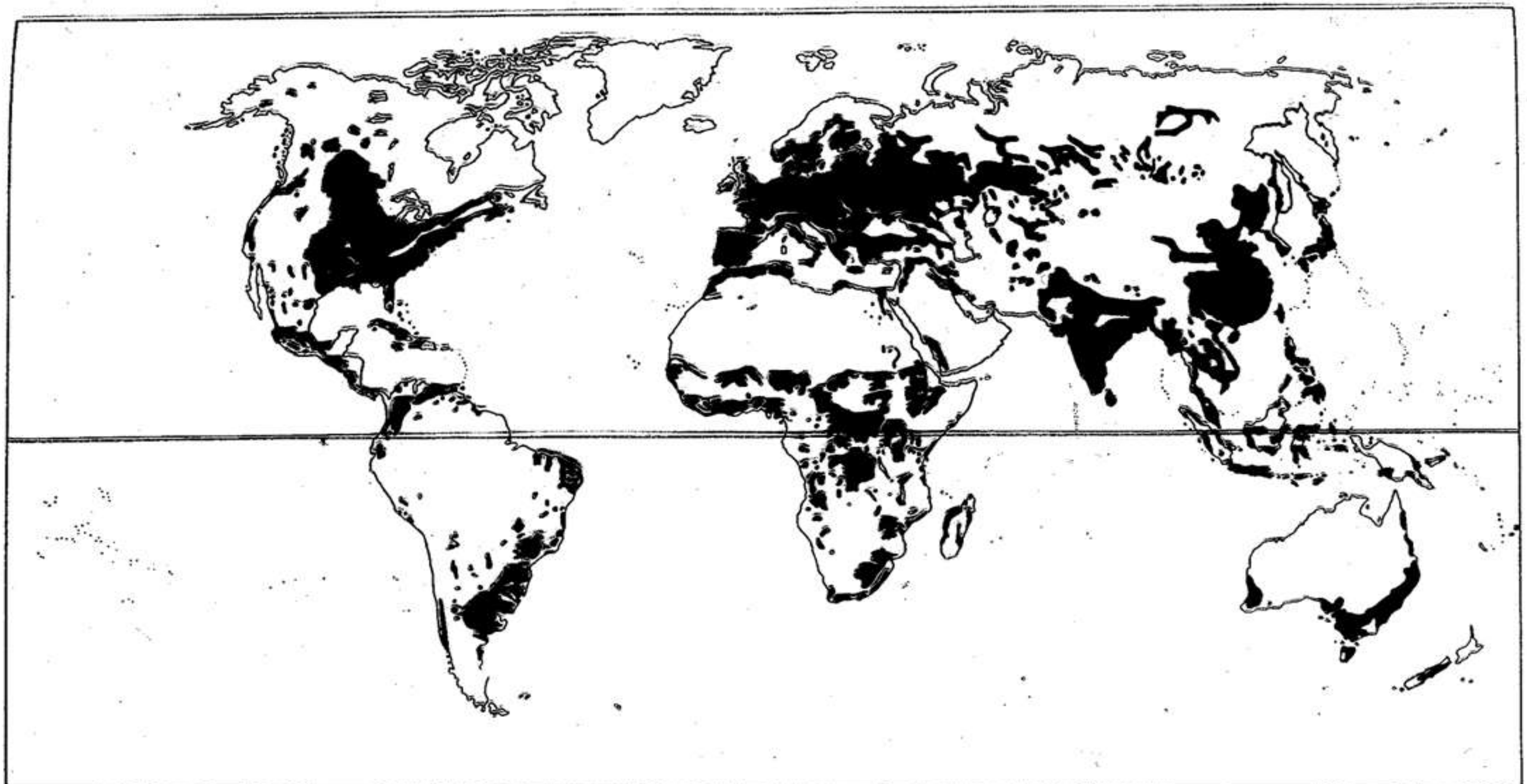

Strategies for a healthy aging: One size never fits all
Find your way to your tailor made disease prevention, healthy aging, and beauty using a brand new science based holistic epigenetic concept >>>
Science proofed functional foods, lifestyle strategies and nutrition

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.

Arable Land: Where is it?



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

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.)

9,800 BC

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

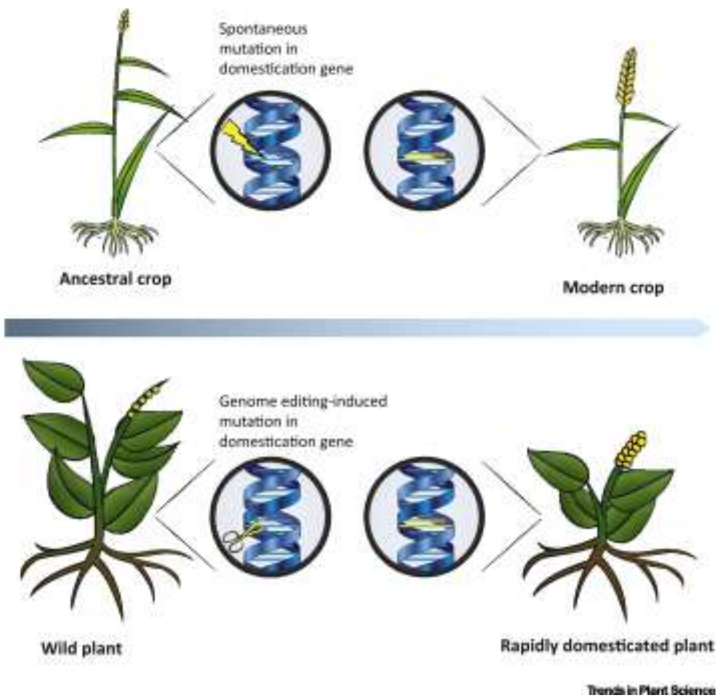
8,500 BC

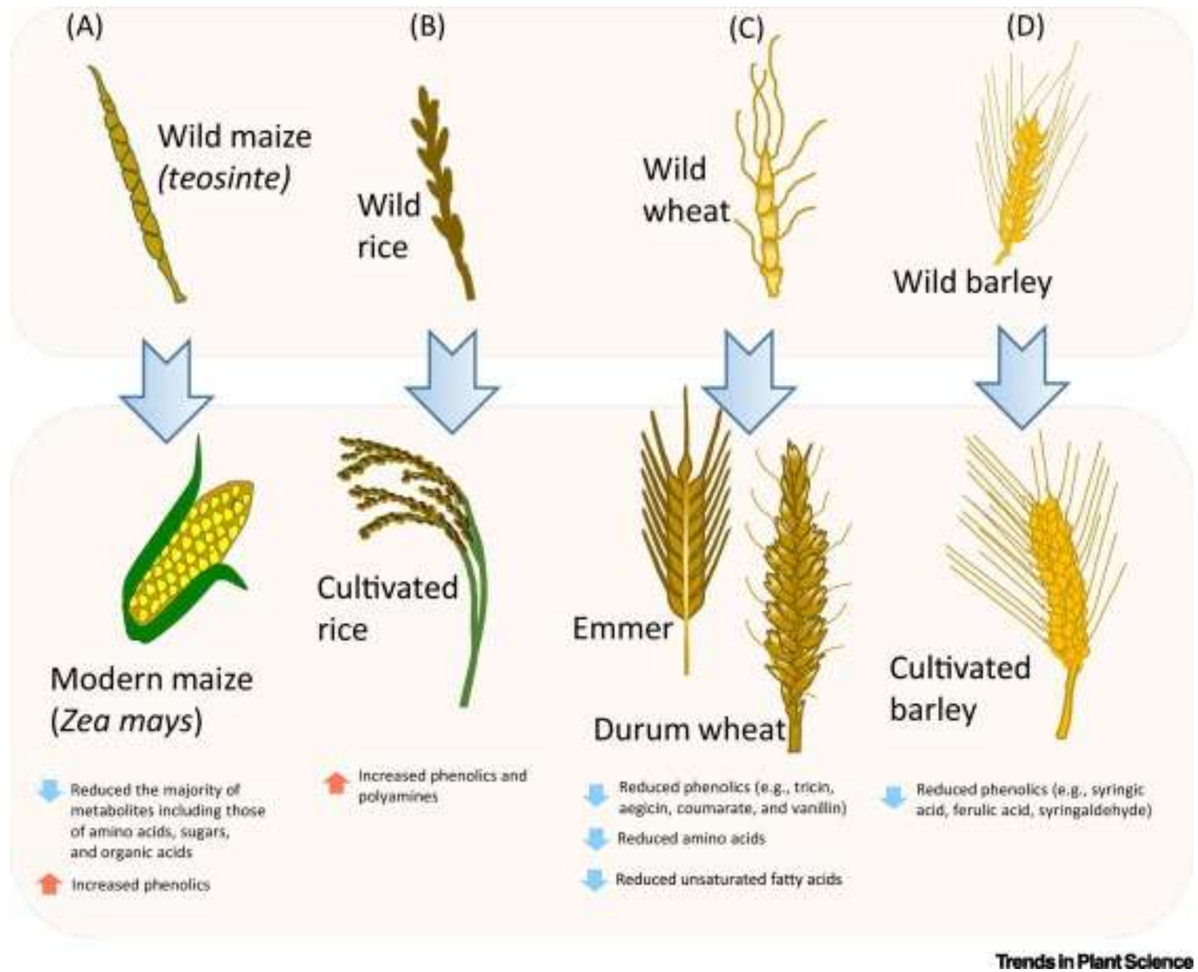






- People across the Fertile Crescent begin growing domestic wheat, barley, chickpeas, peas, beans, flax and bitter vetch.


Spontaneous mutation in domestication gene
Ancestral crop
Modern crop
Genome editing-induced mutation in domestication gene
Wild plant
Rapidly domesticated plant
Trends in Plant Science


(A)
(B)
(C)
(D)
Wild maize (teosinte)
Wild rice
Wild wheat
Wild barley
Modern maize (Zea mays)
Cultivated rice
Emmer
Durum wheat
Cultivated barley
Reduced the majority of metabolites including those of amino acids, sugars, and organic acids
Increased phenolics
Increased phenolics and polyamines
Reduced phenolics (e.g., tricin, aegicin, coumarate, and vanillin)
Reduced amino acids
Reduced unsaturated fatty acids
Reduced phenolics (e.g., syringic acid, ferulic acid, syringaldehyde)
Trends in Plant Science

Coevolution: crops Society
Spread, centers of origin

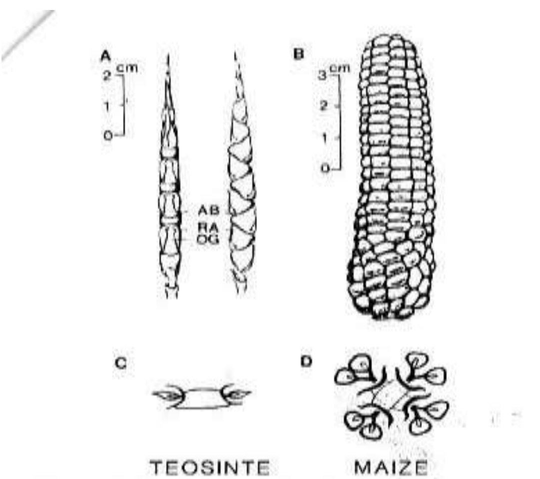
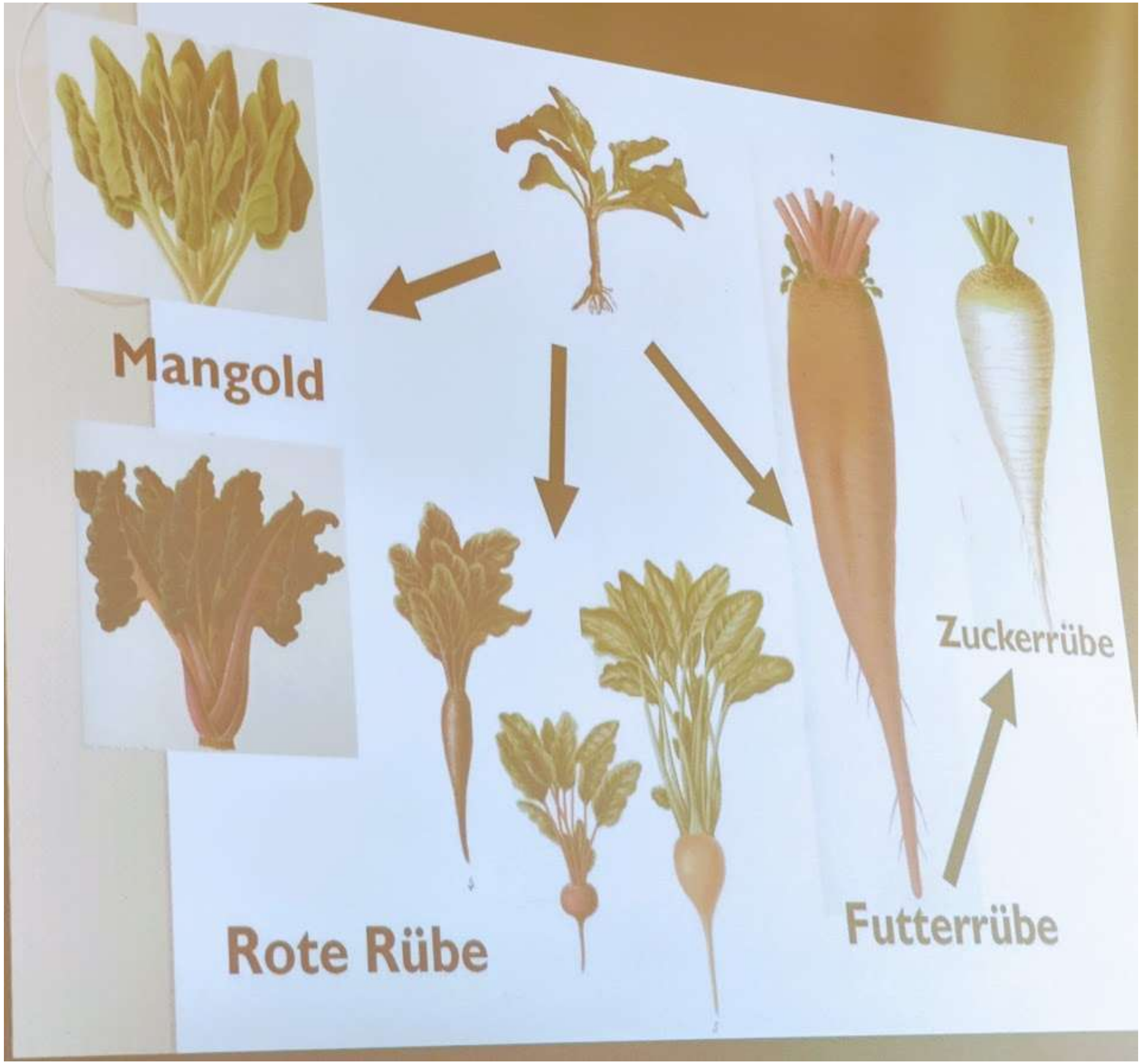


FIG. 2. Architecture of annual teosinte and maize ears (female inflorescences) adapted from Iltis (7). (A) Teosinte ear. AB, abscission layer; OG, outer glume; and RA, rachis internode. (B) Maize ear. (C–D) Schematic cross-sections of teosinte (C), showing two ranks of cupules with one spikelet per cupule, and of maize (D), showing four ranks of cupules with two spikelets per cupule.



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

8500 BC

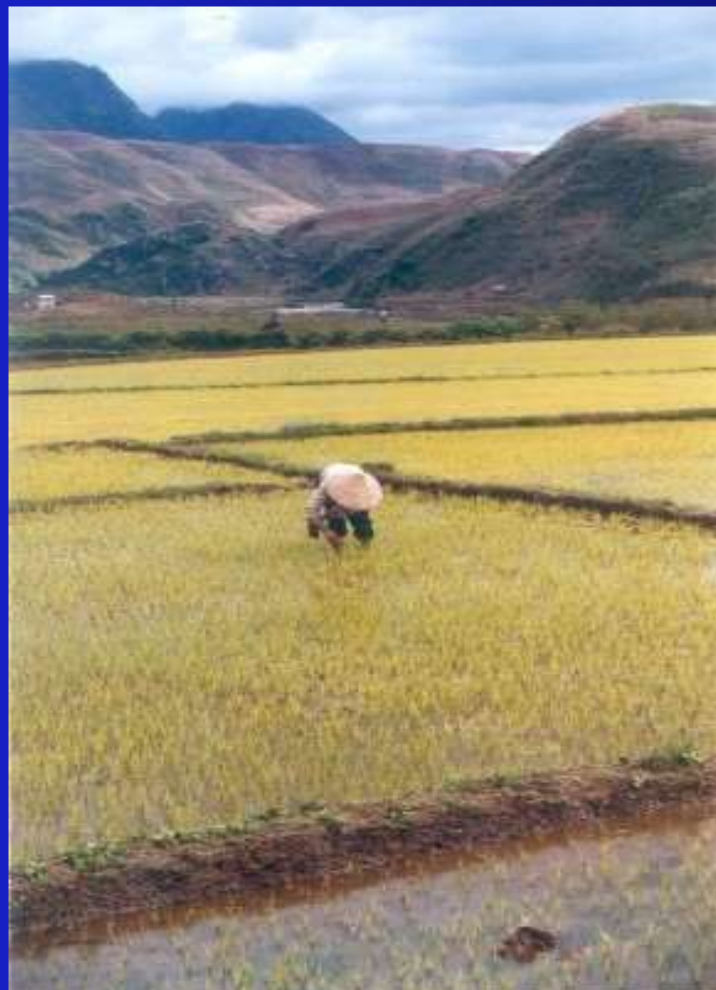
- Sheep and Goats are domesticated.

Middle East
Romania
Ukraine
Russia
Kazakhstan
Bulgaria
Black Sea
Greece
Georgia
T'bilisi
Caspian
Sea
Uzbekistan
Ankara
Armenia
Yerevan
Azerbaijan
Baku
Turkmenistan
Turkey
Ashgabat
Azerbaijan
Cyprus
Nicosia
Syria
Tehran
Mediterranean
Sea
Beirut
Lebanon
Damascus
Baghdad
Iraq
Iran
Afghanistan
Israel
Jerusalem
Amman
Jordan
Cairo
Kuwait
Kuwait
Persian
Gulf
Pakistan
Egypt
Manama
Qatar
Oman
Saudi
Bahrain
Doha
Abu Dhabi
Gulf
of
Oman
Tropic of Cancer
Riyadh
Muscat
Arabia
United
Arab
Emirates
Oman
Red
Sea
Boundary Undefined
Sudan
Khartoum
Eritrea
Asmara
Sanaa
Yemen
Arabian
Sea
Gulf of Aden
Djibouti
Djibouti
Socotra
(Yemen)
Ethiopia
Somalia
Addis Ababa
400 km
400 mi
30°
40°
50°
20°
10°
30 N

7,000 BC

- Native Americans - Indians, Hawaiians and Eskimos - begin simple farming.

6,800 BC



- Rice is domesticated in Southeast Asia.

6,500 BC

- Evidence that cattle are domesticated in Turkey.

4,000 BC, Cont'd

- Evidence that rice is domesticated in northwestern Thailand.

Plowing the Fields

4,000 BC

- Egyptians discover how to make bread using yeast.

3,500 BC

- First agriculture in the Americas, around Ecuador.

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.)

600

- The moldboard plough is invented in eastern Europe.


850

- Use of coffee is known in Arabia.

1,000

- Corn is being raised by Native Americans in large plots.

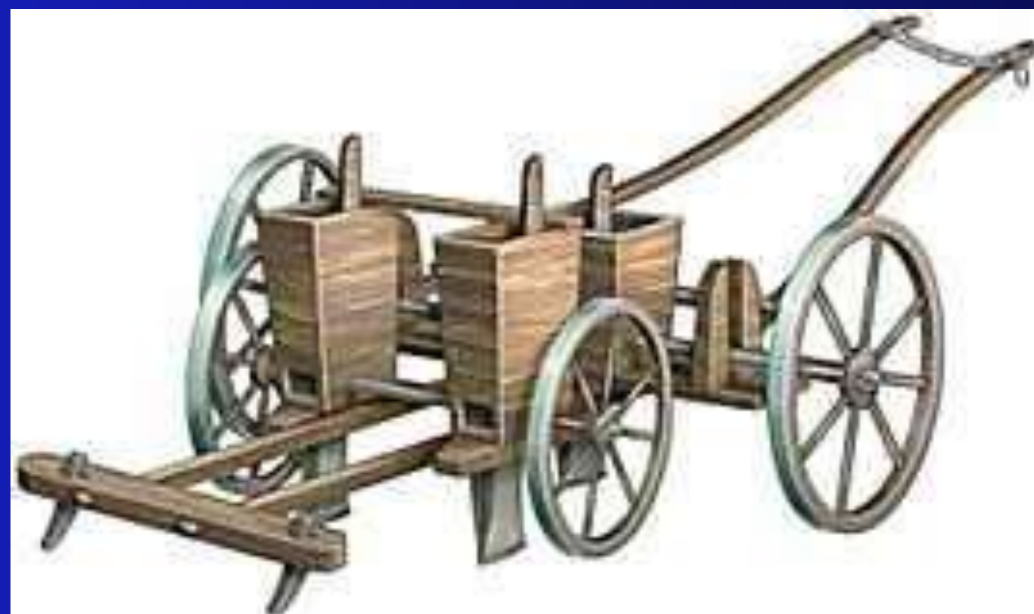
Ancestor to Modern Corn

1607

- Indians show the Plymouth Rock colonists how to grow crops such as corn, pumpkins, squash and beans.

1701

- Jethro Tull invents the seed drill.

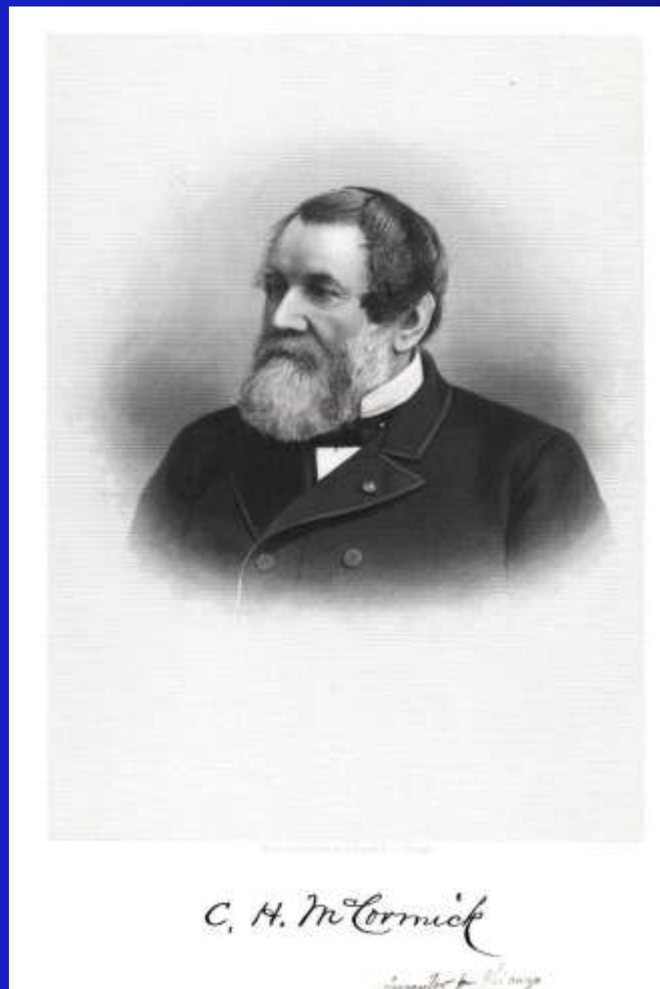


Modern Seed Drill

1809

- Nicholas Appert invents canning for food preservation.

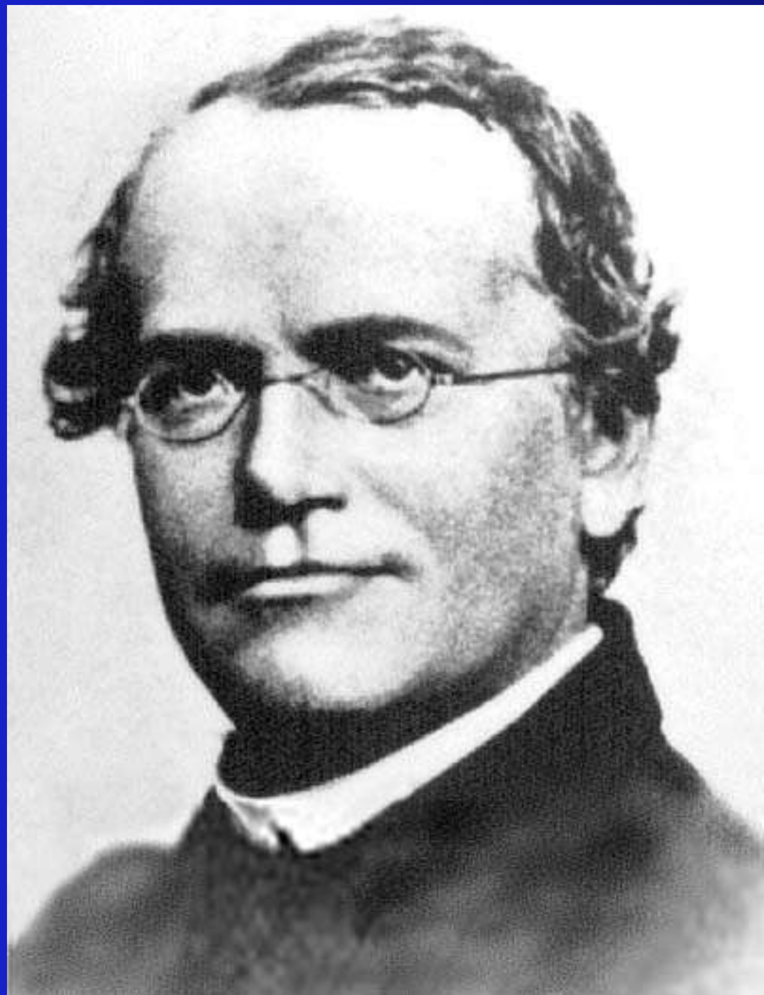
1834



- Cyrus McCormick invents the reaper.
- mowing

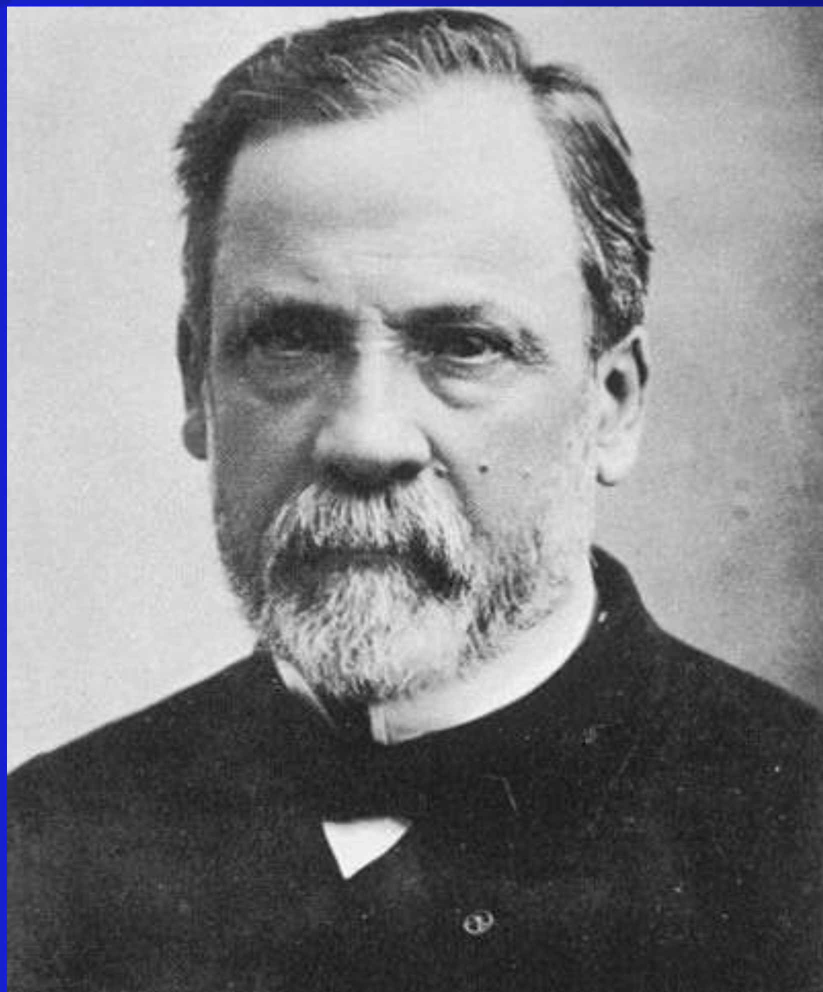
STATE HISTORICAL SOCIETY OF WISCONSIN

1855



- Gregor Mendel publishes his paper describing Mendelian Inheritance.

1871



- Louis Pasteur invents pasteurization.

2000s

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

Saatgutwirtschaft & Pflanzenzüchtung 2

ARCHE NOAH

- Starke Spezialisierung:
  Trennung Landwirtschaftliche Produktion von Züchtung & Saatgutproduktion
- Betriebswirtschaftliche Ziele maximiert
- Konzentrationsprozesse (Profite, Zuchtprogramme)

→**Abhängigkeiten:** Firmen too big too fail?
Marktbeherrschend (Preise, Zuchtziele)

→**Nicht nachbaufähige** Sorten (F1 Hybride)

2000s

- Development of new pesticides.

2000s

- Genetically modified organisms are cultivated around the world.

2000s


Microbe new to science found in self-fermented beer | Science | AAAS

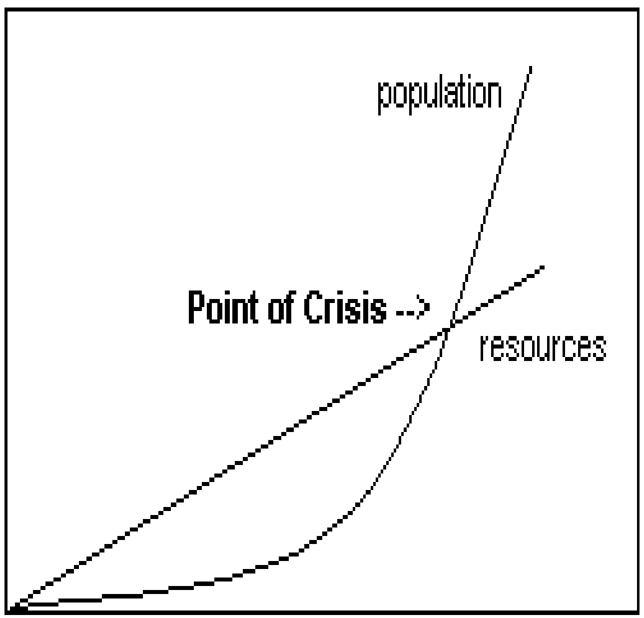
Visit

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

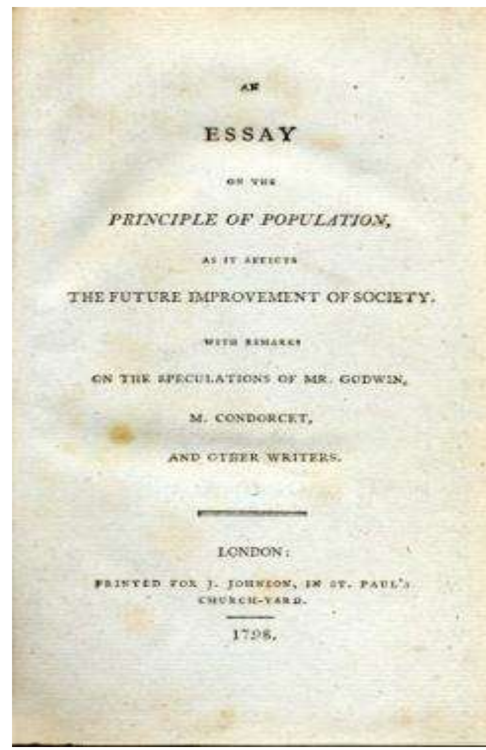
CGIAR Consultative Group on International Agricultural Research.

http://www.cgiar.org

T. Malthus: 1766- 1834
Crisis in food production



Malthus' Basic Theory



AN
ESSAY
ON THE
PRINCIPLE OF POPULATION,
AS IT AFFECTS
THE FUTURE IMPROVEMENT OF SOCIETY.
WITH REMARKS
ON THE SPECULATIONS OF MR. GODWIN,
M. CONDORCET,
AND OTHER WRITERS.

LONDON:
PRINTED FOR J. JOHNSON, IN ST. PAUL'S
CHURCH-YARD.
1798.

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.

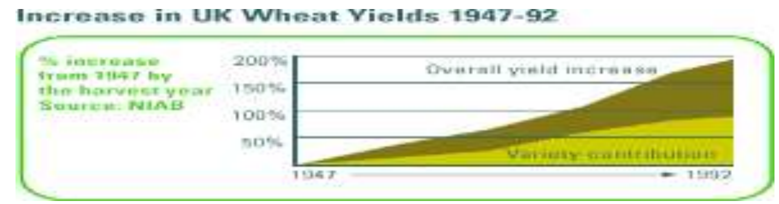
Population Matters by Nancy Birdsall et al – 1990s (surveys confirm overall negative impact of population growth on per capita output growth across a large # of countries)

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)

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.

Green revolution

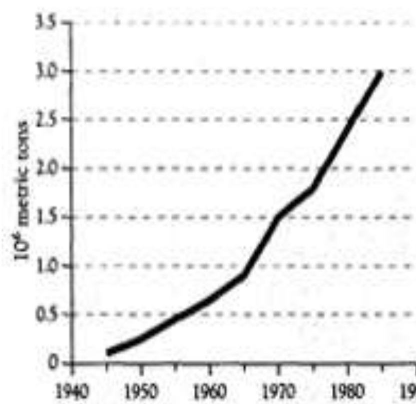
Table 10.1 Trends in Yields in 93 Developing Countries

	Yield (kilograms per hectare)			
Crop Type	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	1,855	2,145	2,790
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	1,265	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*).

Figure 1

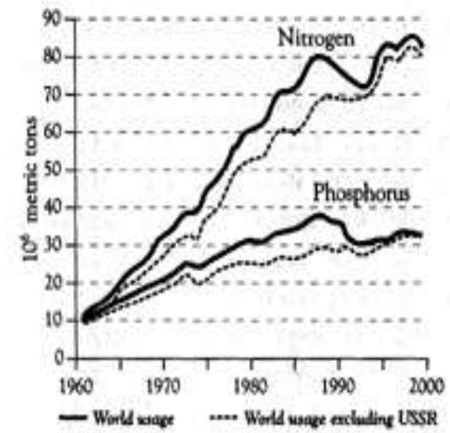
Global Pesticide Production 1945–1985



Source: Modified from Tilman, David, et al. 2001. "Forecasting Agriculturally Driven Global Environmental Change." Science 292–284.

Figure 2

Global Fertilizer Use 1960–2000



Source: Food and Agriculture Organization of the United Nations. http://apps.fao.org (Accessed July 17, 2002).

Note that the apparent leveling of world fertilizer use since 1990 is a result of the collapse of the Soviet Union and subsequent decreases in Soviet fertilizer use. Fertilizer use for the rest of the world has continued to increase at unsustainable rates.

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 ?

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

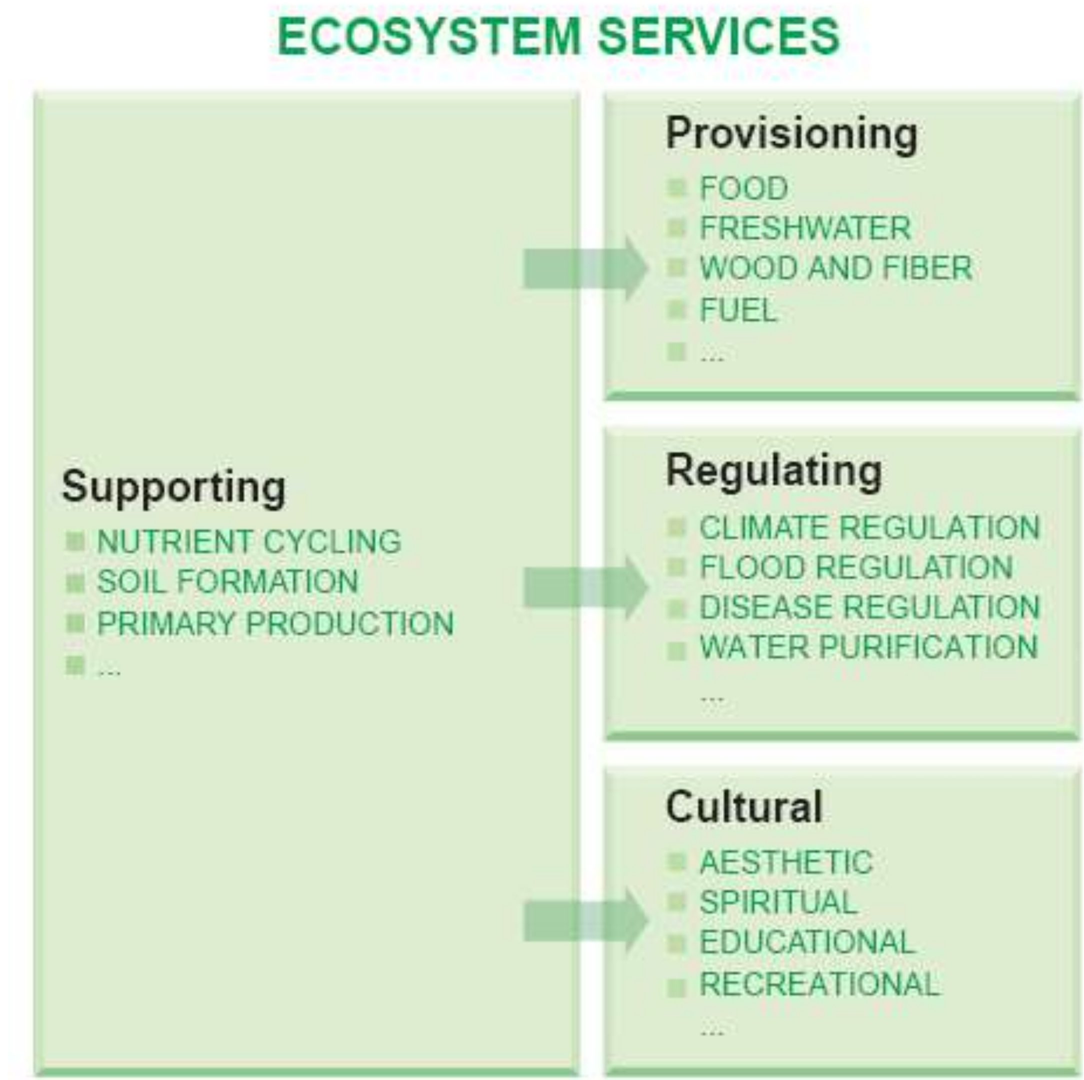
Millennium Ecosystem assessment, 2001-2005

Overview of Findings

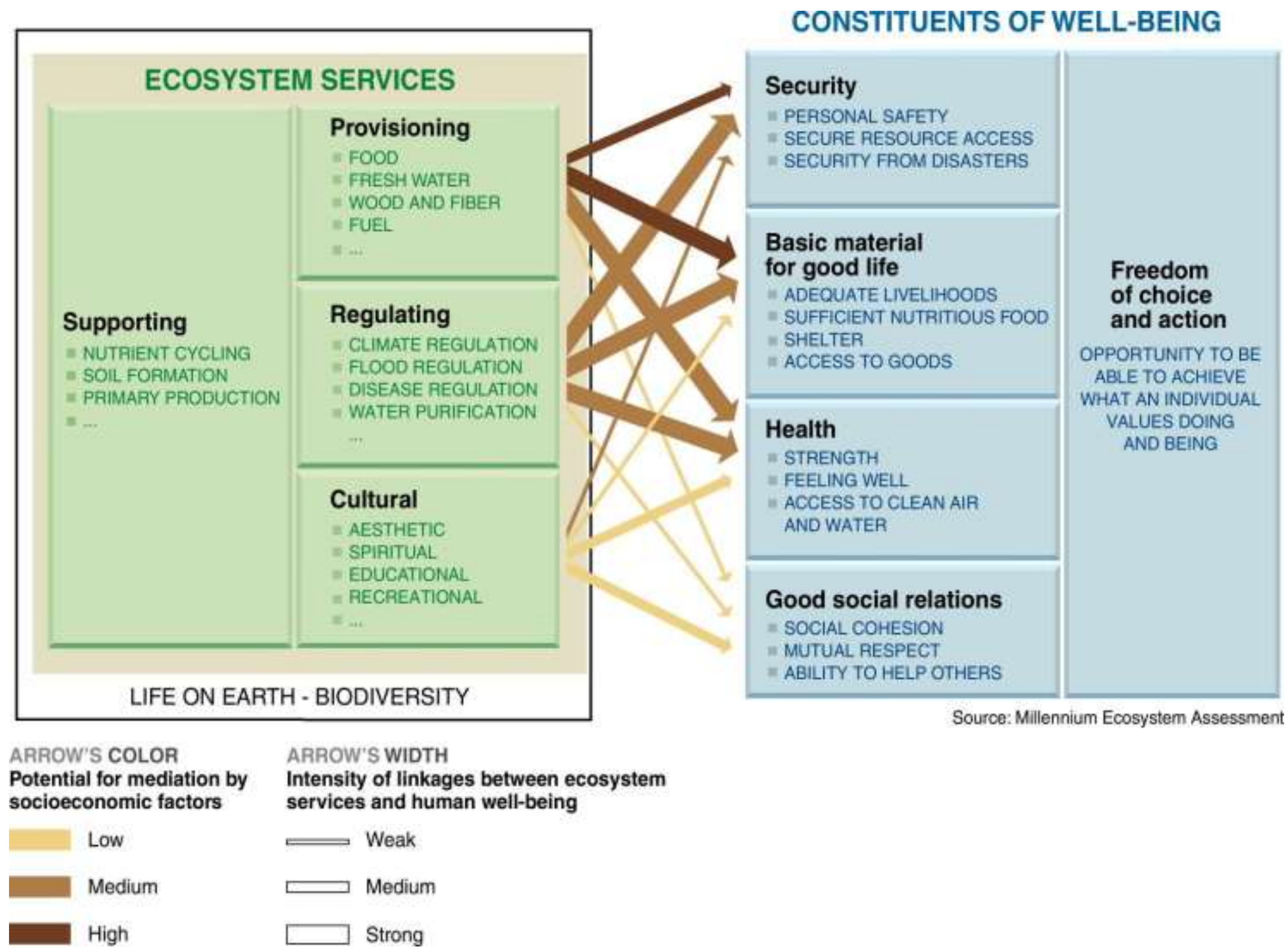
- Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber and fuel
- The changes that have been made to ecosystems have contributed to substantial 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

Focus: Ecosystem Services

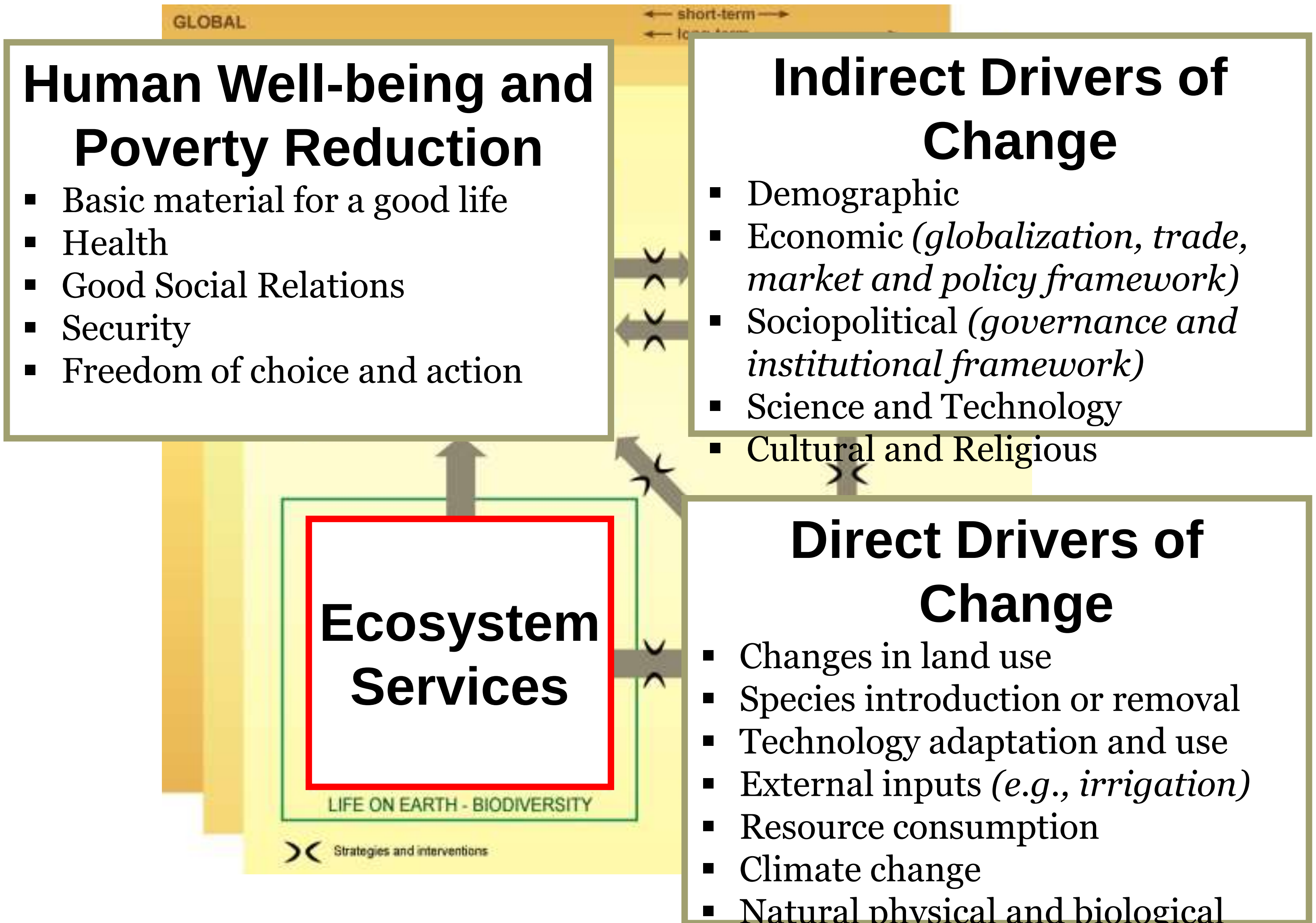
The benefits people obtain from ecosystems



Focus: Consequences of Ecosystem Change for Human Well-being



MA Framework



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

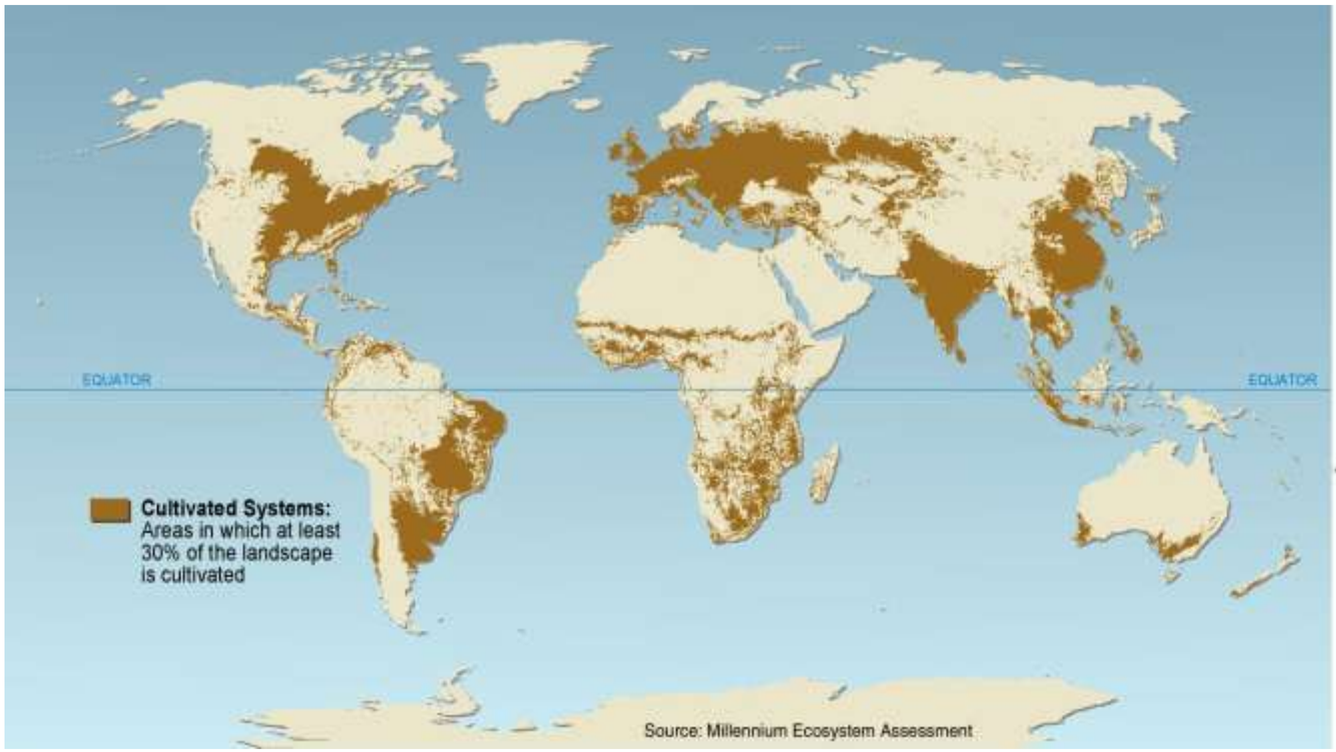
- 3. Ecosystem Prospects for Next 50 Years
- 4. Reversing Ecosystem Degradation

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

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.

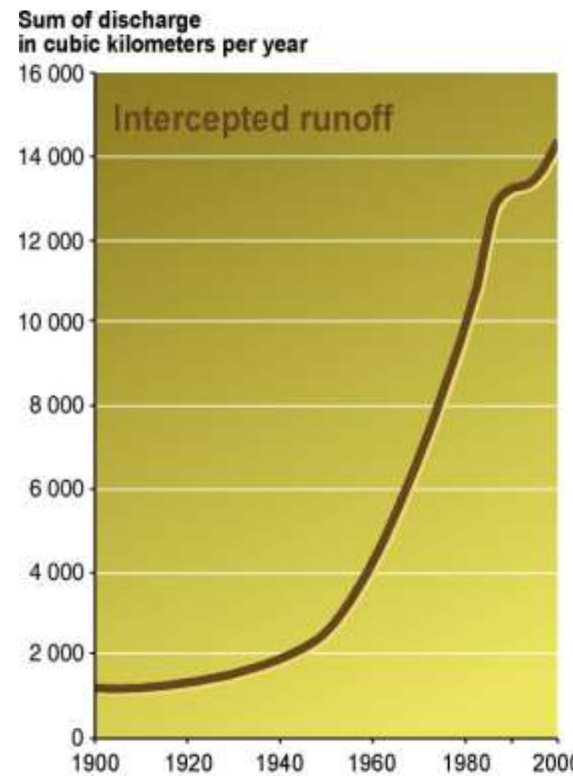


Cultivated Systems in 2000 cover 25% of Earth's terrestrial surface

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

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)

Limits of Carrying capacity : MA, Changes in direct drivers

Habitat transformation:

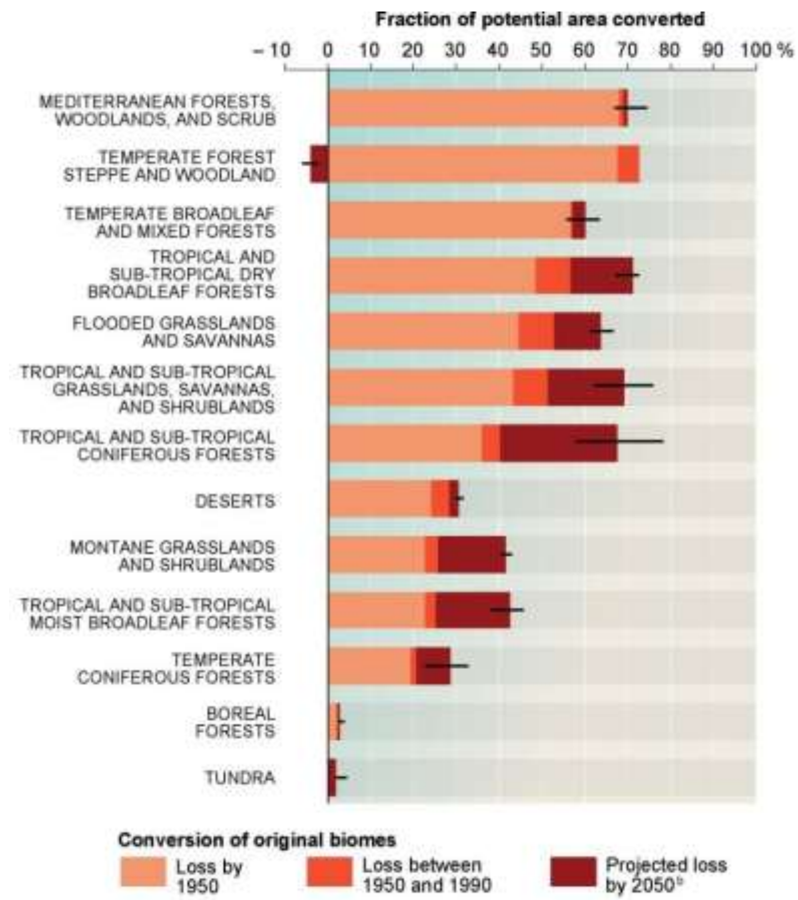
– Further 10–20% of grassland and forestland is projected to be converted by 2050

Overexploitation, overfishing:

– Pressures continue to grow in all scenarios

Invasive alien species:

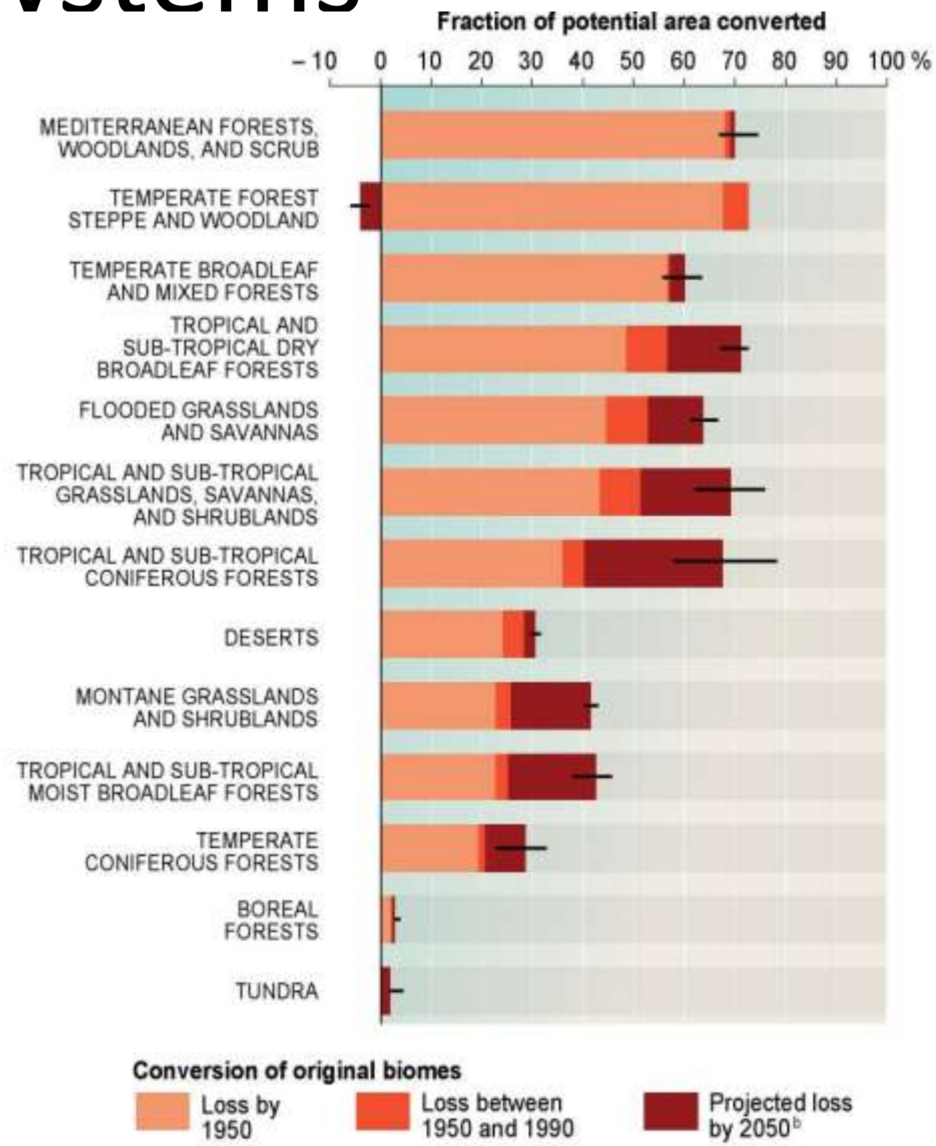
– Spread continues to increase



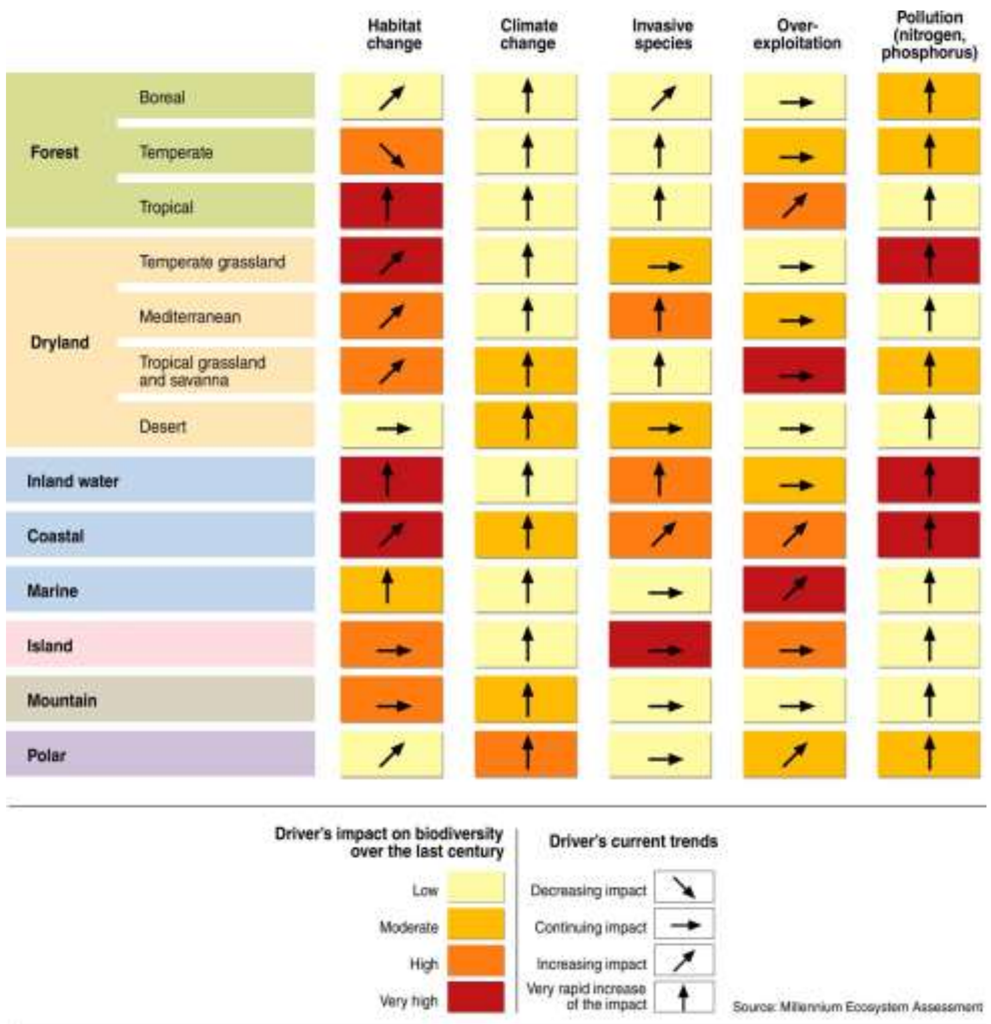
Unprecedented change: Ecosvstems

– 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



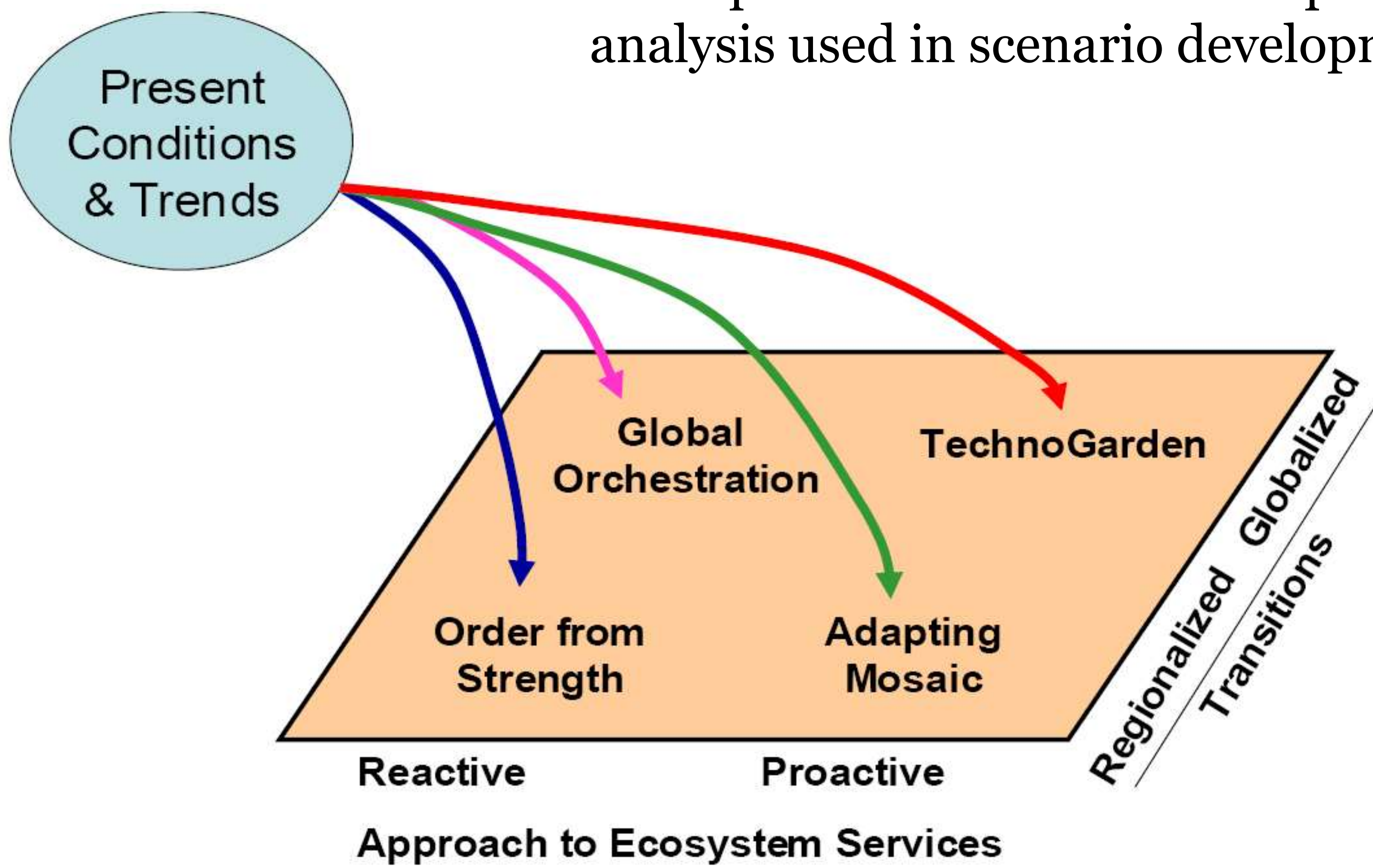
Direct drivers growing in intensity



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

MA Scenarios

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



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.

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.

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.


The Earth Summit was a UN event

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

http://www.resalliance.org/

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

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ICSU

Earth System Science Partnership (ESSP)

*The **ESSP** is a partnership for the integrated study of the Earth System, the ways that it is changing, and the implications for global and regional sustainability.*

The urgency of the challenge is great: In the present era, global environmental changes are both accelerating and moving the earth system into a state with no analogue in previous history.

*To learn more about the ESSP, clink on links to access **Strategy Paper** and a **video presentation** by the Chair of the ESSP Scientific Committee, Prof. Dr. Rik Leemans of Wageningen University, The Netherlands.*

*The **Earth System** is the unified set of physical, chemical, biological and social components, processes and interactions that together determine the state and dynamics of Planet Earth, including its biota and its human occupants.*

***Earth System Science** is the study of the Earth System, with an emphasis on observing, understanding and predicting global environmental changes involving interactions between land, atmosphere, water, ice, biosphere, societies, technologies and economies.*

2009 Global Carbon Budget

Carbon Budget 2009 — An annual update of the global carbon budget and trends

Scientists report the annual growth rate of atmospheric CO2 was 1.6 parts per million in 2009. This is below the average for the period 2000 - 2008 of 1.9 ppm per year. The mean growth rate for the previous 20 years was about 1.5 ppm per year. This increase brought the atmospheric CO2 concentration to 387 ppm by the end of 2009, 39 per cent above the concentration at the start of the industrial revolution (about 280 ppm in 1750). The present concentration is the highest during at least the past 2 million years.

Researchers from the Global Carbon Project attribute the global financial crisis for the abrupt decline in fossil fuel emissions by 1.3 per cent in 2009. Professor Pierre Friedlingstein, lead author of the research, said: "The drop in CO2 emissions is less than half that anticipated a year ago. This is because the drop in World Gross Domestic Product (GDP) was less than anticipated and the carbon intensity of world GDP, which is the amount of CO2 released per unit of GDP, improved by only 0.7 per cent in 2009 - well below its long-term average of 1.7 per cent per year".

For more information, access the Global Carbon Project website.

Food Security and Global Environmental Change

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

The EcoTipping Points Project

Models for Success in a Time of Crisis

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Understanding EcoTipping Points and Sustainability: Vicious Cycles and Virtuous Cycles

ETP | Weiter

- **Author**: Gerry Marten
- **Ingredients for Success** – What it takes to reverse vicious cycles: An explanation of the key ingredients that we have seen for turning decline to restoration in our stories
- **Note to teachers:** Visit our page providing a classroom lessons for learning about feedback loops, vicious cycles, and virtuous cycles from EcoTipping Point stories

Page Quick Links:

- Rainwater Harvest (Rajasthan, India)
- Community Gardens (New York City)
- Apo Island Marine Sanctuary (Philippines)
- Escaping The Pesticide Trap (Andhra Pradesh, India)

Watch 3 min. Intro Video

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中文网站

EcoTipping Points

- How do they work?
- Leveraging vicious cycles to virtuous
- Ingredients for success
- Create your own

Case study environmental tipping point: Apo Island

apo island

Sustainable Fishing in Apo Island

Implementing Agency:
Siliman University
Community of Barangay Apo Island,
and
Protected Area Management Board
(PAMB) of Apo Island

Contact Person:
Mr. Mario Pascobello
Barangay Captain, Apo Island
6217 Dauin, Negros Oriental
Philippines

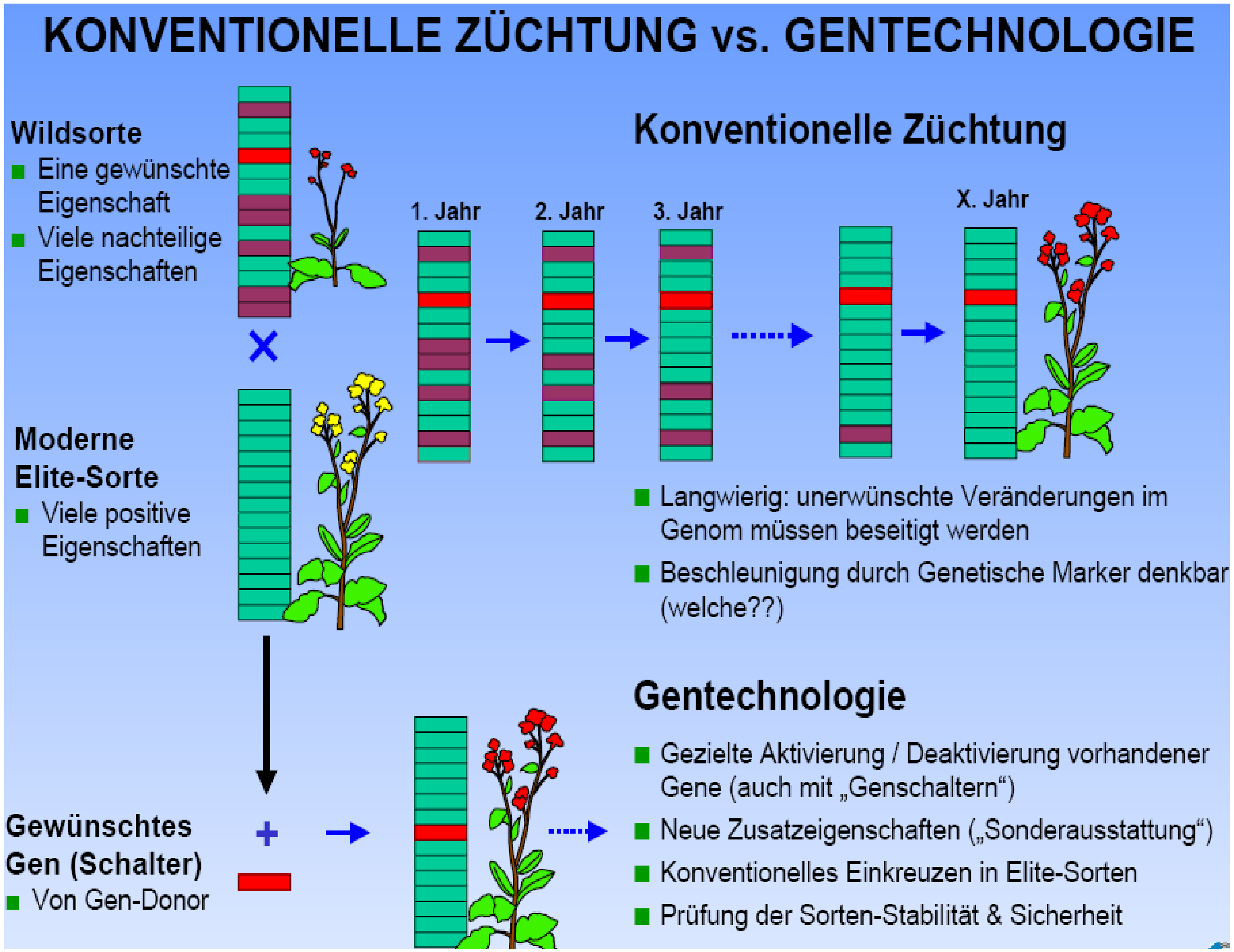
Location:
Mindanao Sea
25 km south of Dumaguete City
Negros Oriental, Philippines

Funding:
Silliman University thru Asia Foundation, and PVO-USAID

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

Plant breeding, selection

Breeding, yield, time for development



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.

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.

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.

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.

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?

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,

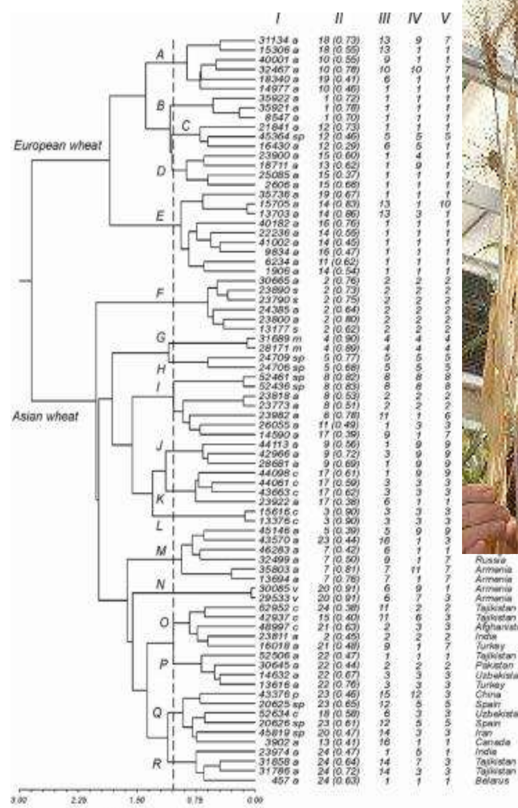
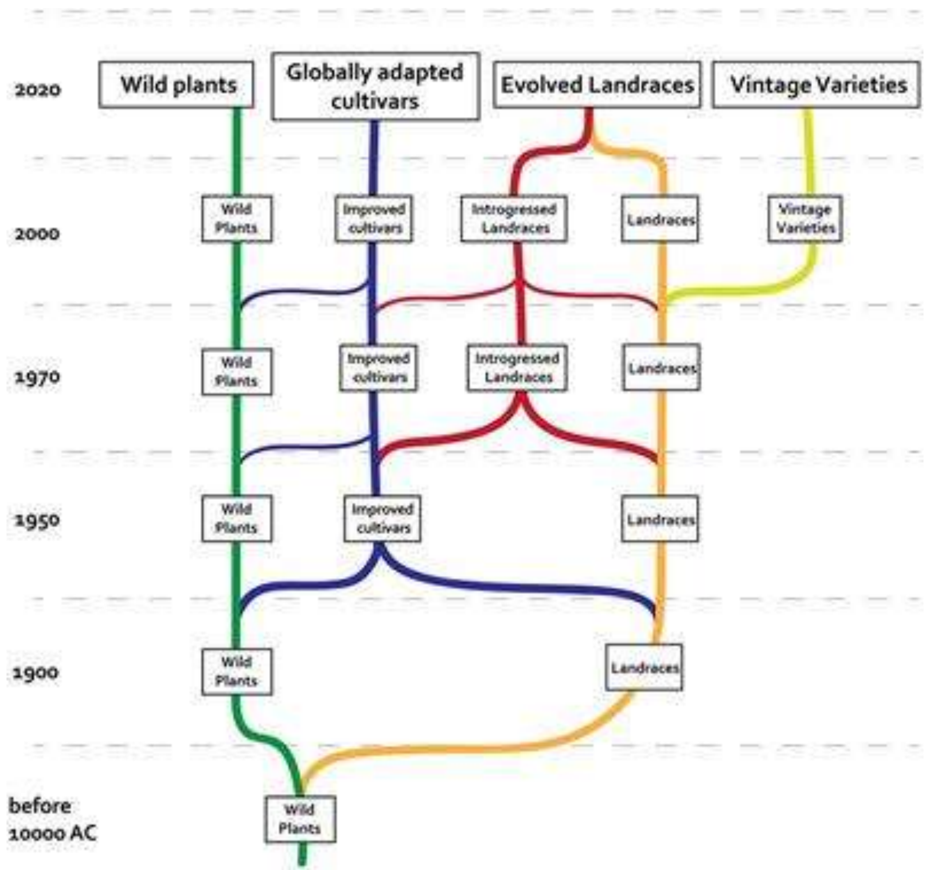
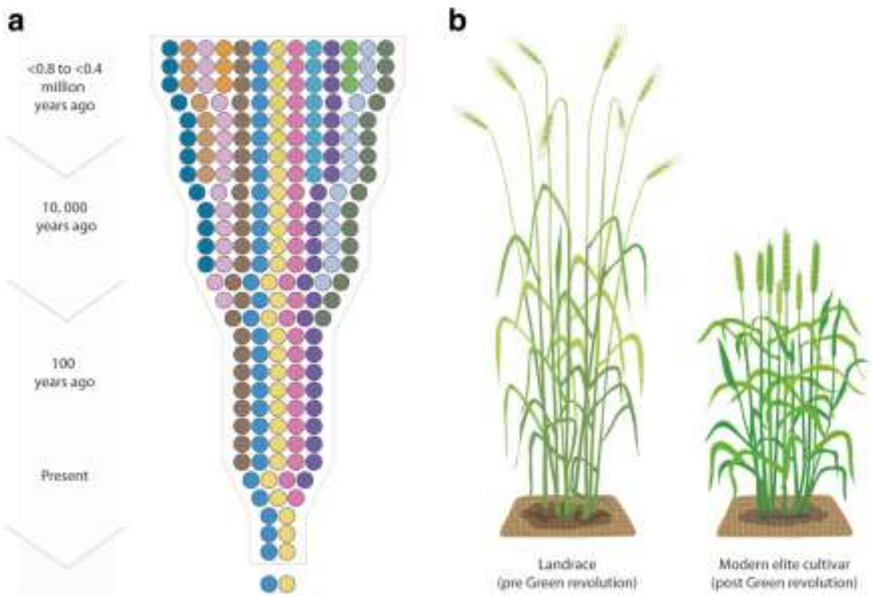


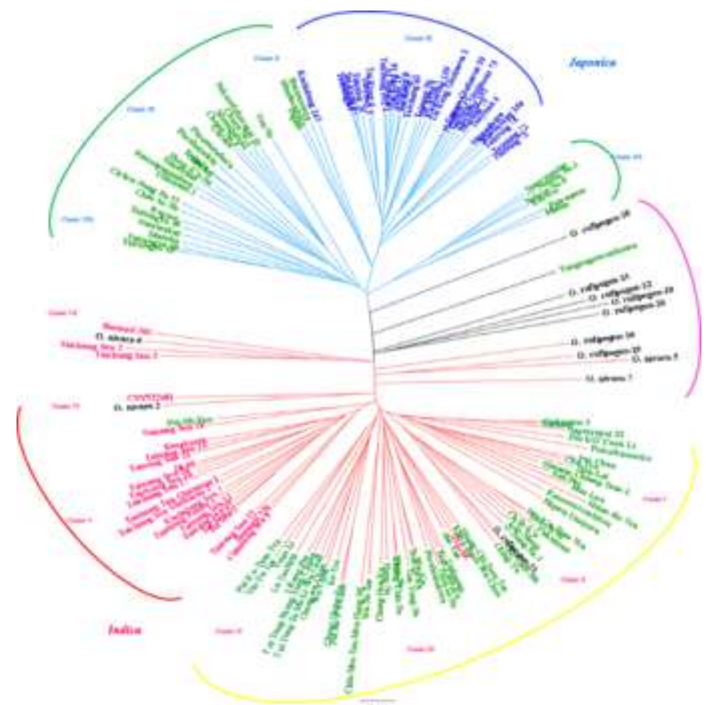
Figure 1. Dendrogram based on SSR data shows the distribution of 78 hexaploid wheat landraces. (*I*) VIR catalogue numbers and species codes: a – *T. aestivum*, c – *T. compactum*, m – *T. macha*, p – *T. petropavlovskyi*, s – *T. sphaerococcum*, sp – *T. spelta* and v – *T. vavilovii*; (*II*) groups defined using PCA based on SSR data and factor loadings; (*III – V*) groups derived using PCA based on AFLP, RAPD and ALL data, respectively; (*IV*) countries of origin.

Wild, cultivars, races, varieties



Crop diversity, characterstics





Value of Diversity , traits

BUSINESS

Crop diversity decrease will affect resistance to disease, drought

A new study confirms what most people involved in U.S. agriculture thought already: Crop diversity is declining, as many farmers increasingly focus on corn and soybeans.

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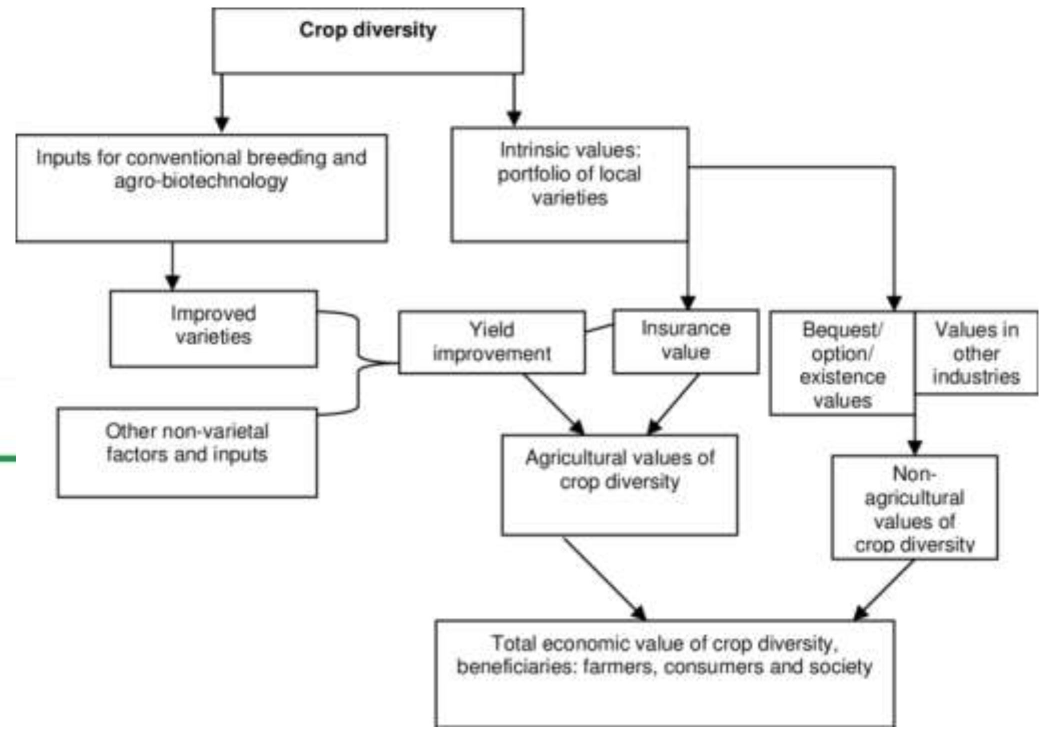
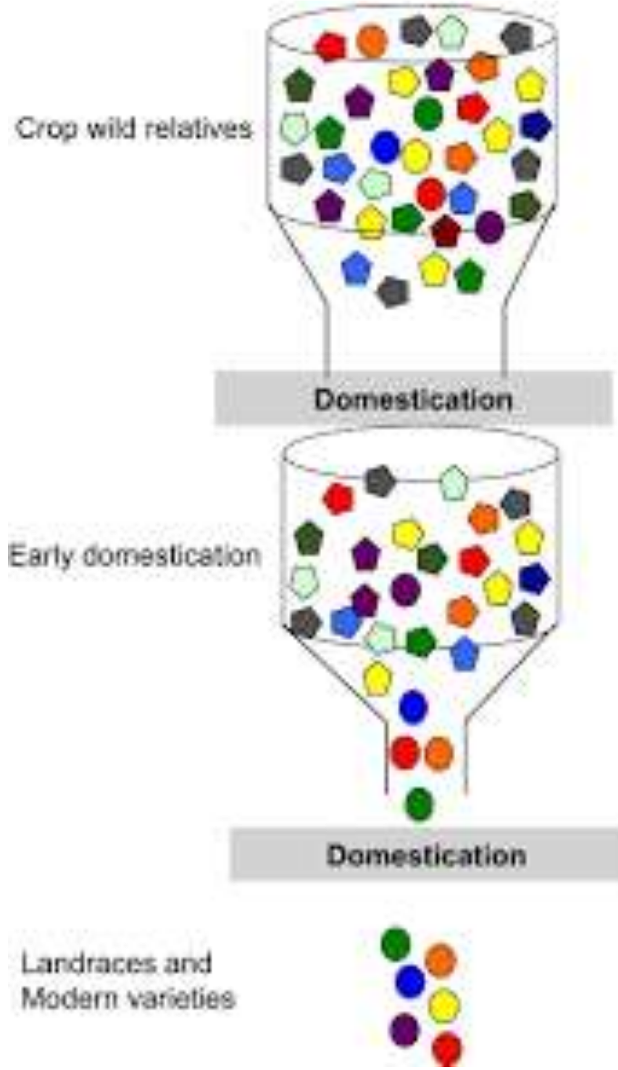
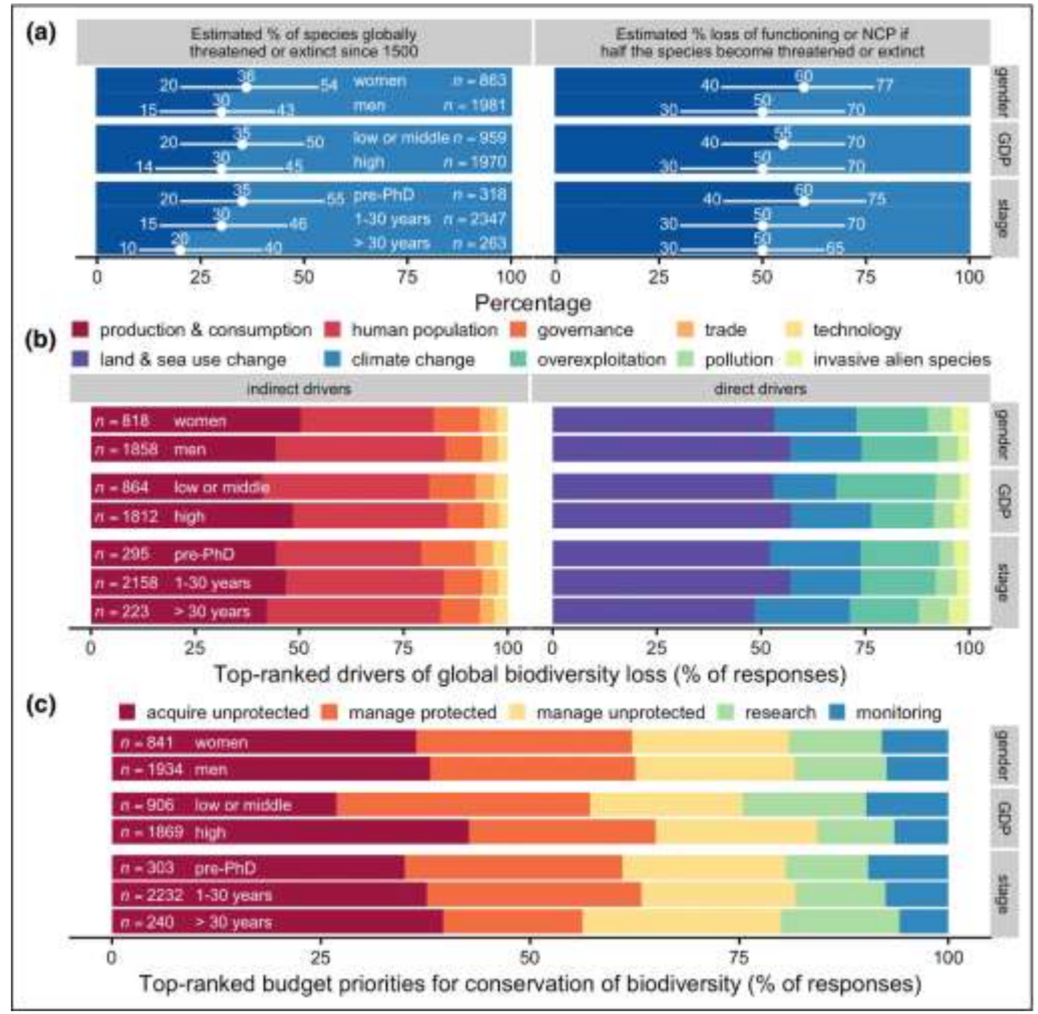
Article | Published: 24 February 2022

Global plant diversity as a reservoir of micronutrients for humanity



Loss of diversity



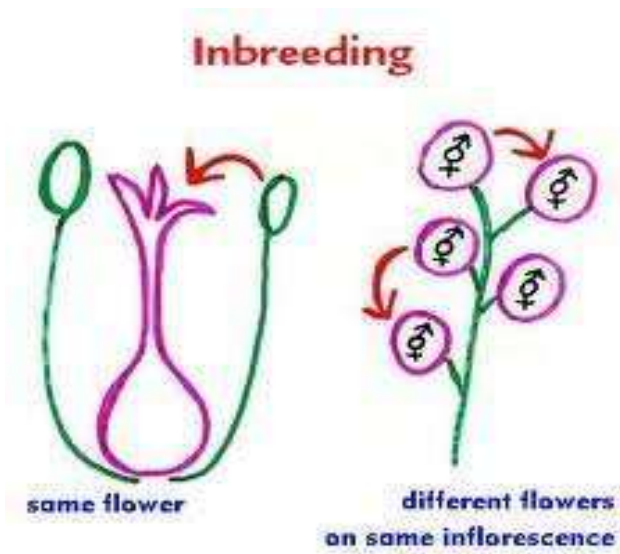


BREEDING METHODS

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

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.



MERITS & DEMERITS

MERITS OF INBREEDING

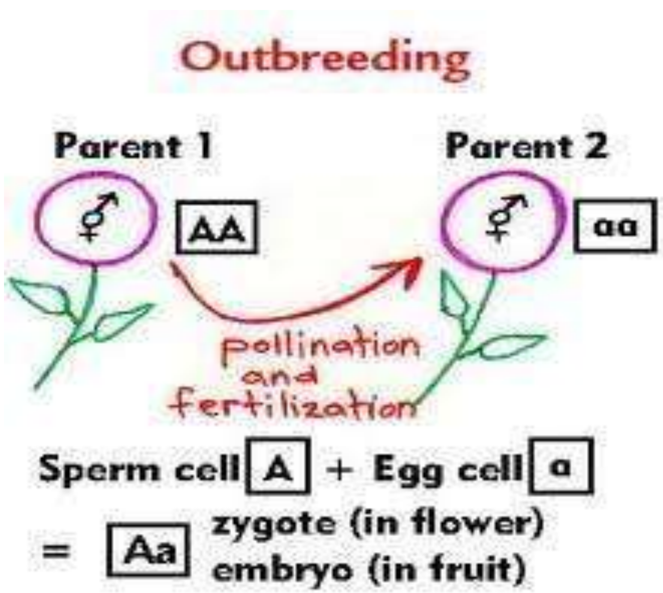
- A) Increase of Homozygotes, B)Production of Pure lines. C)Elimination of Deleterious Recessive Characters. D)Production of Valuable Breeds.

DEMERITS OF INBREEDING

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

OUTBREEDING

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



TYPES OF OUTBREEDING

A)INTRASPECIFIC : Matting between Members of Same Species.

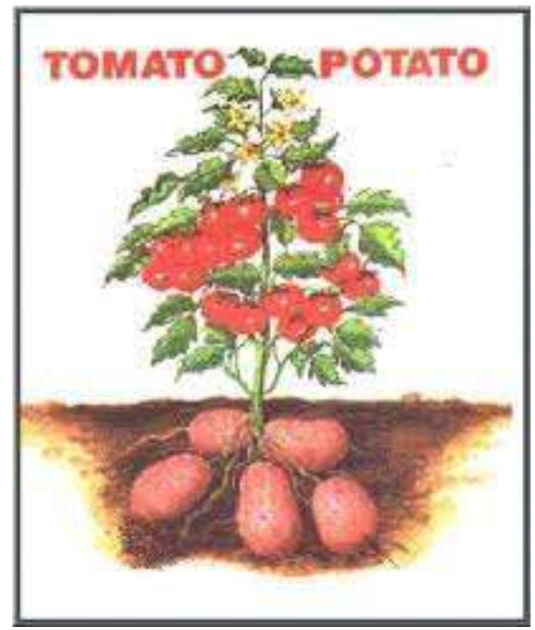
B)INTERSPECIFIC : Matting between Members of Different Species.

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

TYPES OF OUTBREEDING

INTERSPECIFIC

INTERGENERIC

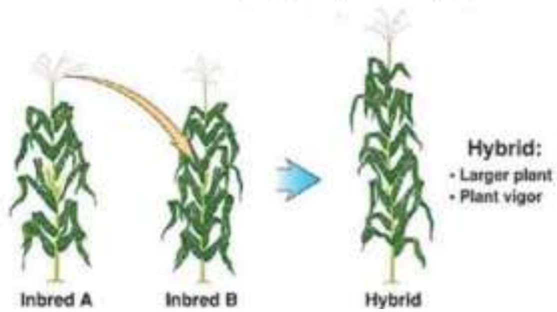


RESULTS OF OUTBREEDING

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.

Hybrid breeding; Heterosis: crossing of homozygotic Llnes

- Hybridization occurs when inbred parents are mated (cross pollinated)
- Creates a heterozygous individual
- Benefits
  - Increased heterosis (vigor) in F_1 generation



- Heterosis occurs when two homozygous individuals are cross pollinated.
  - This causes all loci to become heterozygous
  - The increased heterozygosity causes increased plant vigor
- Benefits of Increased Vigor
  - Increased yield
  - Better standability
  - Better germination
  - Overall better plant performance

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.

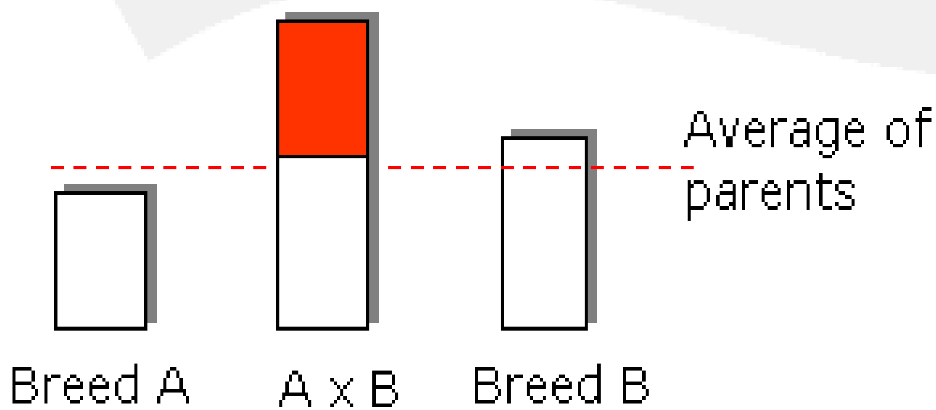
HETEROSIS BREEDING

- 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.

Hybrid: Heterosis effect

The purpose of crossing is to make use of the heterosis effect partly to improve fertility and partly to combine the different characteristics for which the lines were previously selected. For meat production a desirable quality in the final product is to produce large numbers of rapidly growing individuals. This requires good fertility in the mother combined with good growth rate in the progeny.

The heterosis effect makes the hybrid pigs better than the average of the parents. The traits with the lower heritability show the largest heterosis effect. This is particularly true for fertility, mothering abilities and body structure, which have a low heritability.



Heterosis Effect

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.

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

genetic male sterility

What is Male Sterility ?

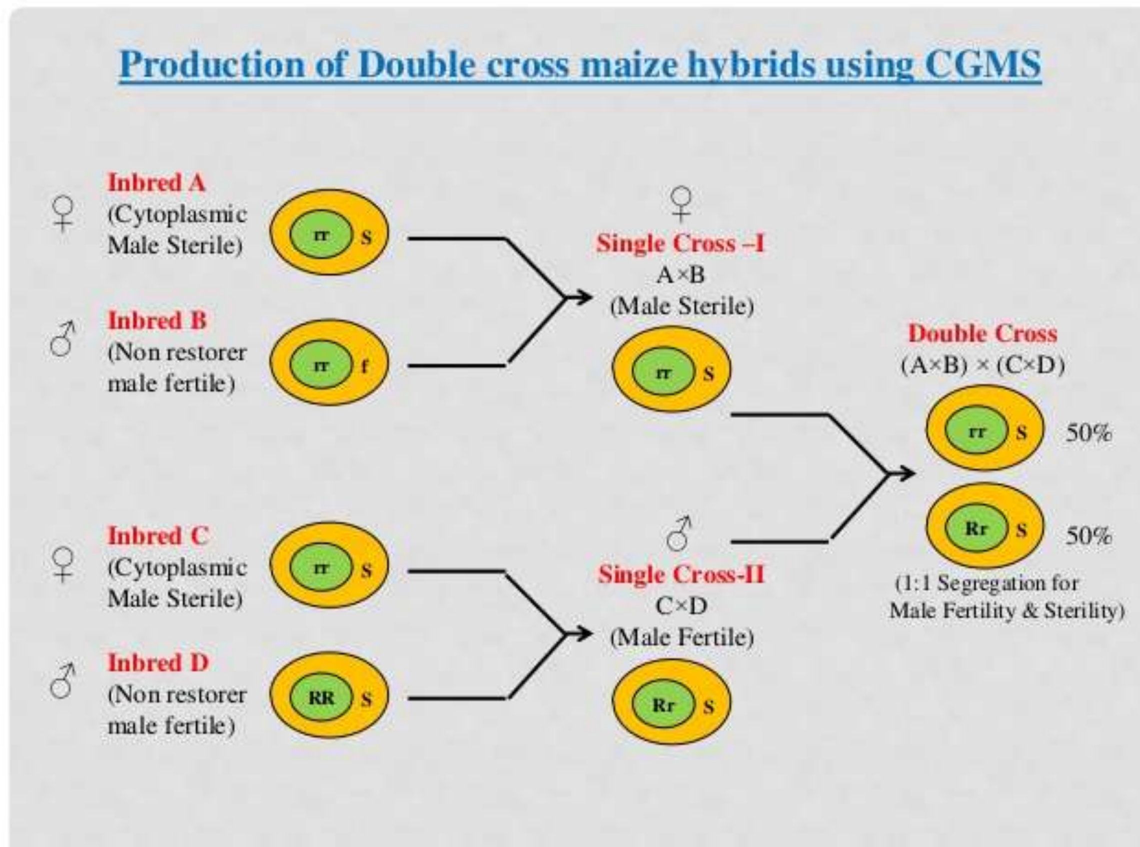
- Definition : Inability of flowering plants to produce functional pollen.
- Male sterility is agronomically important for the hybrid seed production.

1st documentation: 1763—Kölreuter


Flower of male-fertile pepper


Flower of male-sterile pepper

4



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.

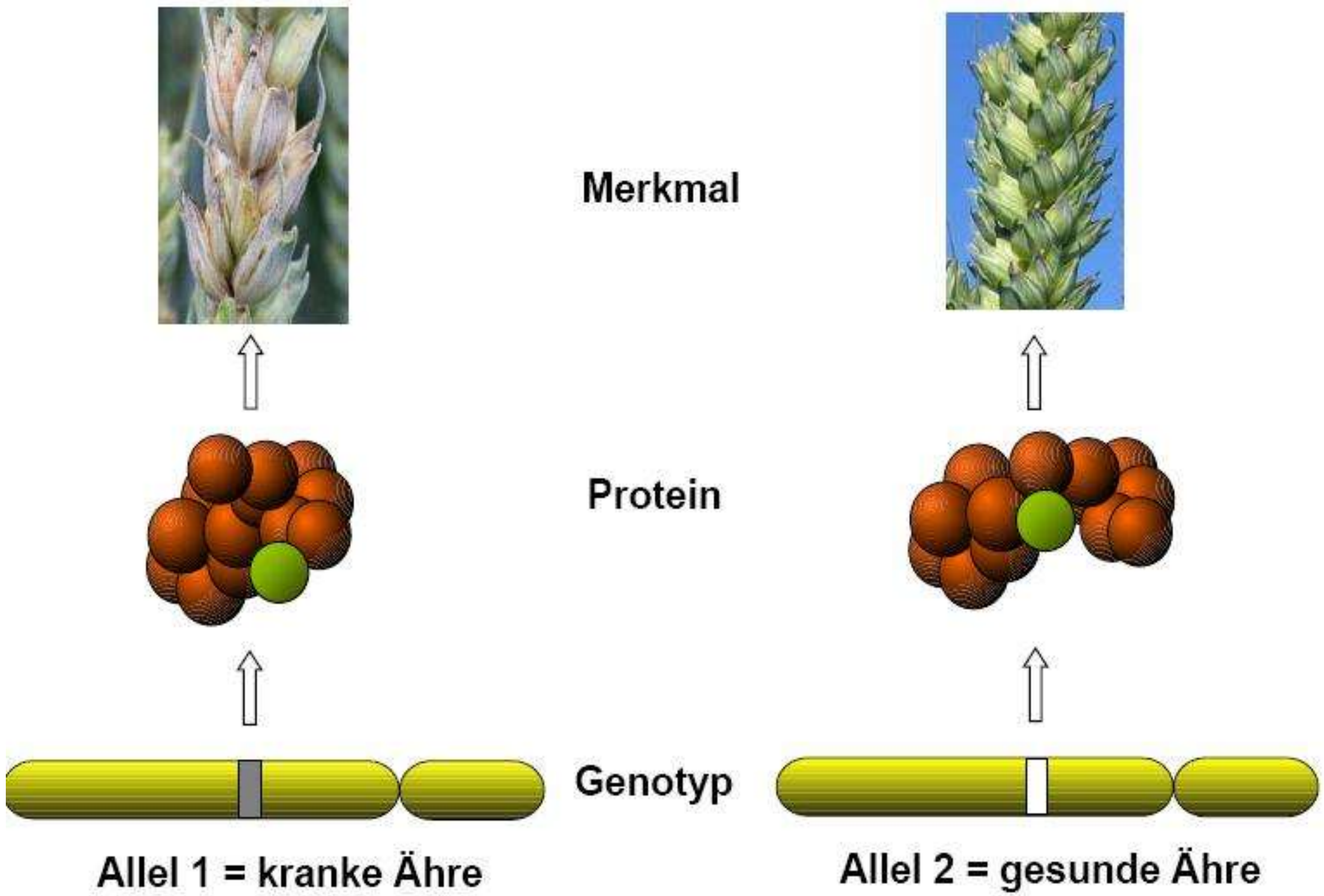
Precision breeding
Marker assisted breeding

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, disese resistance loci, etc.) from one genetic backgrond to another.

Breeding for an improved trait using markers



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

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

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)

Sweetcorn

Marker Assisted Selection

Important gene controlling endosperm in sweet corn

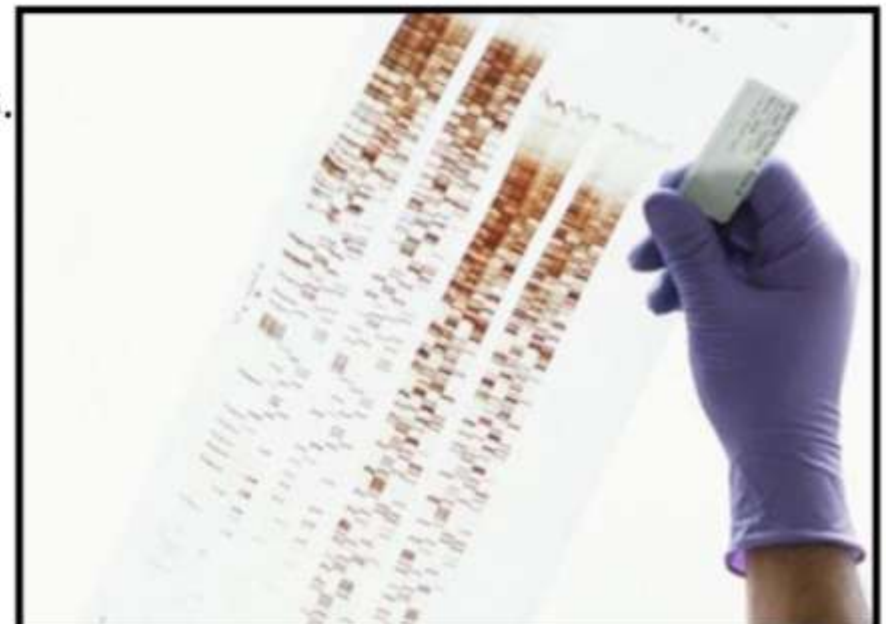
Category	Gene	Sweetness	Texture	Flavor	Germination /Vigor	Shelf life
Standard sweet	su1	10% sucrose ↓	creamy ↑	good ↑	good ↑	short ↓
Sugar-enhanced	se	2X sucrose	creamy	good	good	longer
Super sweet	sh2,bt1, bt2	3X-8X sucrose ↑	Less creamy ↓	poor ↓	poor ↓	Long ↑

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™

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

Testing can be done on seed or leaf

F = female parent, M = male parent

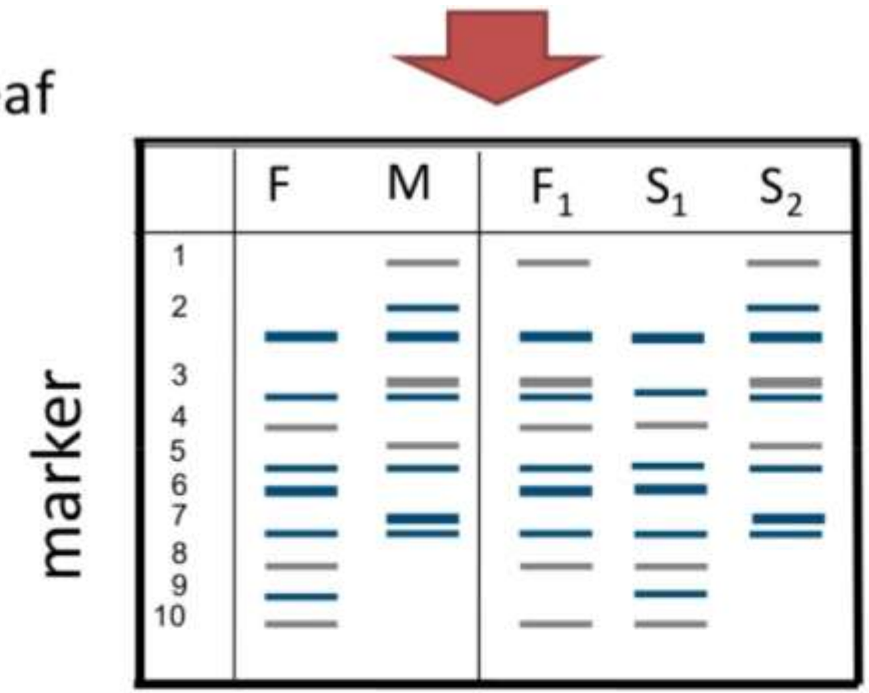
F1 = Hybrid

S1 = Sample#1

: Same female / different male

S2 = Sample#2

:Different female / Same male

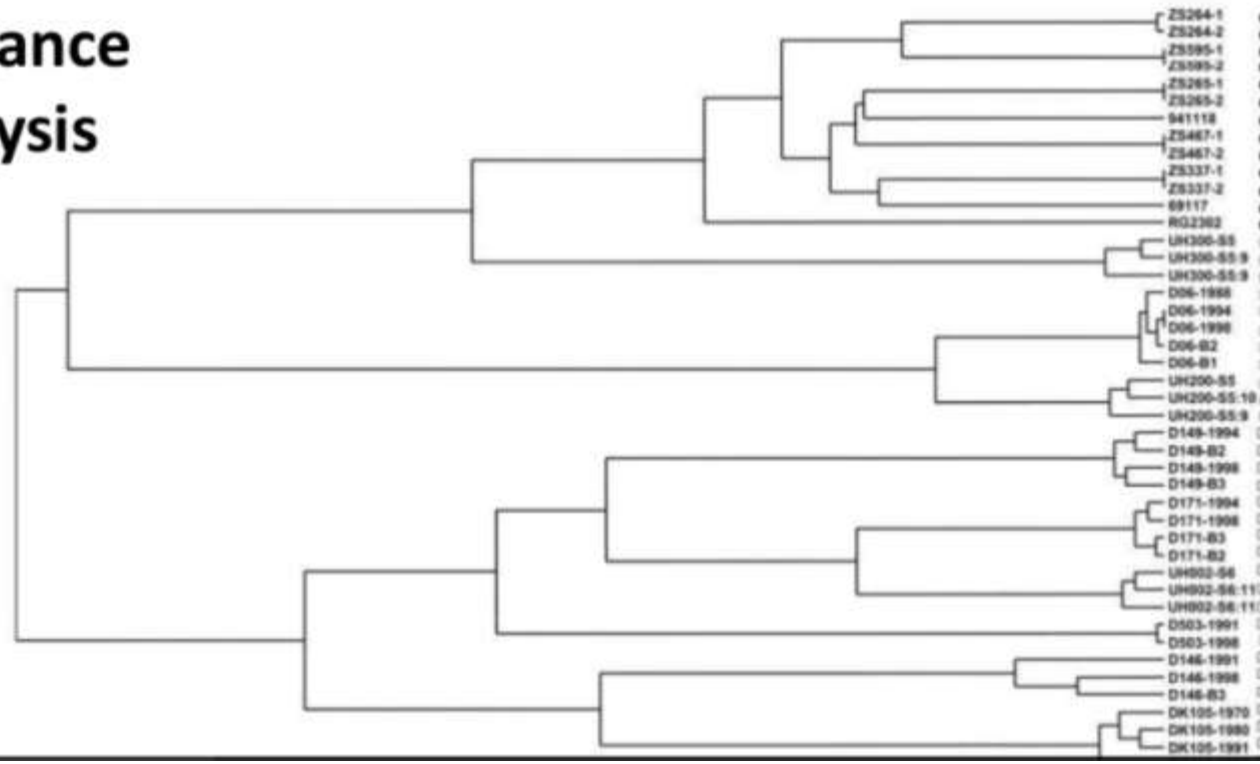


DNA profile using 10 different marker (dominant marker)

Genetic mapping

- **Genetic distance**
- **Cluster analysis**

Useful information for Breeder to arrange heterotic group



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.

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.

A. Spontaneous mutations : Mutation occur in 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.

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. BaseAnalogues:5 Bromo Uracil,5-chlorouracil. 4.Other mutagens: Nitrous Acid, SodiumAzide.

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.

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.

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.

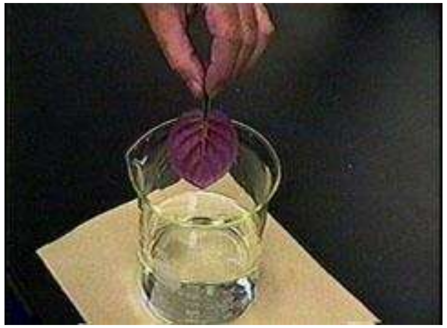
Pierre Lagoda, Head of the FAO/IAEA Plant Breeding and Genetics Section. E-mail: P.J.L.Lagoda@iaea.org

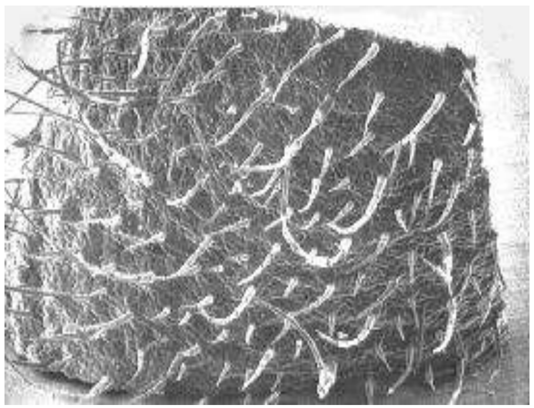
Breeding: Irradiation

Breeding: Irradiation

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

Breeding: Tissue culture , Clones ?

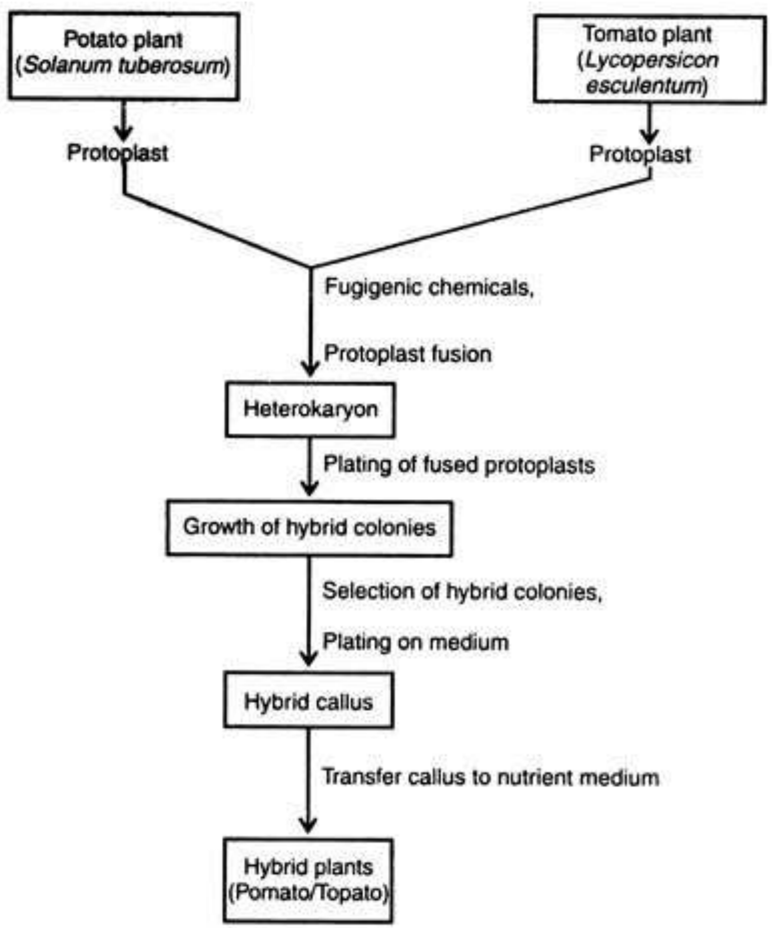


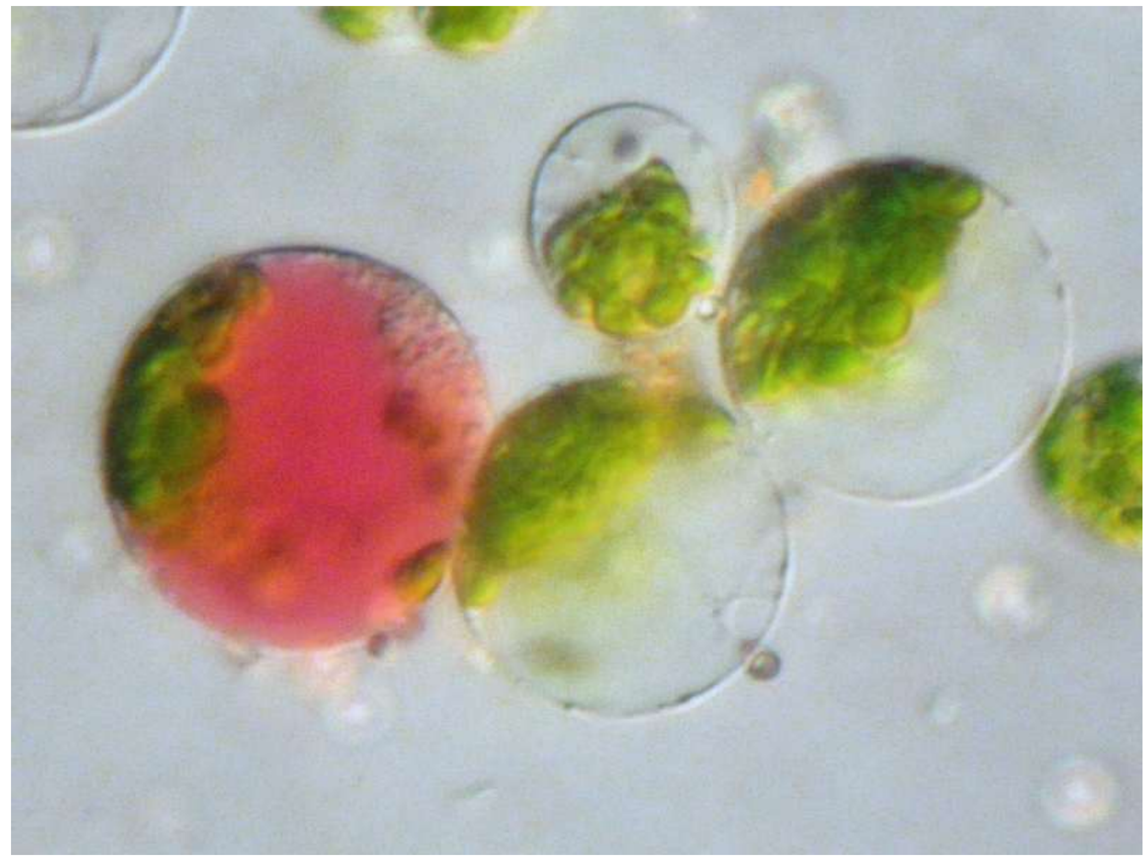


Somaclonal variation

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

Protoplast fusion

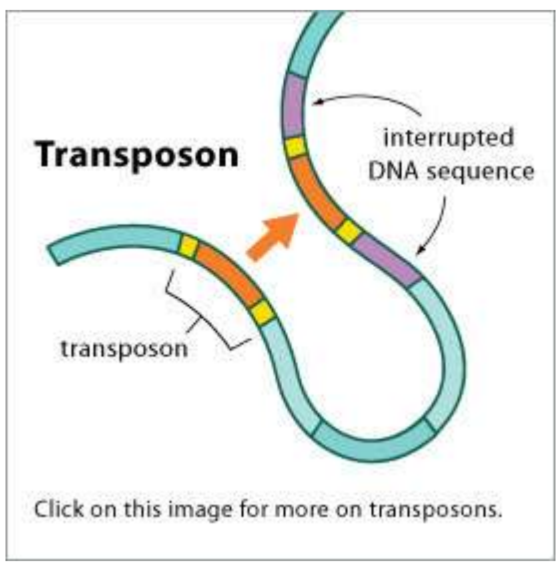


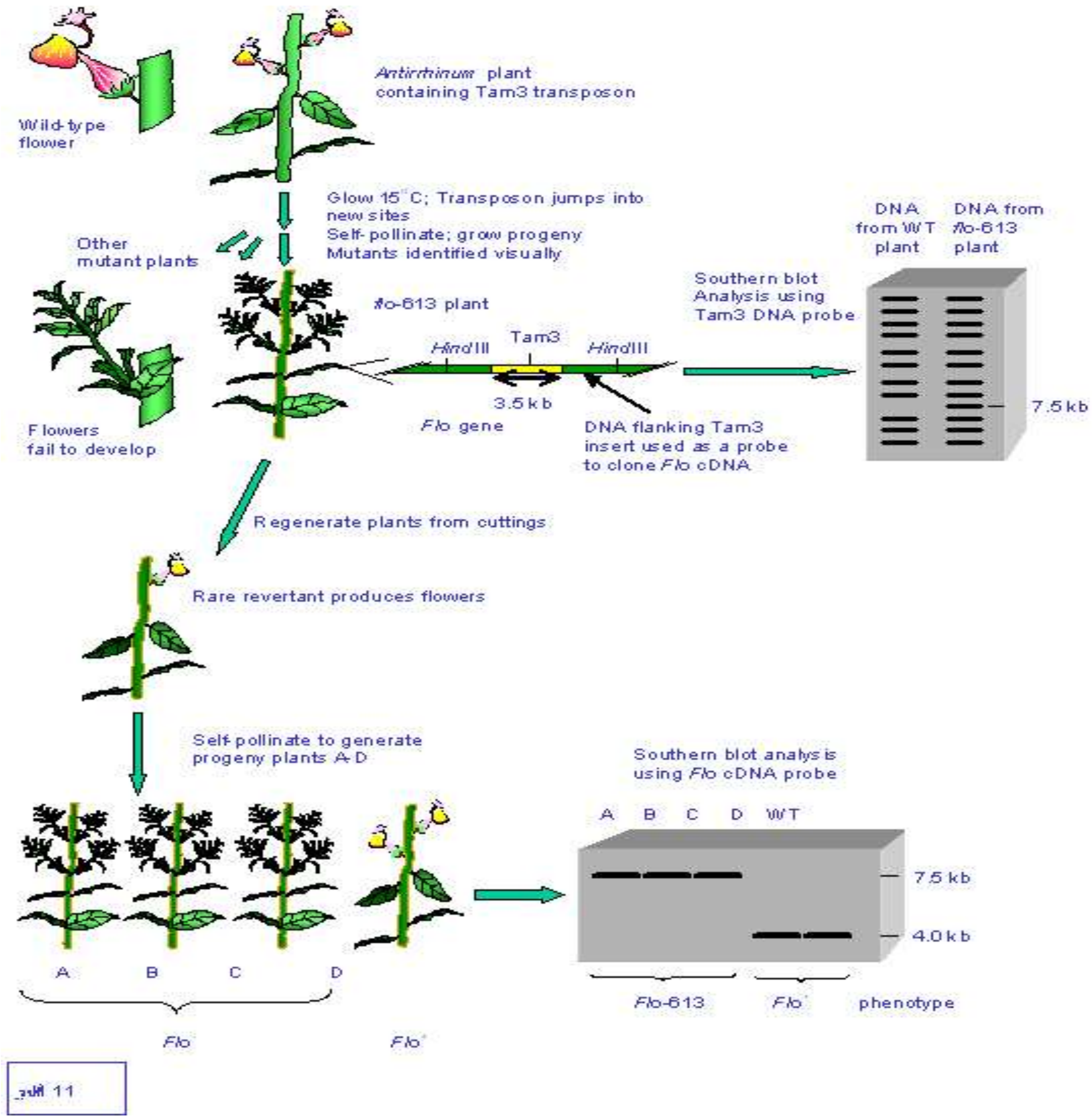


Tomoffel

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).

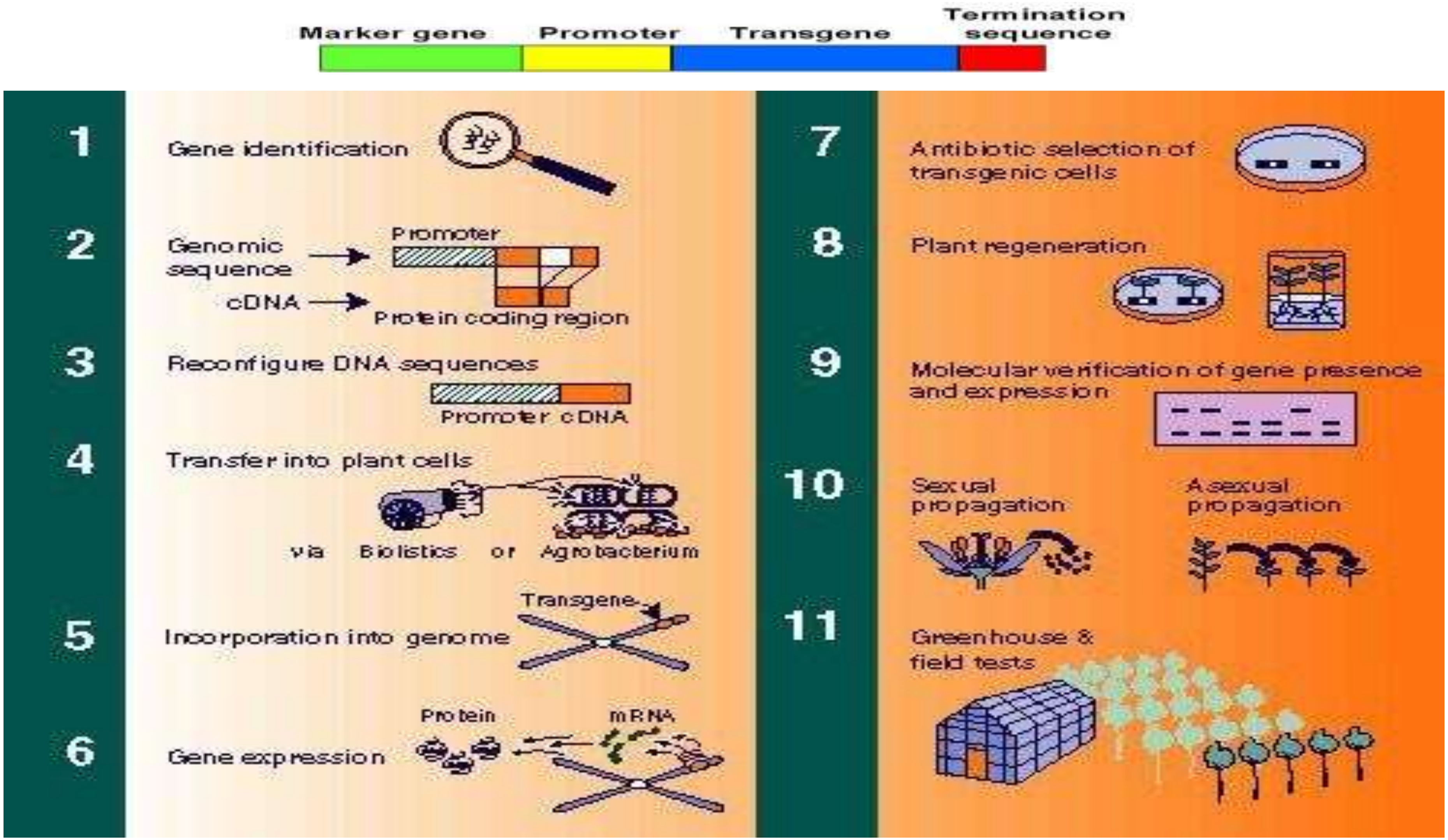




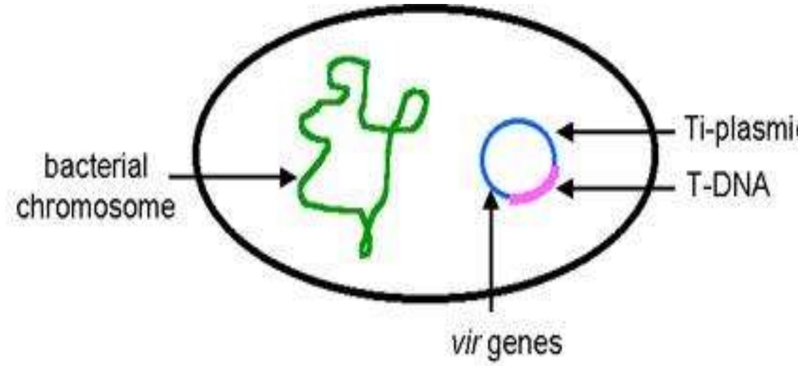
Transposon tagging

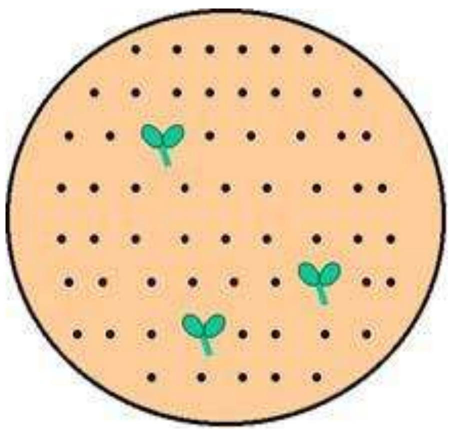
The molecular isolation of transposable elements now permits the cloning of genes in which the element resides. The major advantage of this system is that genes whose function is not known can be cloned

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

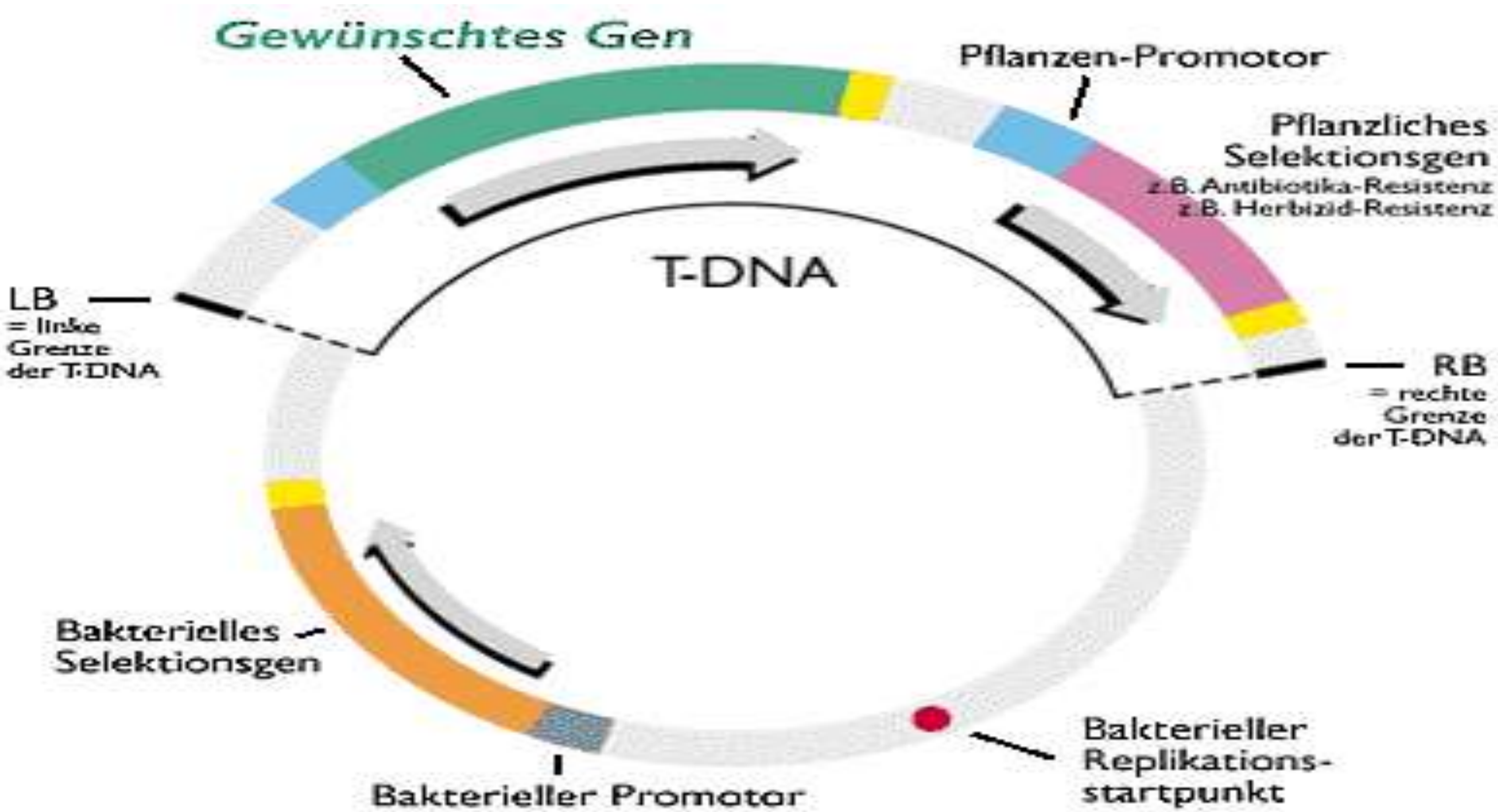


Agrobact. tumefaciens

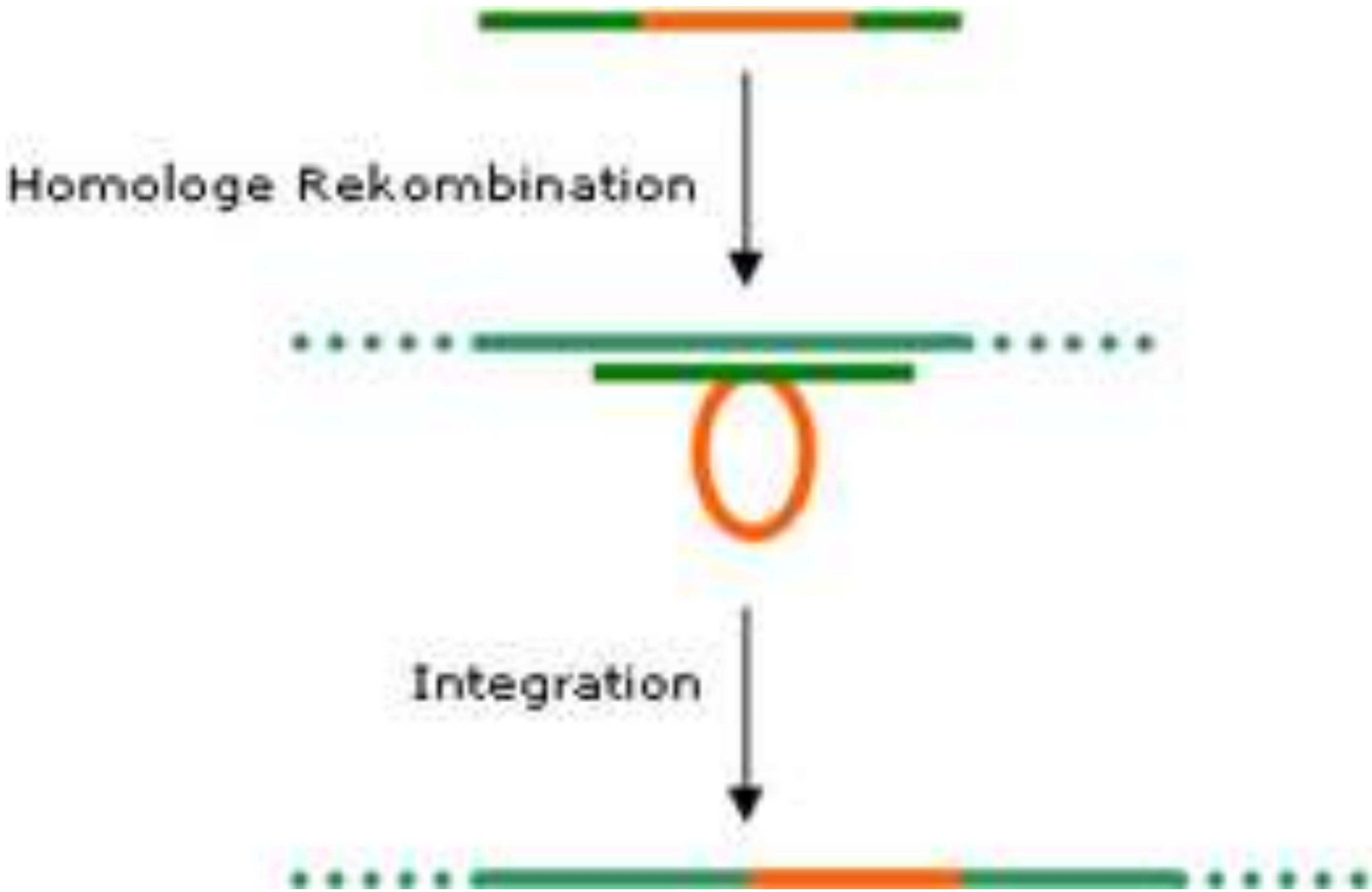




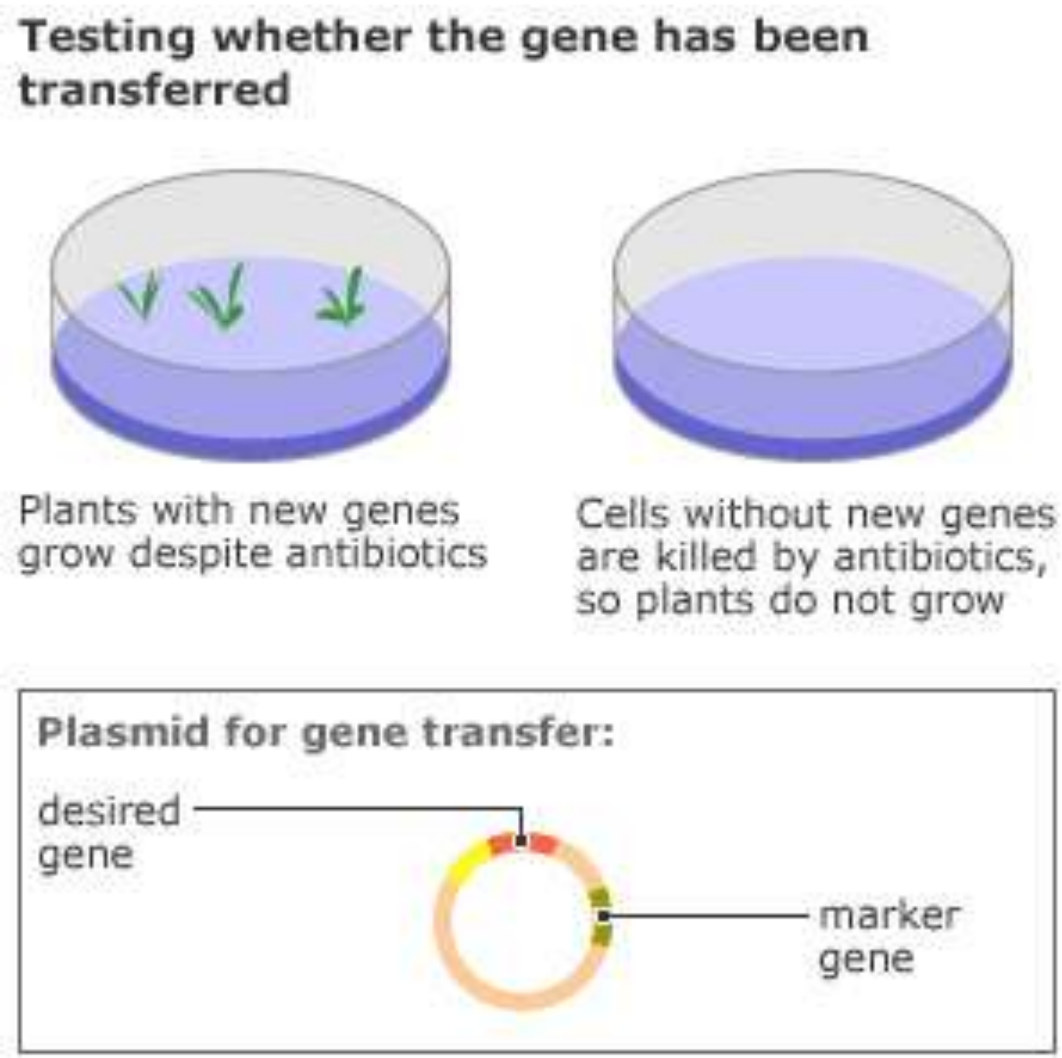
T DNA


Gewünschtes Gen
Pflanzen-Promotor
Pflanzliches Selektionsgen
z.B. Antibiotika-Resistenz
z.B. Herbizid-Resistenz
T-DNA
LB
= linke Grenze der T-DNA
RB
= rechte Grenze der T-DNA
Bakterielles Selektionsgen
Bakterieller Promotor
Bakterieller Replikations-startpunkt

Homolog recombination



Antibiotic resistance marker gene



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

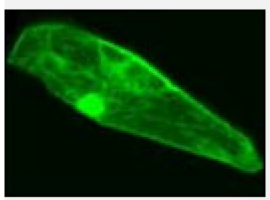
Marker Genes

Alternatives to Antibiotic Resistance Markers

New marker systems have been developed, but whether these new systems truly offer a safety advantage remains to be investigated.

Possible alternative marker gene systems:

- Herbicide resistance genes: After treatment with an herbicide, only the plants harbouring the herbicide resistance gene and gene of interest survive.
- Marker genes that enable the plant cell to use a particular food source: If the plant cells are fed only this one energy source, only the plants that have successfully incorporated the new genes will be able to grow. An example of this approach is the PMI gene. This marker gene enables the plant cell to use mannose, a type of sugar, as a source of energy. This marker gene was used to develop 3272 maize, a GM maize line recently submitted to European Commission for authorisation.

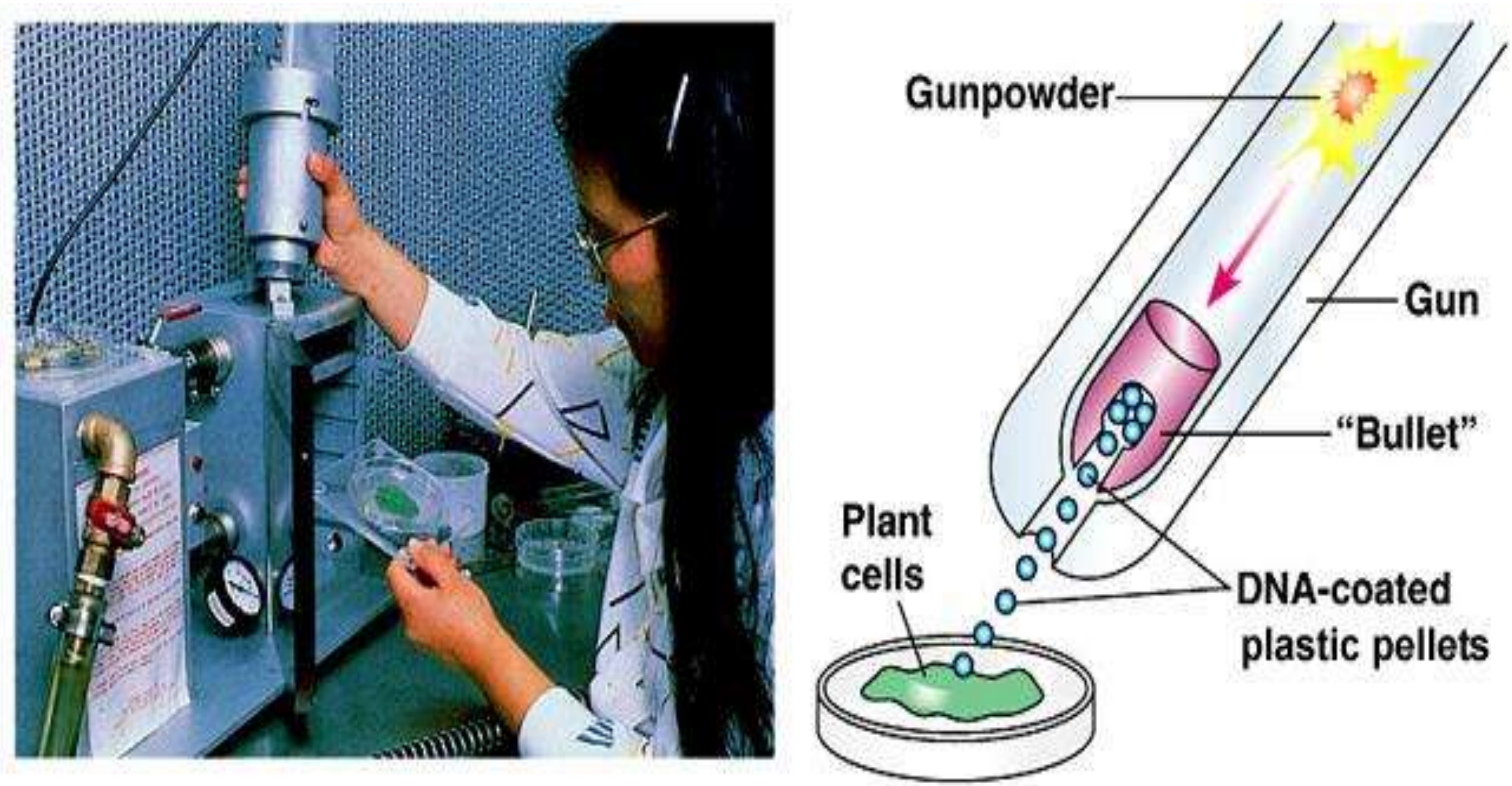


Visible markers: A fluorescent protein marks transformed plant cells

- Genes that enable the plant to produce proteins that bind to toxic heavy metals, thereby allowing transformed cells to survive heavy metal treatments (e.g. cadmium).
- Visible markers: These marker genes make transgenic plants visually recognisable. The gene for the green fluorescent protein (GFP) makes genetically modified plant cells appear green when exposed to UV light. A

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

Gene gun


Gunpowder
Gun
"Bullet"
Plant cells
DNA-coated plastic pellets

(a) (b)

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.

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

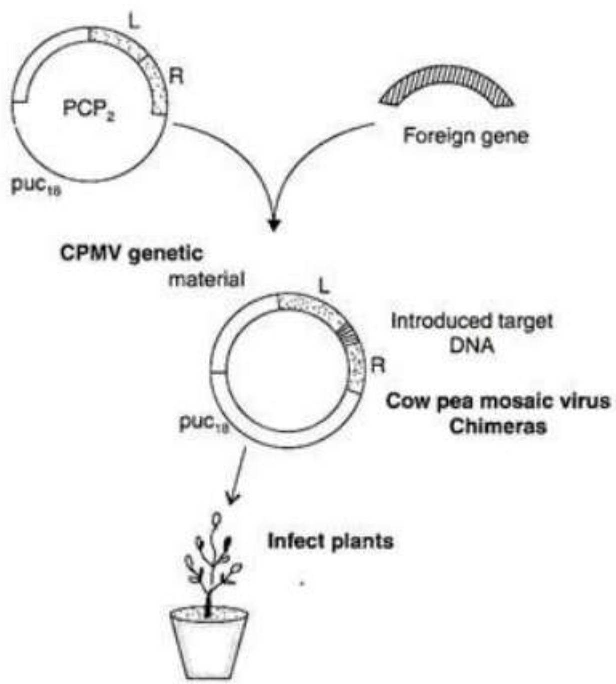


Fig. 14.14 CpmV expression vector construction and infection of plants

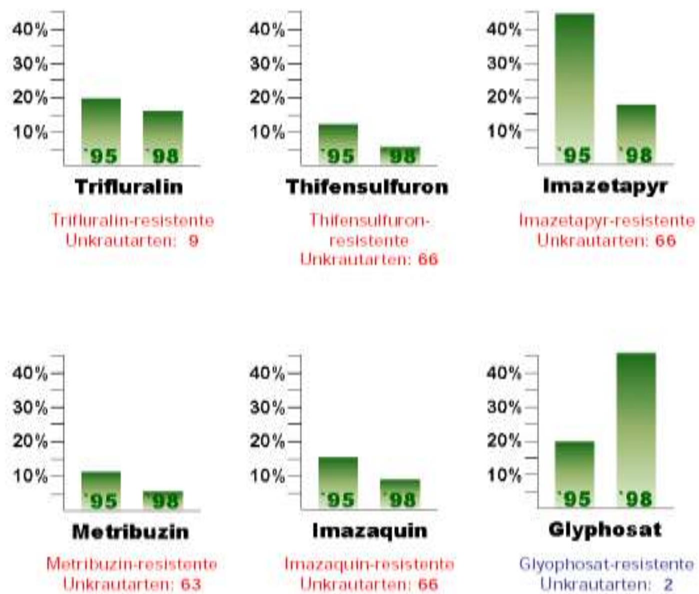
Gene Therapy	
viral vector	non-viral vectors
Advantage high transfection efficiency	Advantage better safety profile lower production cost
Disadvantage high immunogenicity high production cost low packaging capacity	Disadvantage low transfection efficiency insufficient cellular uptake poor targeted delivery

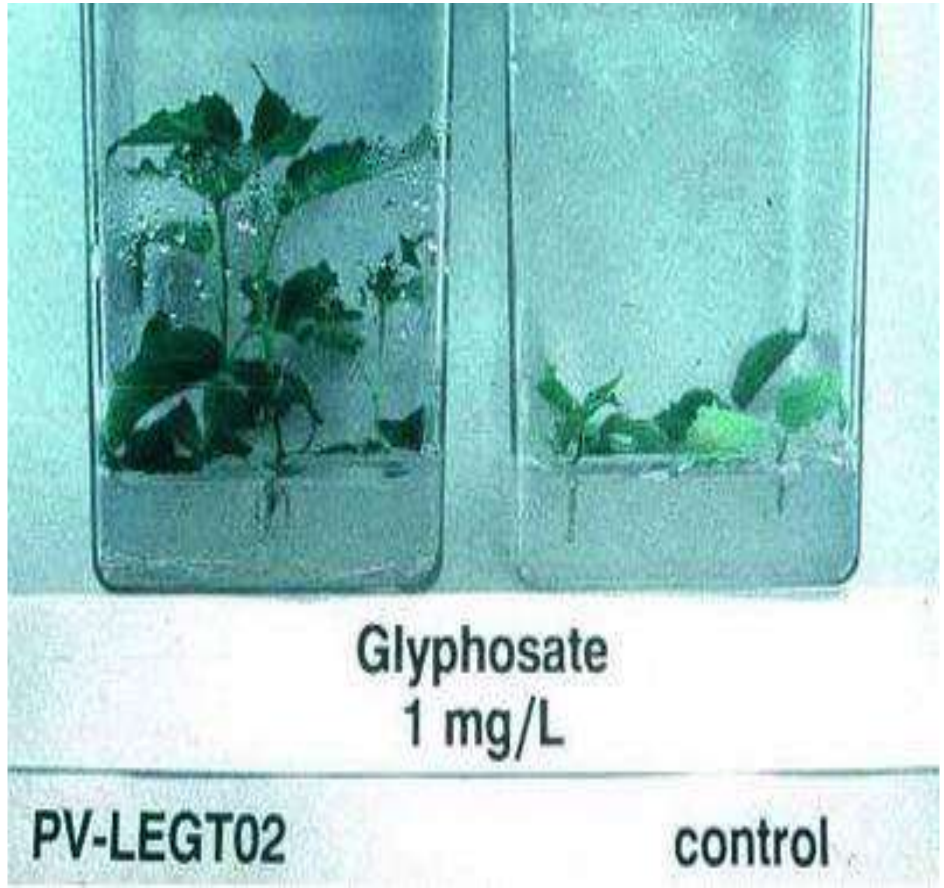
Herbicide tolerance, glyphosate

Dank gentechnisch erzeugten Glyphosat-toleranten (Roundup-Ready) Sojasorten ist der Einsatz von problematischen Herbiziden im Sojaanbau seit 1995 rückläufig

Die Säulen repräsentieren den Anteil der US-Amerikanischen Sojaanbaufläche, auf welcher das betreffende Herbizid in den Jahren 1995 und 1998 eingesetzt wurde

Quellen: Gianessi und Carpenter, 2000 (http://www.ncfap.org/soy85.pdf);
International Survey of herbicide-resistant weeds (http://www.weedscience.com/default.htm)





Herbicide Resistant Soybean

BEFORE

AFTER

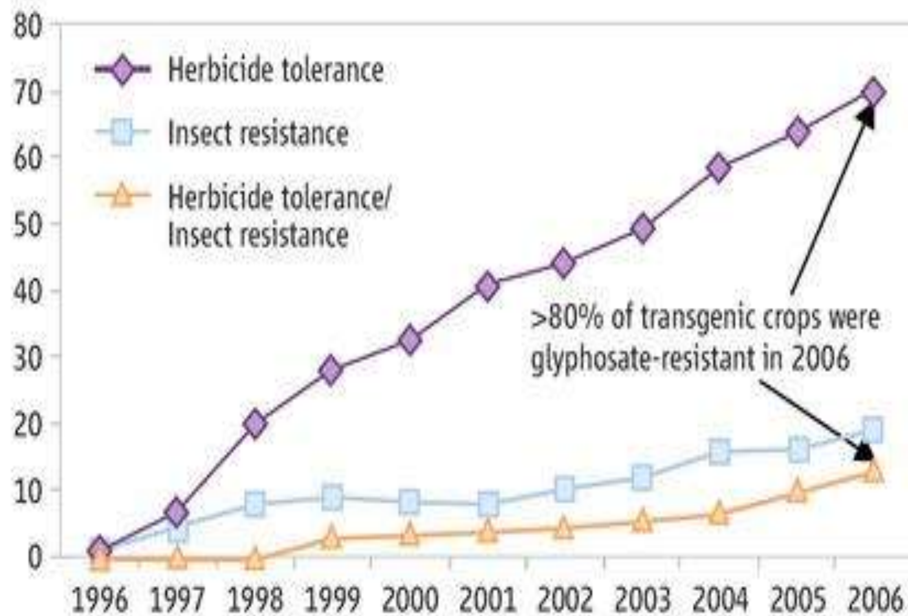
HERBICIDE APPLICATION

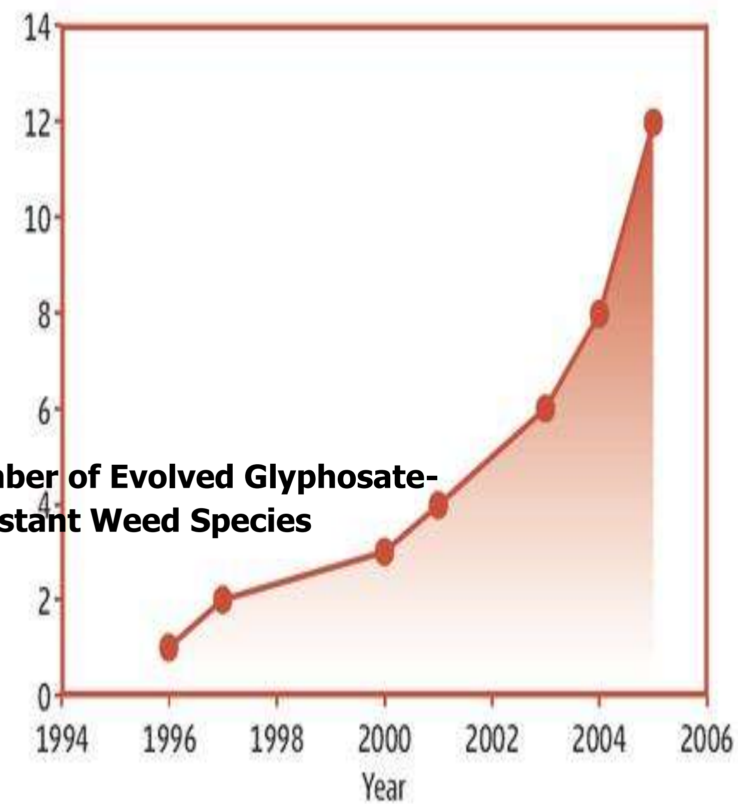
Herbicide Resistance: more or less herbicide? depending on local agricultural background

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

Old and new Problems: Resistance

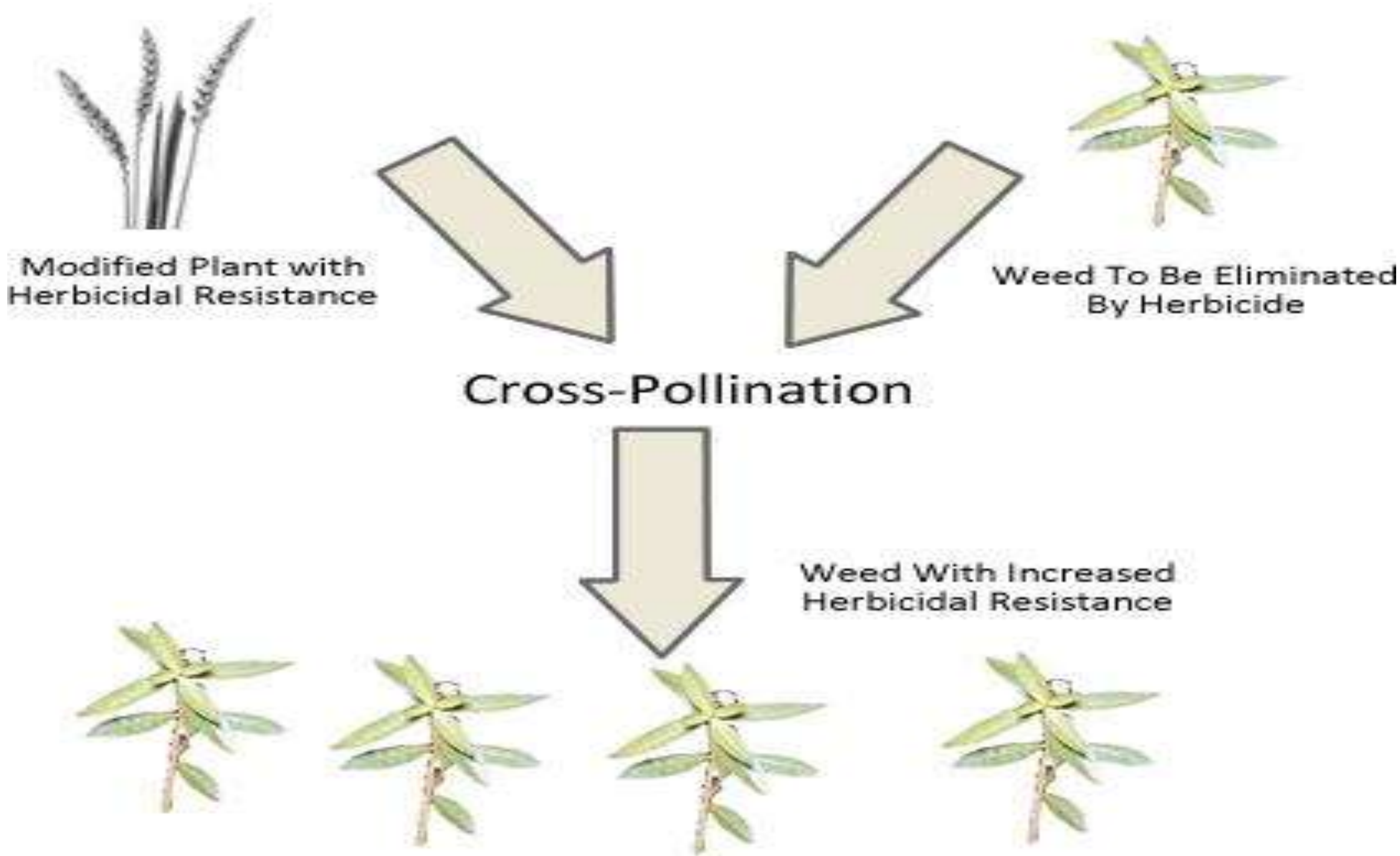
Herbicide Resistant Weeds Evolve





Number of Evolved Glyphosate-Resistant Weed Species

Herbizide resistance, gene transfer



Gene flow: multiresistant Rape

Environ. Biosafety Res. 5 (2006) 77–87

DOI: 10.1051/ebr:2006017

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

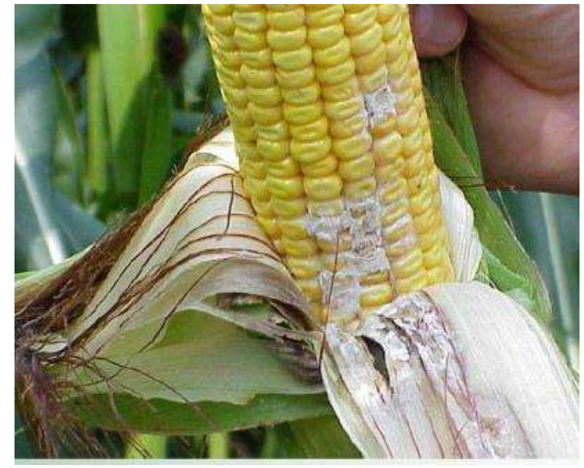
Mitsuko AONO[1]*, Seiji WAKIYAMA[2], Masato NAGATSU[2], Nobuyoshi NAKAJIMA[1], Masanori TAMAOKI[1], Akihiro KUBO[1] and Hikaru SAJI[1]

[1]Environmental Biology Division, National Institute for Environmental Studies, 16-2 Onogawa, Tsukuba, 305-8506, Japan
[2]Japan Wildlife Research Center, 3-10-10 Shitaya, Taito-Ku, Tokyo, 110-8676, Japan

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

Insect resistance, BT maize



BT resistance: B. thuringiensis proteins

Insect Resistant Maize

Corn hybrid with a Bt gene (left) and a hybrid susceptible to European corn borer (right).
Source: Monsanto

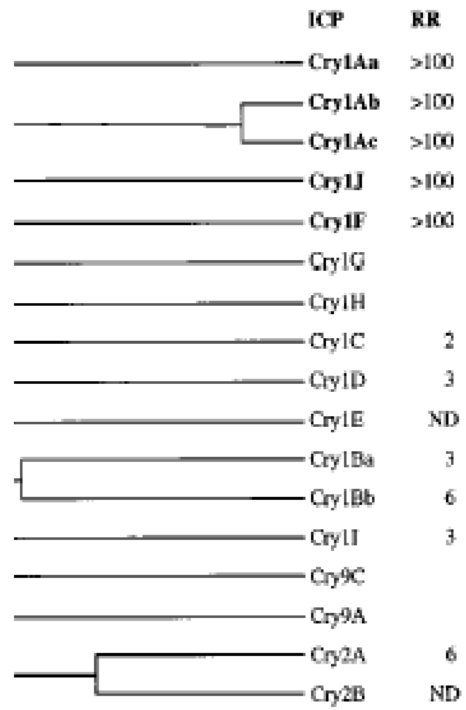


FIG. 1. Amino acid sequence similarity of domain II of *B. thuringiensis* toxins and resistance ratios (RR) of diamondback moth larvae. The dendrogram was

Roundup ready, Monsanto

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)**

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)

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

Insect Resistant Cotton

Disease Resistance, viruses

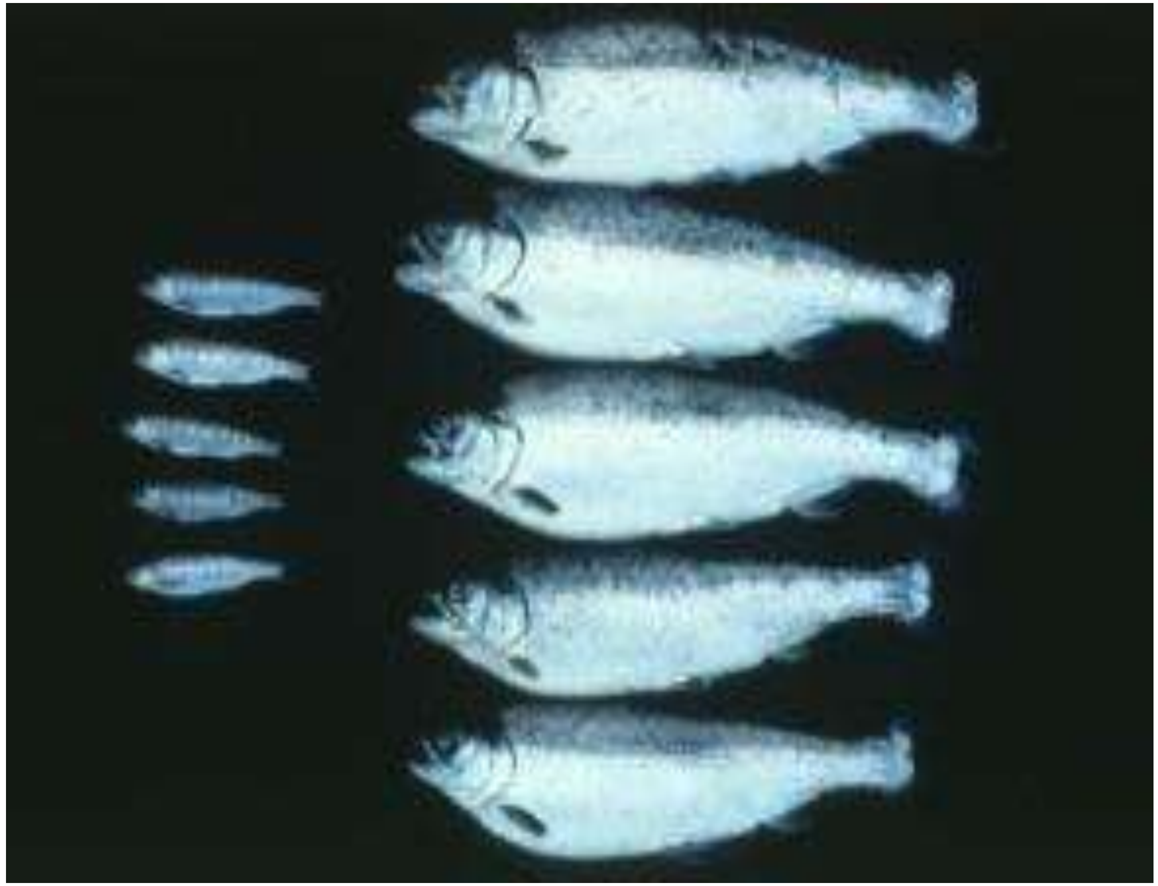
.

Genetically engineered papaya resistant
papaya ringspot virus

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

Growth-enhanced fish

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



(Devlin et al. 1994)

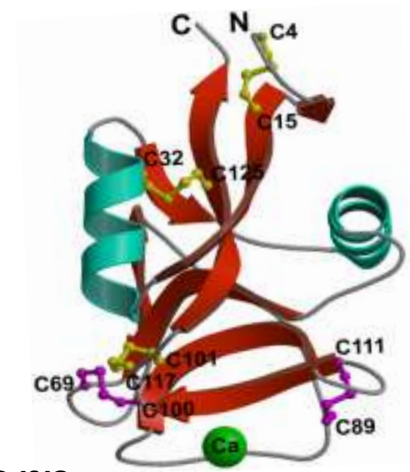
Auto-transgenic mud loach: β-actin promoter linked to GH gene.

GM Salmon

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

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

- 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.

Golden Rice

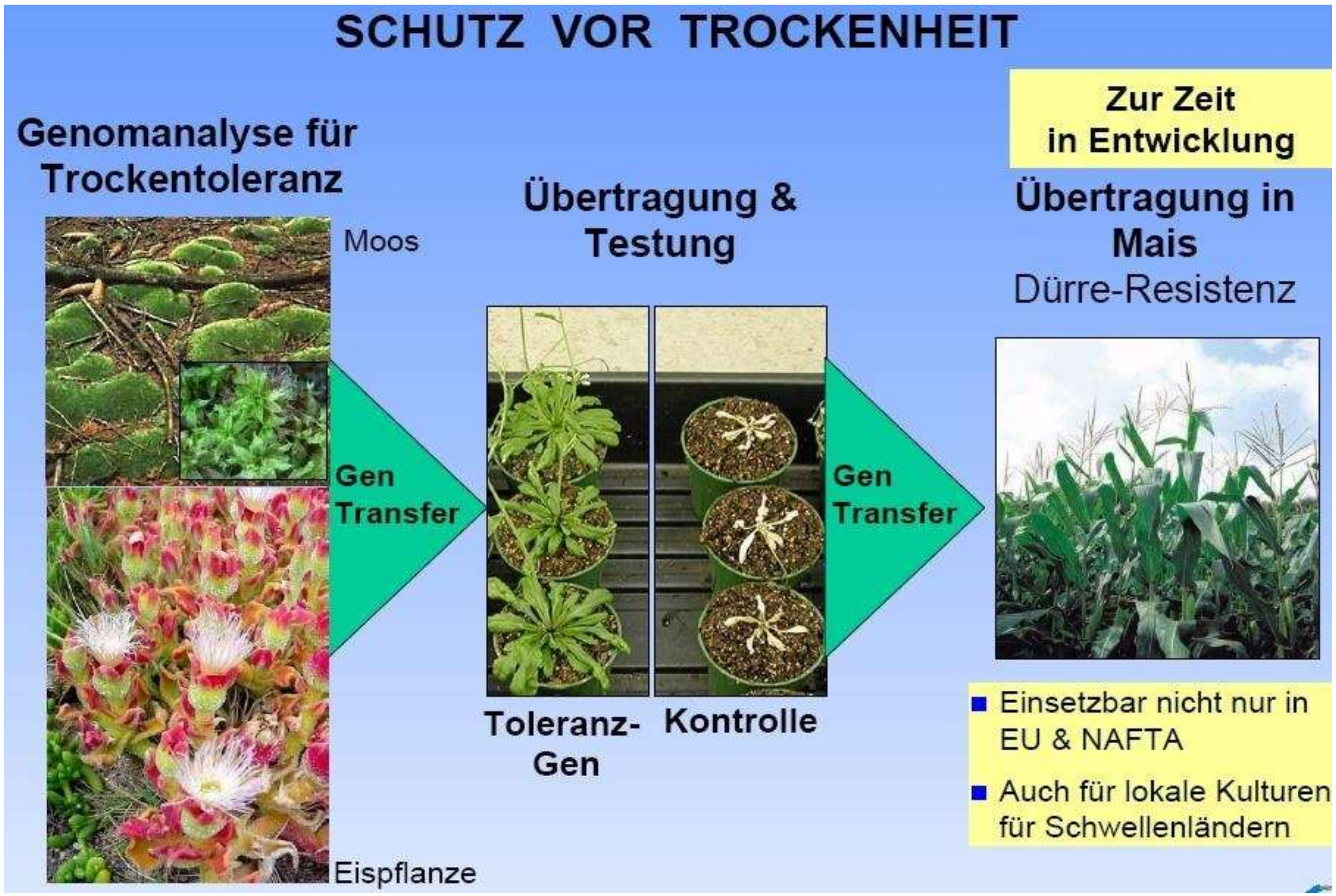
Goldener Reis,

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.

GMO tobacco,
expression of human proteins in plants

GMOs in development:
CLAIMED BREEDING OBJECTIVES



CLAIMED BREEDING OBJECTIVES

Claimed breeding objectives

VERRINGERUNG VON ALLERGENEN & GIFTEN

Weizen, Mais, Reis: Gluten-frei — **In Entwicklung**

Blockade der Gene für Gluten-Produktion

Ziel: Risikofreier Konsum für Zöliakie-Patienten

Erdnuss — **In Entwicklung**

Unterdrückung der Synthese von Allergie-auslösenden Proteinen

Maniok (Cassava): Linamarin-Reduktion

Blockade der Gene für Linamarin-Produktion

Linamarin wird in Blausäure umgewandelt und kann so zu Vergiftungen führen

In Entwicklung

BREEDING OBJECTIVES

PFLANZEN ZUR BIO-PRODUKTION

Gentechnisch veränderte Stärkekartoffel für technische Anwendungen

Feldversuche

Was wurde geändert ?

Ein Gen, für ein Merkmal (Stärke), wurde abgeschaltet

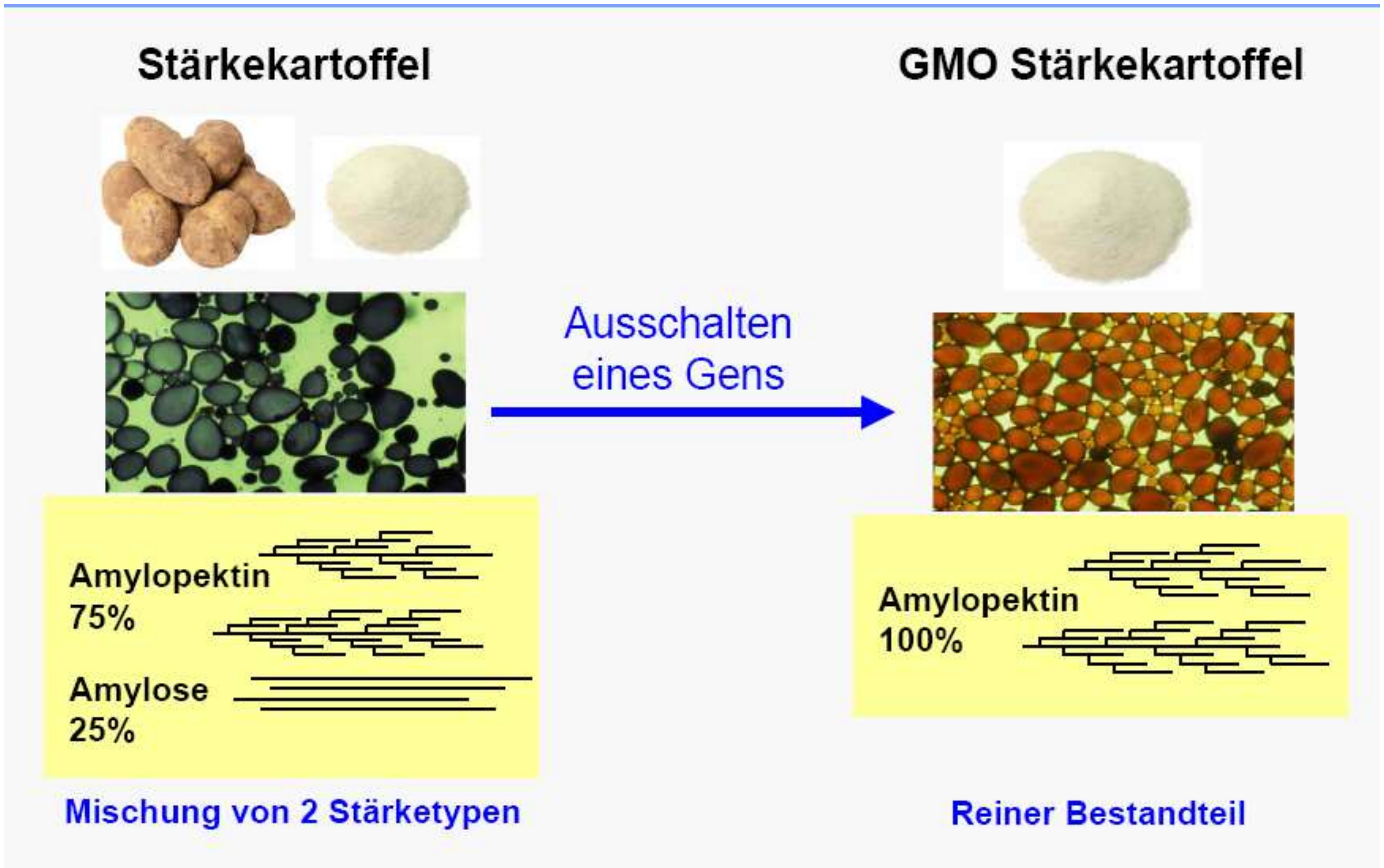
Ergebnis

Knollen, die veränderte & optimierte Stärke enthalten

Vorteile der optimierten Stärke

- Verbesserte Produktqualität
- Optimierung von Produktionsprozessen
- Einsparung von Energie und Ressourcen
- Ersatz von synthetischen nicht-abbaubaren Produkten

Breeding objectives



GMO Trees

Living on EARTH

THIS WEEK'S SHOW

GMO-Trees

- THIS WEEK'S SHOW
- ABOUT LIVING ON EARTH
- WHERE TO TUNE IN
- LOE EDUCATION PROGRAM
- TAPES & OTHER PRODUCTS
- ARCHIVES
- BOOKS AND MUSIC
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- SPECIAL FEATURES
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- SEARCH
- STUDIO RENTALS

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Air Date: Week of May 29, 2009

Maria Tesorera, from a women's group in Chile, protests outside the Belgian Permanent Mission in New York City. Belgium recently planted a test plot of genetically engineered low-ligning poplar trees. (Orin Langelle)

Scientists are developing genetically modified trees for the forests of the future. Ann Peterman of the Global

RealAudio for this Story
(Requires RealPlayer)

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Journal of Arboriculture 29(5): September 2003 259

GENETICALLY MODIFIED TREES: PRODUCTION, PROPERTIES, AND POTENTIAL

by Kevan M.A. Gartland[1], Robert M. Crow[1], Trevor M. Fenning[2], and Jill S. Gartland[1]

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.

GM FLowers

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

Source: DailyTech DT • October 30, 2009 4 retweet Share

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

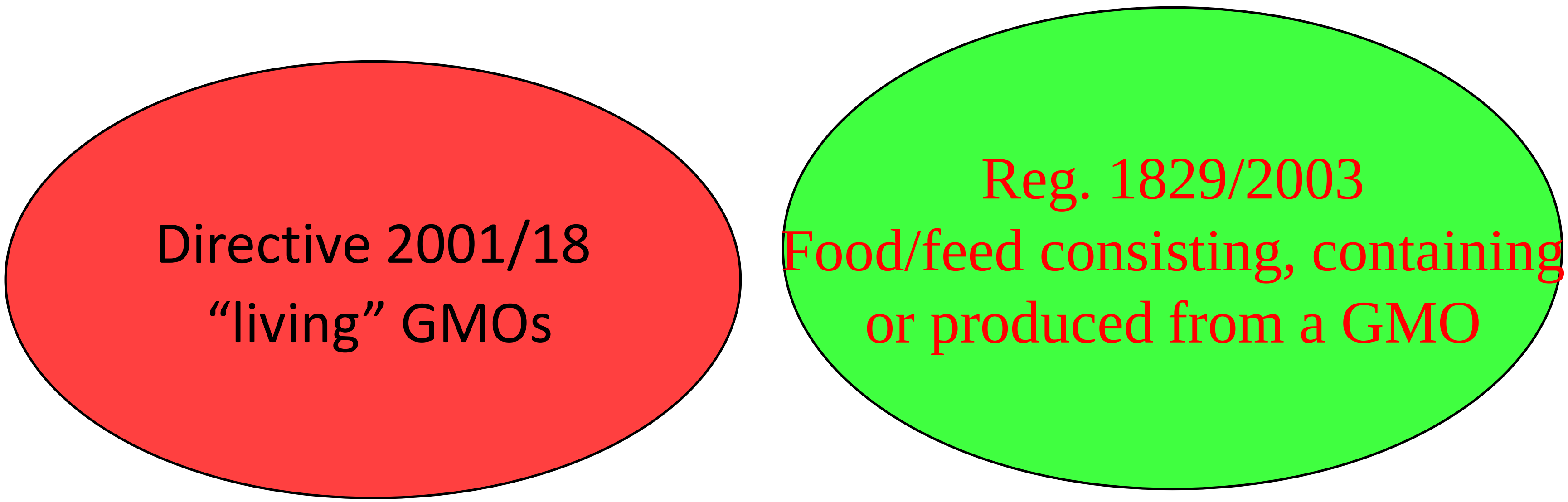
Are you overcome with guilt about how much carbon, sulfides, nitrides, and other emissions goodies were pumped into the atmosphere in the making of your new Toyota Prius? Do you feel dirty?

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

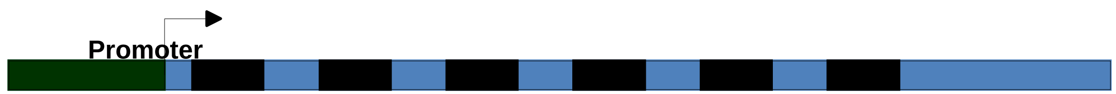
Regulations: Directive 2001/18/EC

- 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)

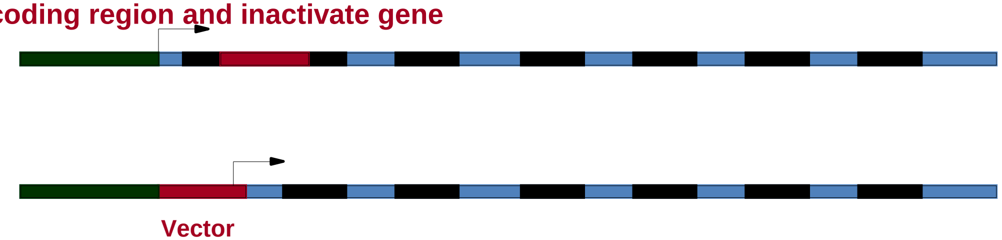
New directive. Scope of Directive 2001/18 and Regulation 1829/2003



Safety: Random integration, Insertional mutagenesis



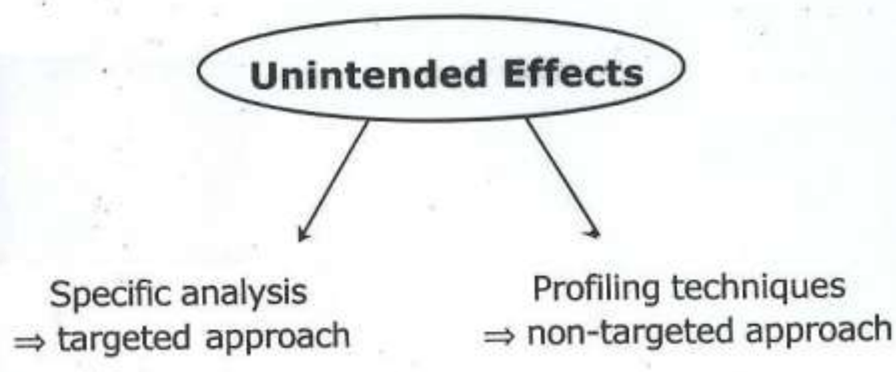
1. Interrupt coding region and inactivate gene



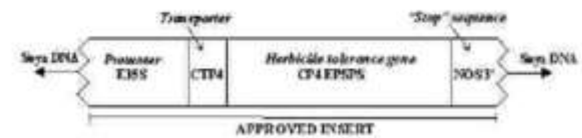
Vector

2. Insert next to gene and activate its expression inappropriately

Safety assessment of transgenic food



a) Approved DNA insert as described by Monsanto in their original EU application for marketing (from Monsanto, 2000)[1]. The function of each individual component of the insert is stated in italics.



b) Unapproved, multiple DNA inserts and unidentified DNA as now revealed (unapproved DNA is shaded). Two additional, unapproved inserts are present: a 250 base pair (bp) fragment of CP4 EPSPS attached to the main insert and a separate 72 bp insert of CP4 EPSPS (Monsanto, 2000)[1]. Adjacent to the unapproved 250 bp insert is the newly discovered (Windels et al. 2001)[2] 534 bp of unidentified, unapproved DNA.

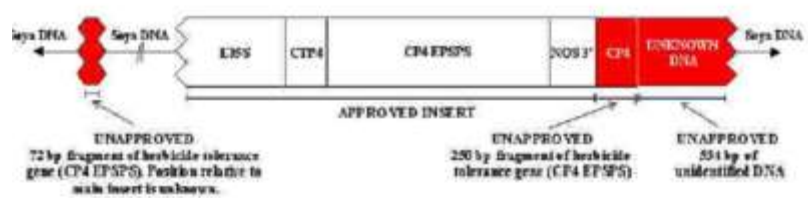
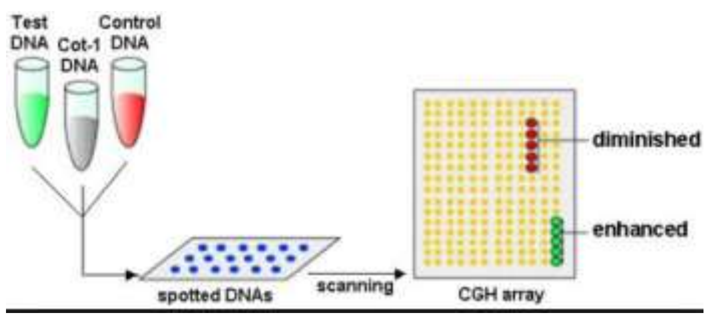
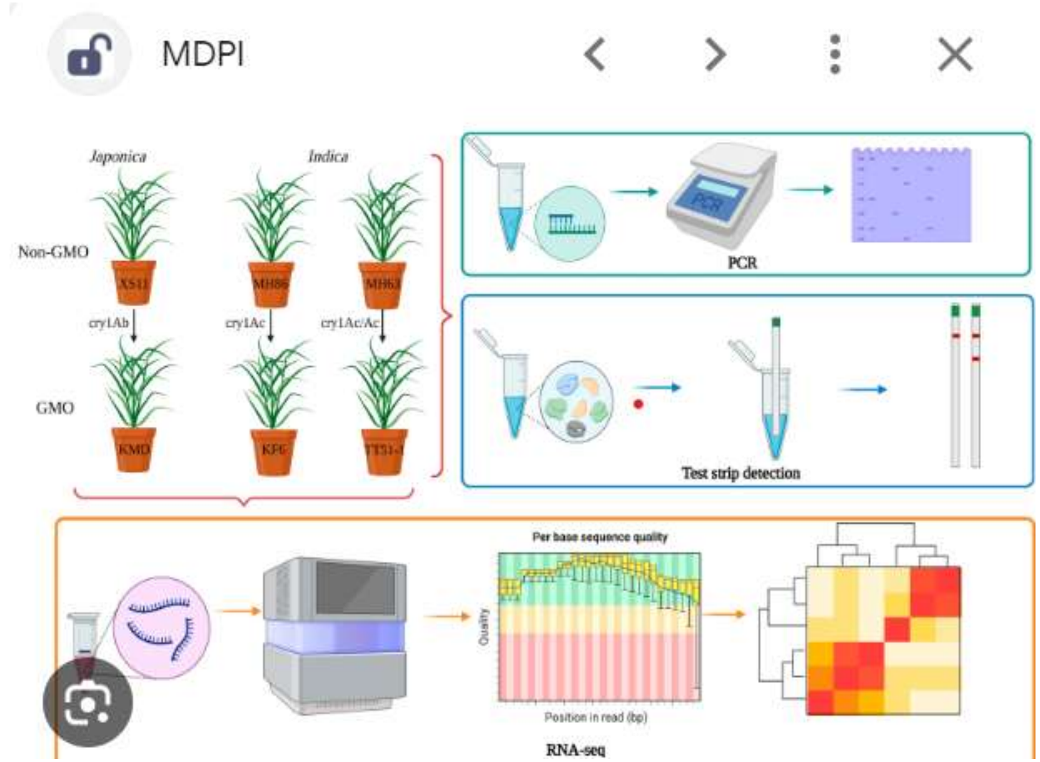


Figure Schematic of the DNA inserts in Monsanto's Roundup Ready soya. Abbreviations: bp - base pair, used to indicate the length of the DNA fragments[1], E35S - cauliflower mosaic virus promoter, CTP4 - chloroplast transit peptide sequence from petunia, CP4 EPSPS - herbicide tolerance gene from *Agrobacterium* sp., strain CP4, NOS3' - nontranslated region of nopaline synthase gene. For footnotes see main text.

Detection of unintended effects in vitro, in vivo

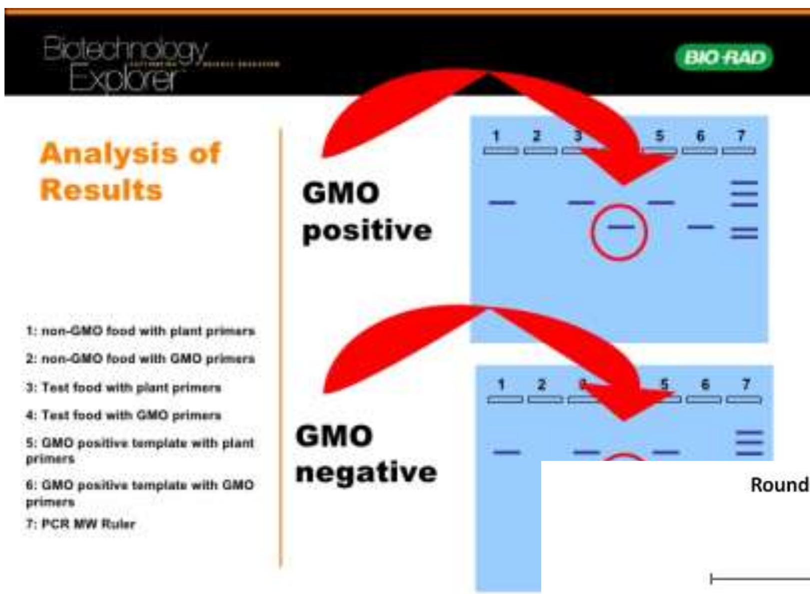


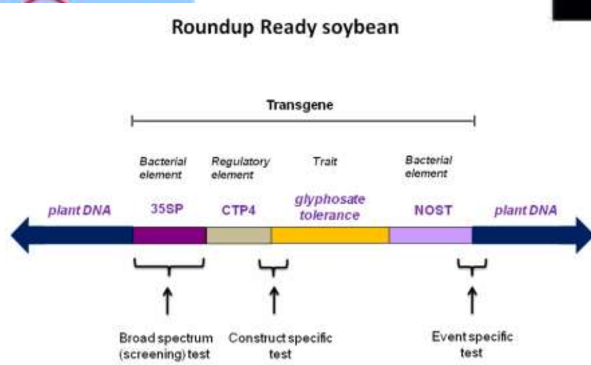


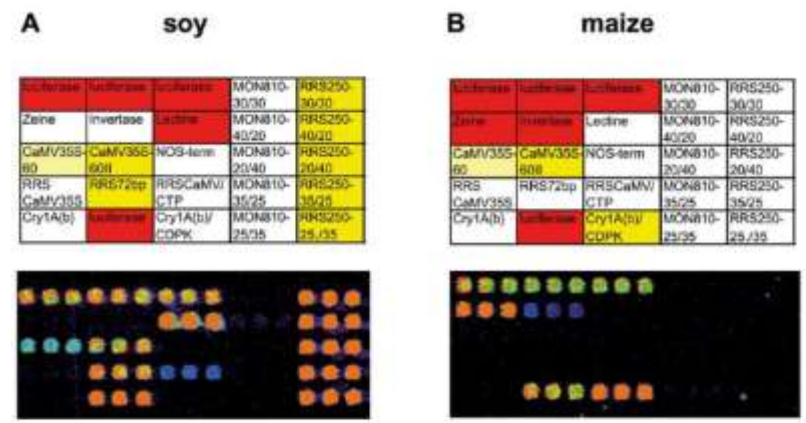
Toxicology Asessment: Difficulties Animal Feeding Studies Whole Foods

- 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

GMO tests: PCR, primers, areas, array







Umwelt Sicherheit LMOs

Convention on Biological Diversity

The Convention | Cartagena Protocol | Supplementary Protocol | BCH | Secretariat | Country Profiles...

Cartagena Protocol on Biosafety

The Cartagena Protocol
- What's new
- About the Protocol
- Text of the Cartagena Protocol
- Strategic Plan

Key Protocol Issues
- Assessment and Review
- Capacity Building
- Compliance
- Financial Mechanism
- Handling, Transport, Packaging and Identification
- Information sharing
- Liability and Redress
- Monitoring and Reporting
- Public Awareness and Participation
- Risk Assessment
- Risk Management
- Roster of Experts
- Socio-economic Considerations

Home | The Cartagena Protocol

The Cartagena Protocol on Biosafety

The *Cartagena Protocol on Biosafety to the Convention on Biological Diversity* is an international agreement which aims to ensure the safe handling, transport and use of living modified organisms (LMOs) resulting from modern biotechnology that may have adverse effects on biological diversity, taking also into account risks to human health. It was adopted on 29 January 2000 and entered into force on 11 September 2003. More »

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What's New | Notifications | Upcoming Meetings

What's new

25 May 2012
Online Forum on Public Awareness, Education and Participation Concerning the Safe Transfer, Handling and Use of Living Modified Organisms (4 - 18 June 2012)

17 May 2012
Report of the eighth Coordination Meeting for Governments and Organizations Implementing and/or Funding Biosafety Capacity-building Activities

1 May 2012

Biosafety Public Awareness ONLINE FORUM

Second National Report on the Implementation of the Cartagena Protocol — RESULTS —

Online Forum on Capacity-Building

Open-ended Online

Cloning, Definition

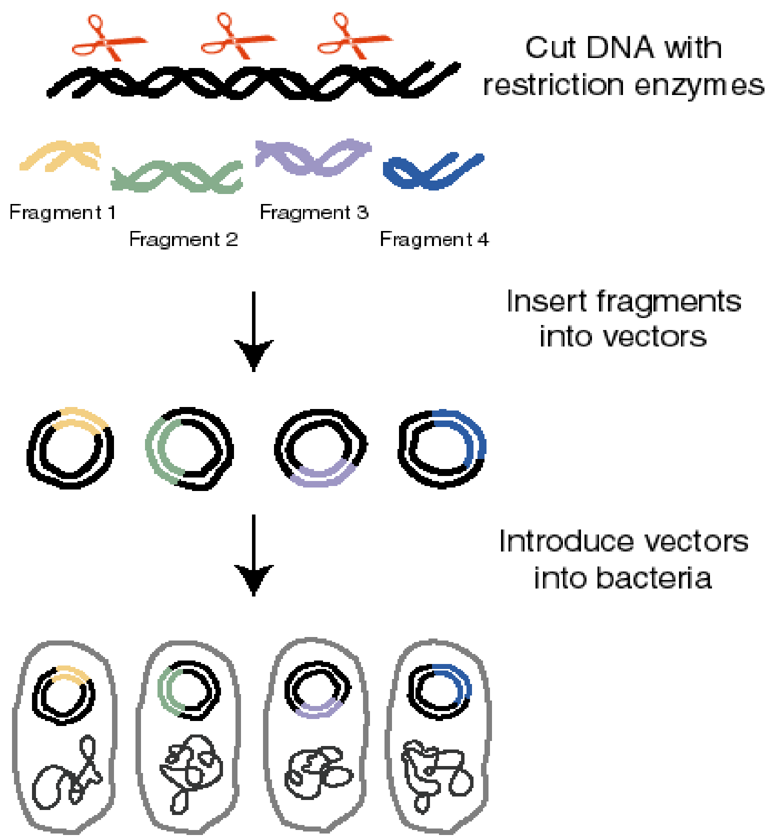
Cloning is the process of making an identical copy of something

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.

DNA cloning:

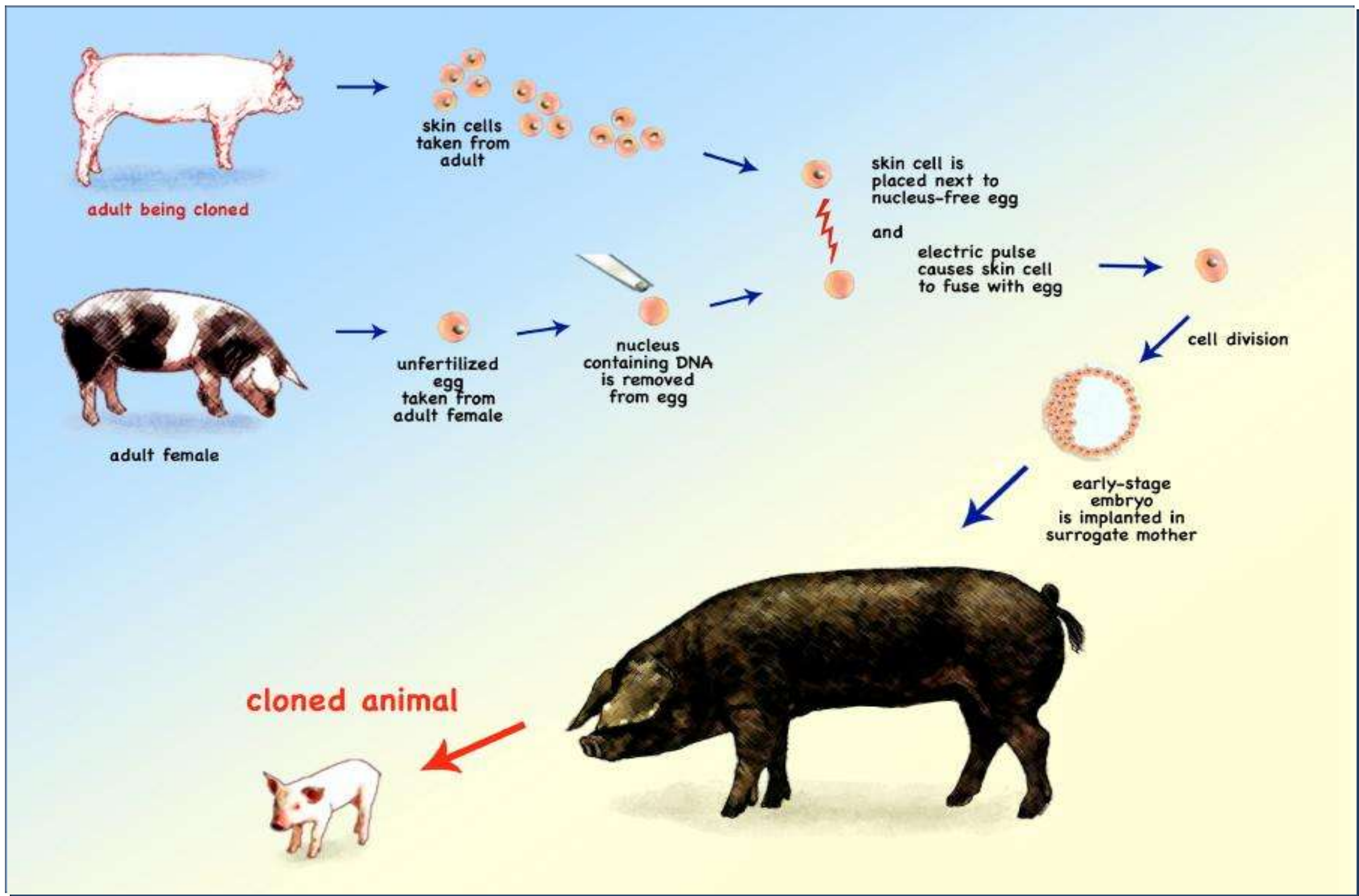


To clone a piece of DNA, DNA is cut into fragments using restriction enzymes that recognize specific sequences of bases in DNA. The fragments are pasted into vectors that have been cut by the same restriction enzyme. Vectors (e.g., plasmids or viruses) are needed to transfer and maintain DNA in a host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

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.

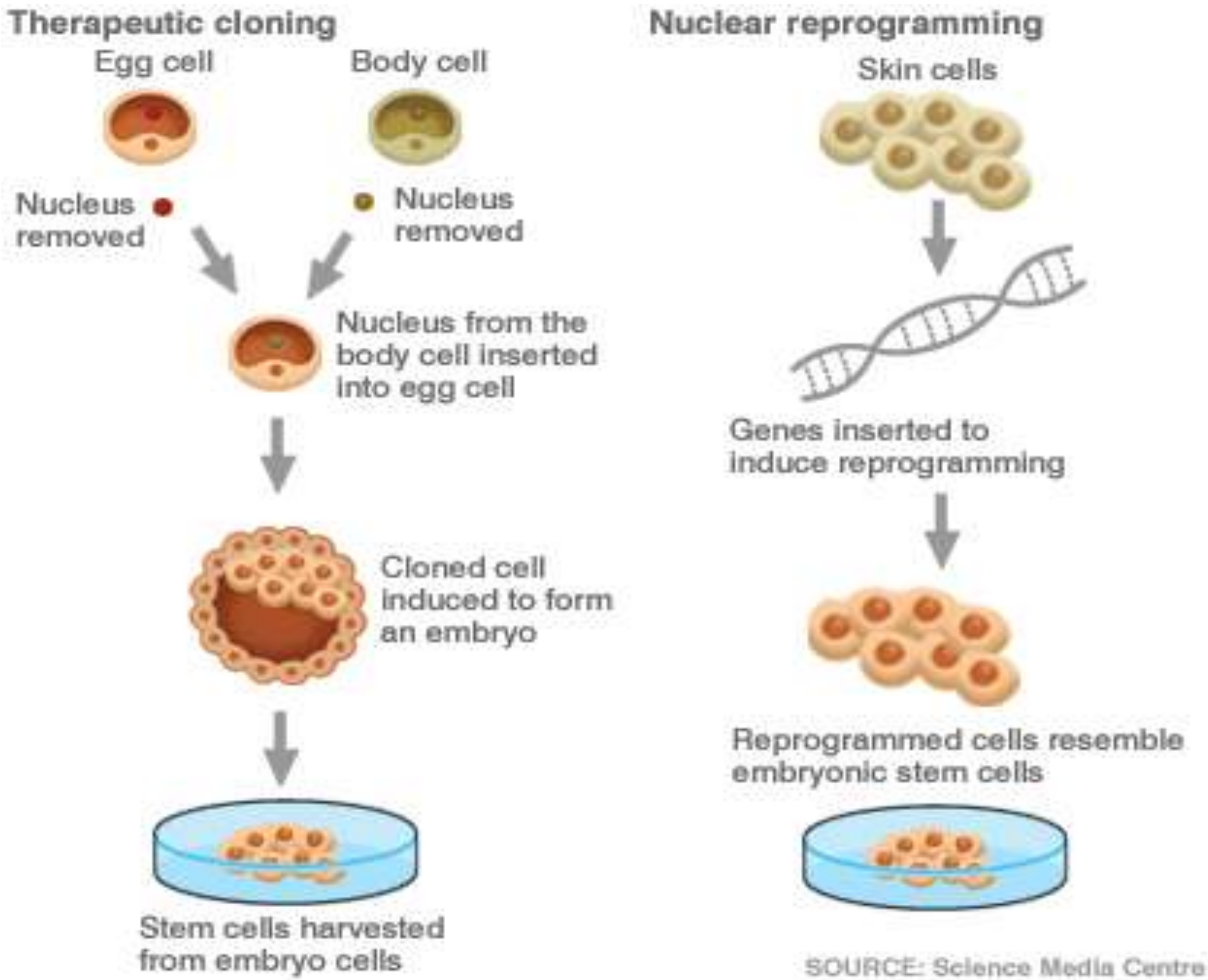
Reproductive Cloning



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.


Therapeutic cloning
Egg cell
Body cell
Nucleus removed
Nucleus removed
Nucleus from the body cell inserted into egg cell
Cloned cell induced to form an embryo
Stem cells harvested from embryo cells
Nuclear reprogramming
Skin cells
Genes inserted to induce reprogramming
Reprogrammed cells resemble embryonic stem cells
SOURCE: Science Media Centre

New Objectives

Conventional Transgenic Approaches

Fig. 2. Hawaiian papaya plot in 2011. Hawaiian papaya plot showing diseased, devastated, non-transformed trees in the foreground and healthy transgenic trees behind. (Photo courtesy of Dennis Gonsalves, Agricultural Research Service, U.S. Department of Agriculture, Hawaii)

Drawbacks:

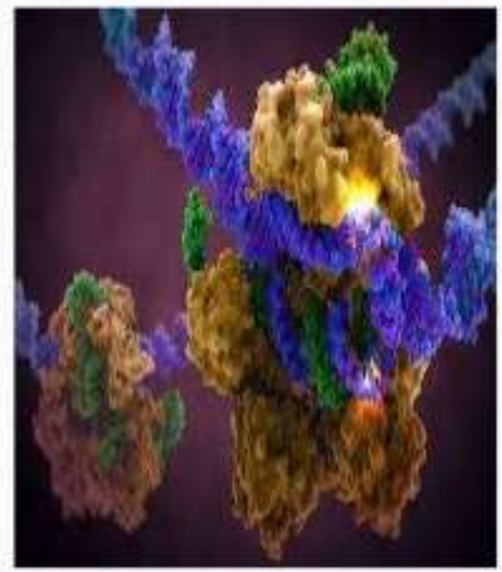
- Random insertion of transgene
- Not suitable for gene targeting or precise gene mutation
- Difficult to perform gene replacement or create allelic variation
- Introduction of undesirable DNA fragments (T-DNA, selection markers)
- Extensive regulatory requirements
- Public concerns over transgenic crops

New technology is much needed:

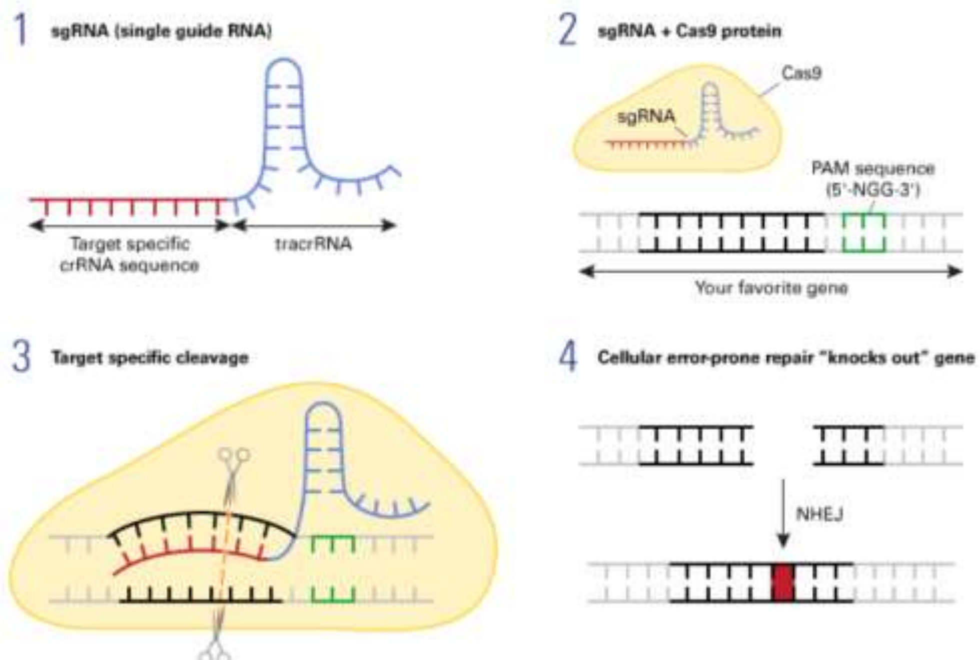
- To precisely and efficiently manipulate genome for crop improvement
- To reduce regulatory hurdles and public concerns

Cas-9 (**C**RISPR **a**ssociated **p**rotein 9)

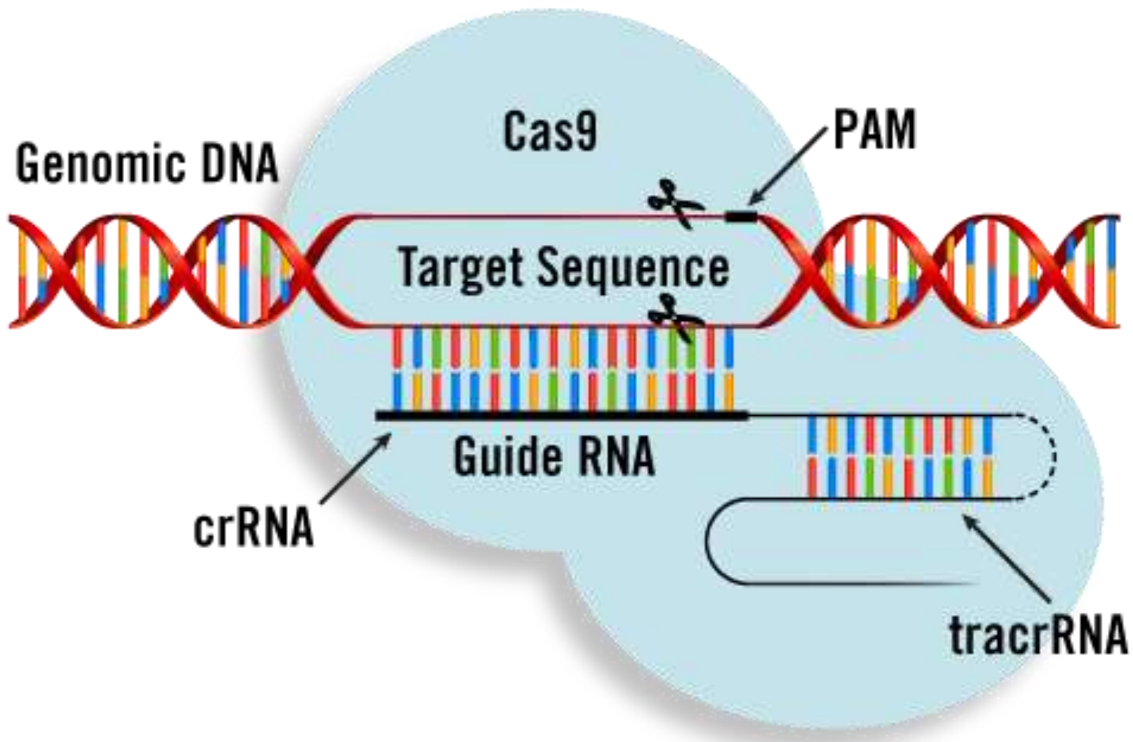
- is an RNA guided DNA endonucleases enzyme.
- associated with CRISPR
- which plays an role in adaptive immunity system, found in bacteria Streptococcus Pyogenes.
- involved in Type II CRISPR mechanism



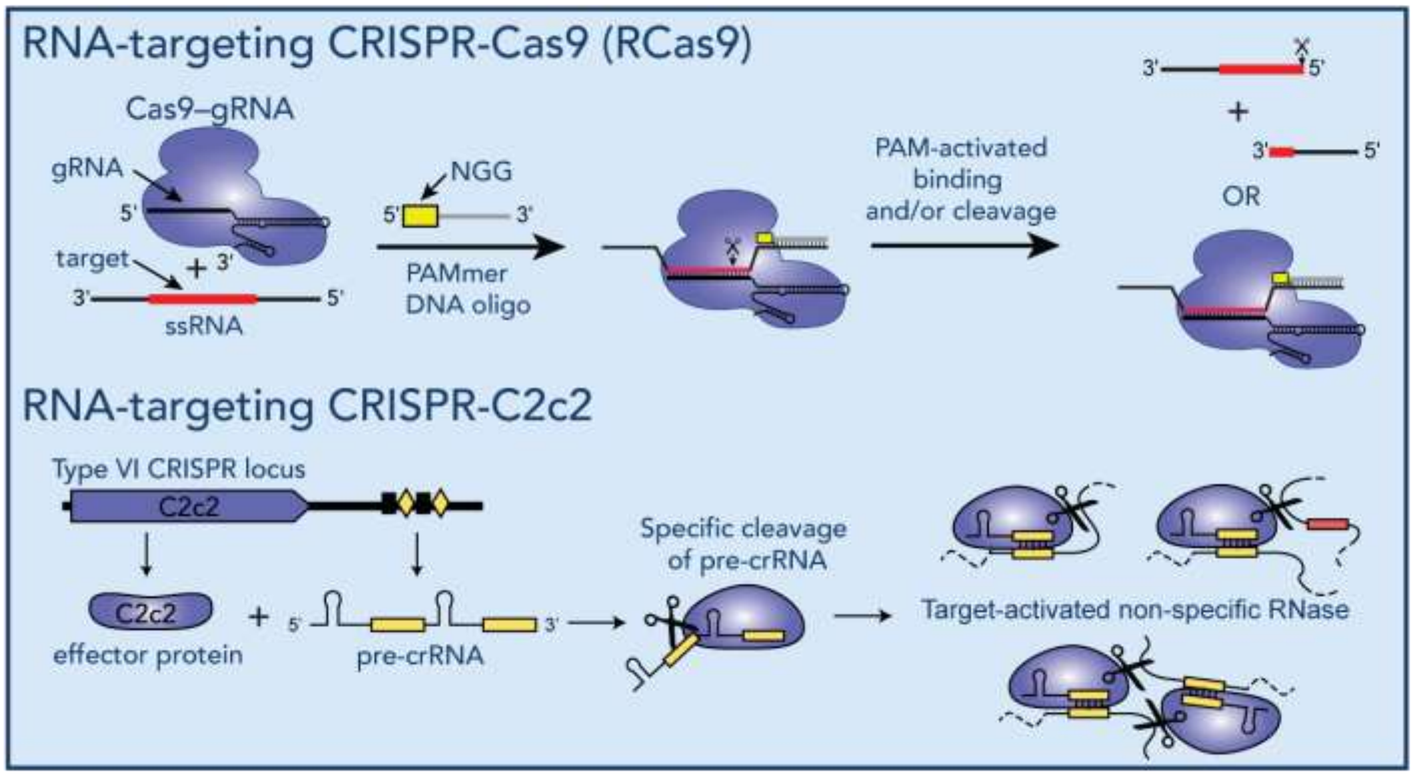
CRISPR/CAS9



The principle of CRISPR/Cas9-mediated gene disruption. A single guide RNA (sgRNA), consisting of a crRNA sequence that is specific to the DNA target, and a tracrRNA sequence that interacts with the Cas9 protein (1), binds to a recombinant form of Cas9 protein that has DNA endonuclease activity (2). The resulting complex will cause target-specific double-stranded DNA cleavage (3). The cleavage site will be repaired by the nonhomologous end joining (NHEJ) DNA repair pathway, an error-prone process that may result in insertions/deletions (INDELs) that may disrupt gene function (4).


Genomic DNA
Cas9
PAM
Target Sequence
Guide RNA
crRNA
tracrRNA

Targeting RNA



CRISPR-Cas9

Broad Application of CRISPR-Cas9 Technology

Technical advantages for basic plant biology and crop breeding

- Targeted gene mutation (multiple or redundant genes)
- Site-specific integration and gene stacking
- Gene replacement via homologous recombination
- Site-directed mutagenesis to create allelic variation
- Chromosomal engineering such as deletion or translocation
- Modification and labeling of multiple genomic sites
- Transcriptional modulation of multiple genes and pathways
- Epigenome editing such as methylation and demethylation
- Cisgenesis without introducing undesirable foreign DNA

Economic, regulatory and societal benefits:

- Reduce costs for precise and efficient molecular breeding
- Eliminate or significantly reduce regulatory requirements
- Alleviate public concerns about GM crops

CRISPR-Cas9 makes mutation

sciencealert Trending

(Meletios Verras/iStock)

HEALTH

BREAKING: CRISPR Could Be Causing Extensive Mutations And Genetic Damage After All

PETER DOCKRILL 16 JUL 2018

CRISPR has been heralded as one of the most important breakthroughs in modern science, but there could be a hidden and potentially dangerous side effect to the wonders of its genetic editing technology, a new study reveals.

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

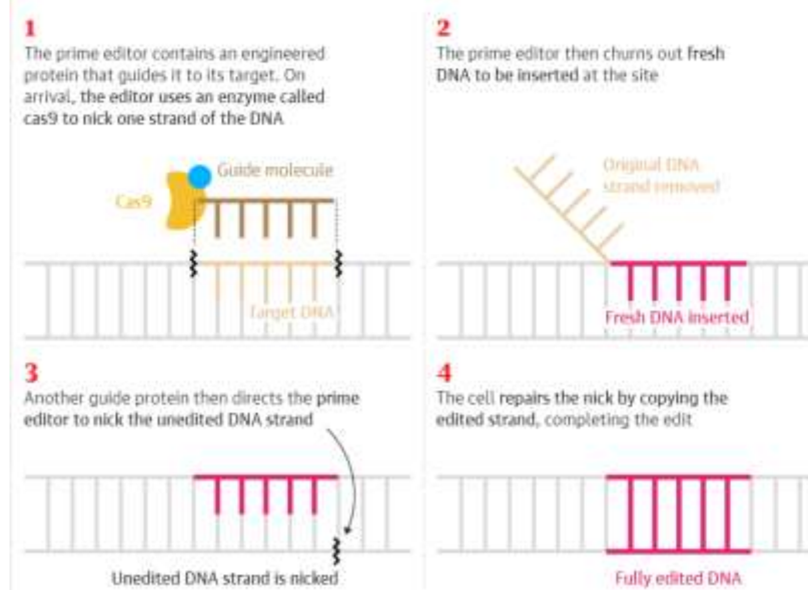
Science 25 Oct 2019:
Vol. 366, Issue 6464, pp. 406
DOI: 10.1126/science.366.6464.406

Article | Info & Metrics | eLetters | PDF

You are currently viewing the summary. **View Full Text**

Summary

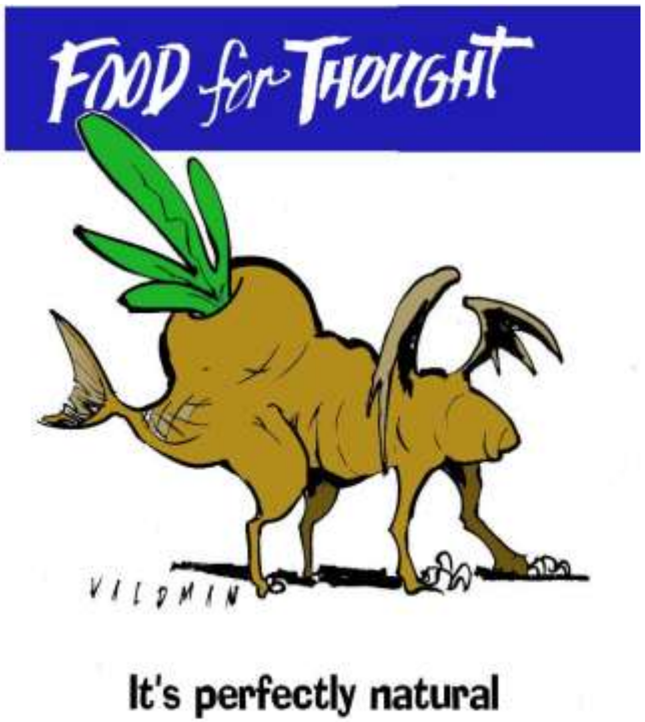
The CRISPR toolbox is stuffed with refinements that have been developed in the 7 years since researchers first described the powerful genome editor. But now, a new one called "prime editing" is turning heads because it steers around a few central shortcomings of its predecessor. CRISPR cuts the double-stranded DNA at precise locations in the genome and then let's the cell repair mechanism take over, which can easily cripple a gene. Researchers can also engineer CRISPR to introduce new DNA at the cut site. But CRISPR is sloppy, often creating unwanted off-target mutations. And it's not very efficient at intentionally introducing specific DNA bases, the As, Cs, Ts, and Gs that make up the double helix. Prime editing, which builds on CRISPR's basic components, promises to get around these problems. First, it does not cut the double helix, but only "nicks" open one strand of the DNA at a targeted site of the genome. The CRISPR machinery then introduces changes by shuttling over a research-designed stretch of RNA coupled to an enzyme, reverse transcriptase, that can read the code and transcribe it into complimentary DNA, which gets edited in at the nick site. A team lead by chemist David Liu at the Broad Institute in Cambridge, Massachusetts, describes its new prime editor in *Nature* this week, showing that it worked remarkably well in more than 175 edits in different human and mouse cells. If it pans out, it could address many genetic diseases that the current CRISPR toolbox cannot.

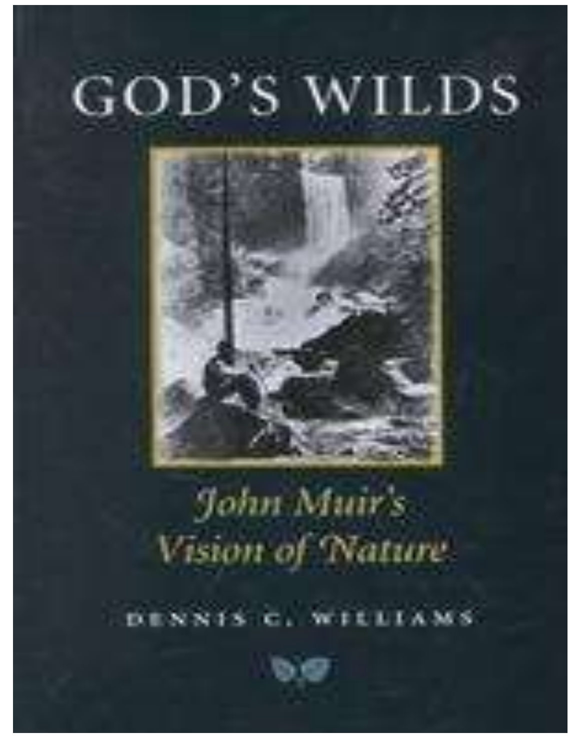


Guardian graphic. Source: Nature

Prime editing can 'nick' and replace sections of mutated DNA strands

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





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*)

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.

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].

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

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]

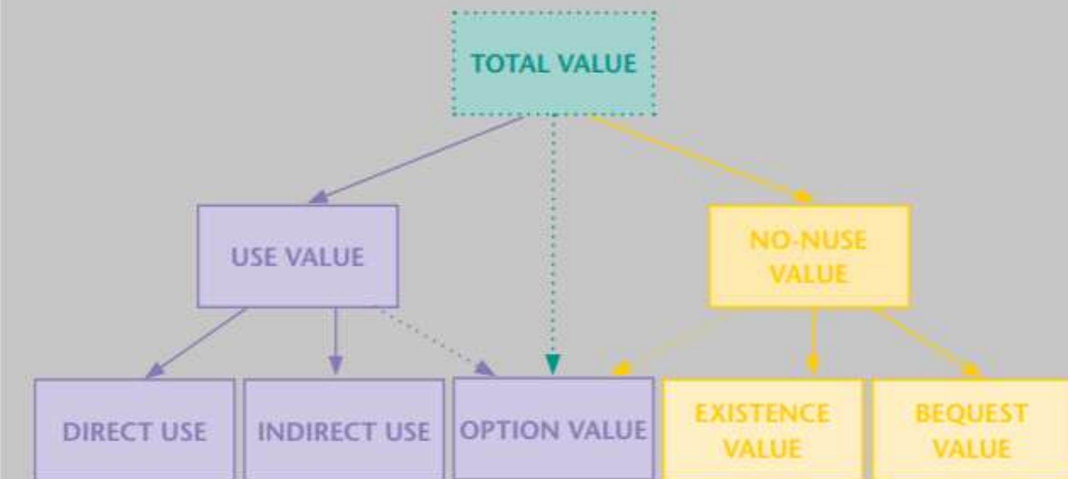
However, this approach has led to fierce debates about whether it's possible to combine such intrinsic perspectives with anthropocentric economic arguments. Those who believe nature **only** has an intrinsic value often see nature as being priceless. They are therefore sceptical about attempts to quantify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

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.



Source: Dziegielewska, D. (2013)[21]

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.

Rise of natural science and nature

Francis Bacon, 1561 – 1626

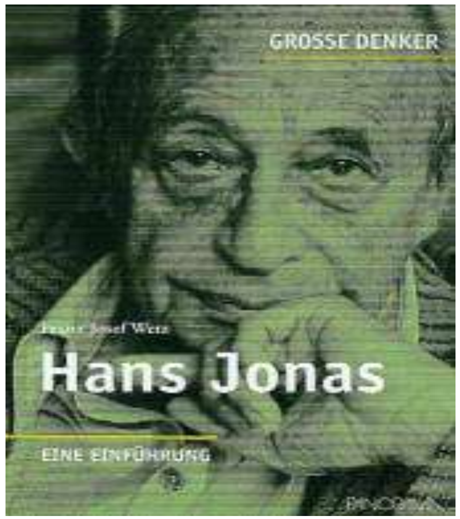
"Nature, to be commanded, must be obeyed"

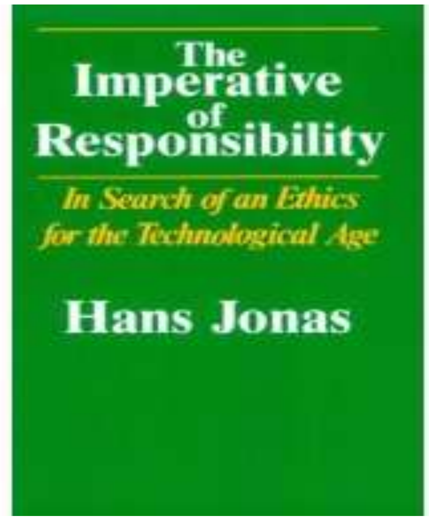
Return to eden

Jean-Jacques Rousseau
1712-1778

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

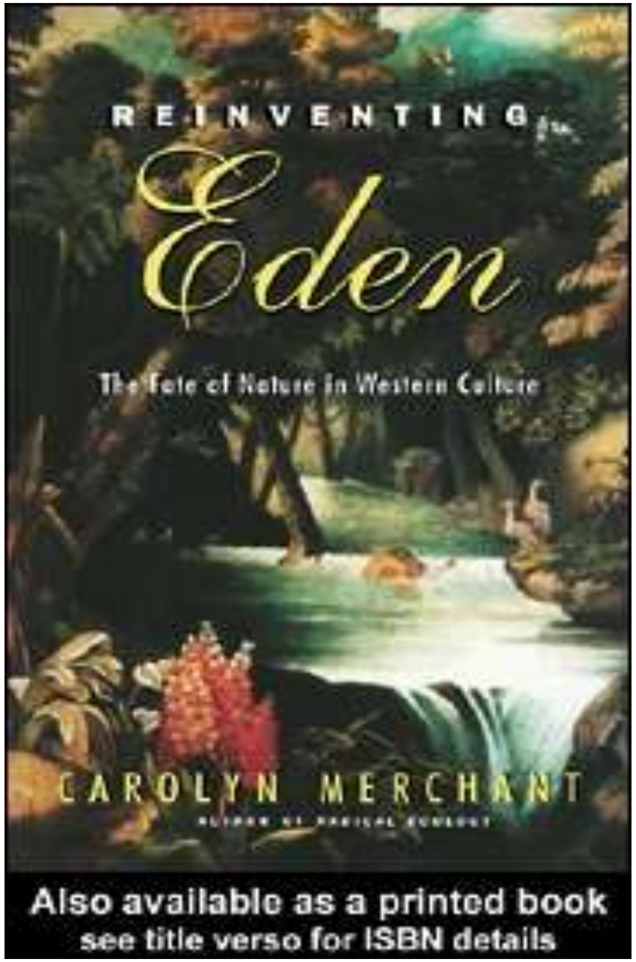
Property and responsibility





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

The problem of land use, transformation and Conservation



Carolyn Merchant

Conservation history,
Univ. of Berkley

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

Carolyn Merchant

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

Carolyn Merchant

UNIVERSITY OF CALIFORNIA, BERKELEY

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Carolyn Merchant

Professor, Department of Environmental Science, Policy and Management
University of California, Berkeley

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

Farming values, middle ages autark?

Farming in the Middle Ages

Farming in the Middle Ages

- Interesting Facts and information about Farming in the Middle Ages in the Middle Ages
- Farming in the Middle Ages
- Agriculture in the Middle Ages
- The Manor
- Common Land
- Farming Methods
- Farming Tools

Farming in the Middle Ages - Feudalism and Rural Life
The introduction of feudalism fostered the movement from town to country, for f
supported by the income from landed property. The country estate of a lord was

Farming in the Middle Ages - The Manor
A manor varied in size, according to the wealth of its lord. In England perhaps
manor; great nobles might have several manors, usually scattered throughout
England, during the period following the Norman Conquest, contained more tha

Farming in the Middle Ages - Common Cultivation of the Arable Land
Of the arable land of the manor the lord reserved as much as he needed for his
"demesne," or domain. The rest of the land he allotted to the peasants who
holdings in common. A peasant, instead of having his land in one compact ma
small strips (usually about half an acre each) scattered over the manor, and sep
banks of unploughed turf. The appearance of a manor, when under cu
checkerboard or a patchwork quilt. The reason for the intermixture of strips s
each peasant had a portion both of the good land and of the bad. It is obvious
peasants to labor according to a common plan. A man had to sow the same ki
and reap them at the same time.

Farming in the Middle Ages - Farming Methods
Farming in the Middle Ages was very backward. Farmers did not know how to
how to provide for a proper rotation of crops. Hence each year they cultivate

Landuse and property

conservation : expolitation

use : property

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.


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Haltungsübung Nr. 68

Sich treu bleiben.

473 Postings

ÖSTERREICHISCHE SCHULE

Friedrich August von Hayek: Ein Leben für den freien Markt

Eine exzellent recherchierte neue Biografie widmet sich den turbulenten ersten fünf Jahrzehnten im Werdegang des vielseitigen österreichischen Gelehrten

Am 2. August 1940 landete der österreichische Nationalökonom Ludwig Edler von Mises (1881 bis 1973) in New York. „Die Welt war in Aufruhr, der Krieg wütete, als wir von Europa Abschied nahmen", schreibt seine Frau Margit 1978 im Vorwort zu den Erinnerungen ihres Mannes. Als jüdischer Intellektueller, der zu allem Überfluss auch noch den Kapitalismus rechtfertigte, war für von Mises an österreichischen Universitäten kein Platz.

BUSINESS LEADERS › RICH & POWERFUL

Who Was Friedrich Hayek? What Was His Economic Theory?

By WILL KENTON Updated December 06, 2022

Reviewed by THOMAS J. CATALANO

Friedrich Hayek was a famous economist, well-known for his numerous contributions to the field of economics and political philosophy. Hayek's approach mostly stems from the Austrian school of economics and emphasizes the limited nature of knowledge. He is particularly famous for his defense of free-market capitalism and is remembered as one of the greatest critics of the socialist consensus.

ÖSTERREICHISCHE SCHULE

Die Tea Party begann im Kaffeehaus

VON RAINER HANK · AKTUALISIERT AM 17.10.2010 · 14:32

What Is Keynesian Economics?

FINANCE & DEVELOPMENT, September 2014, Vol. 51, No. 3

Sarwat Jahan, Ahmed Saber Mahmud, and Chris Papageorgiou

PDF version

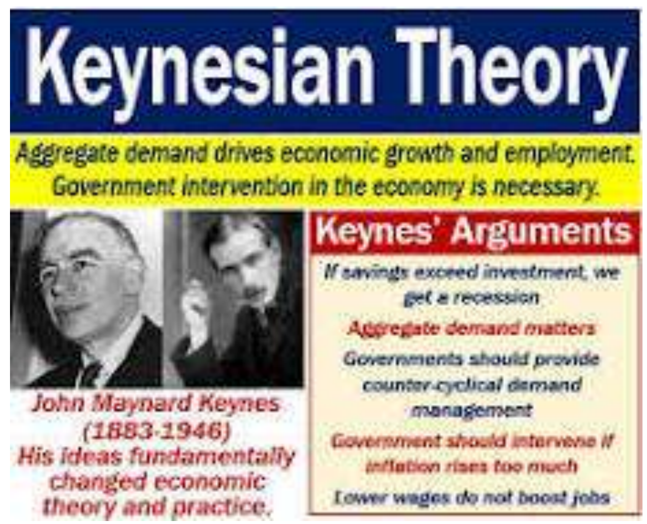
The central tenet of this school of thought is that government intervention can stabilize the economy

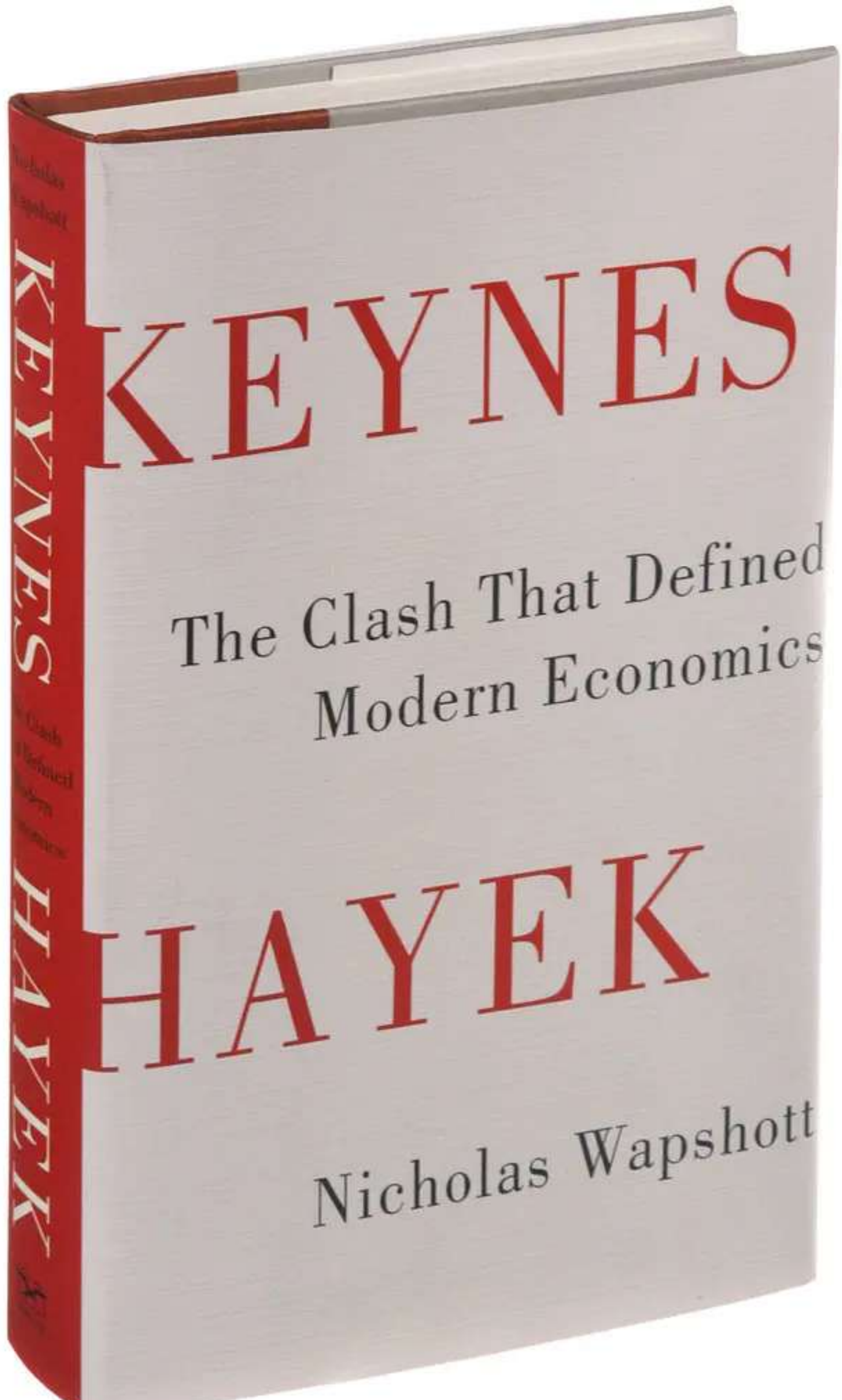
Just how important is money? Few would deny that it plays a key role in the economy.

During the Great Depression of the 1930s, existing economic theory was unable either to explain the causes of the severe worldwide economic collapse or to provide an adequate public policy solution to jump-start production and employment.

British economist John Maynard Keynes spearheaded a revolution in economic thinking that overturned the then-prevailing idea that free markets would automatically provide full employment—that is, that everyone who wanted a job would have one as long as workers were flexible in their wage demands (see box). The main plank of Keynes's theory, which has come to bear his name, is the assertion that aggregate demand—measured as the sum of spending by households, businesses, and the government—is the most important driving force in an economy. Keynes further asserted that free markets have no self-balancing mechanisms that lead to full employment. Keynesian economists justify government intervention through public policies that aim to achieve full employment and price stability.

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.





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.

Nature and property. Public goods

Industrial and Corporate Change
Pp. 131-159

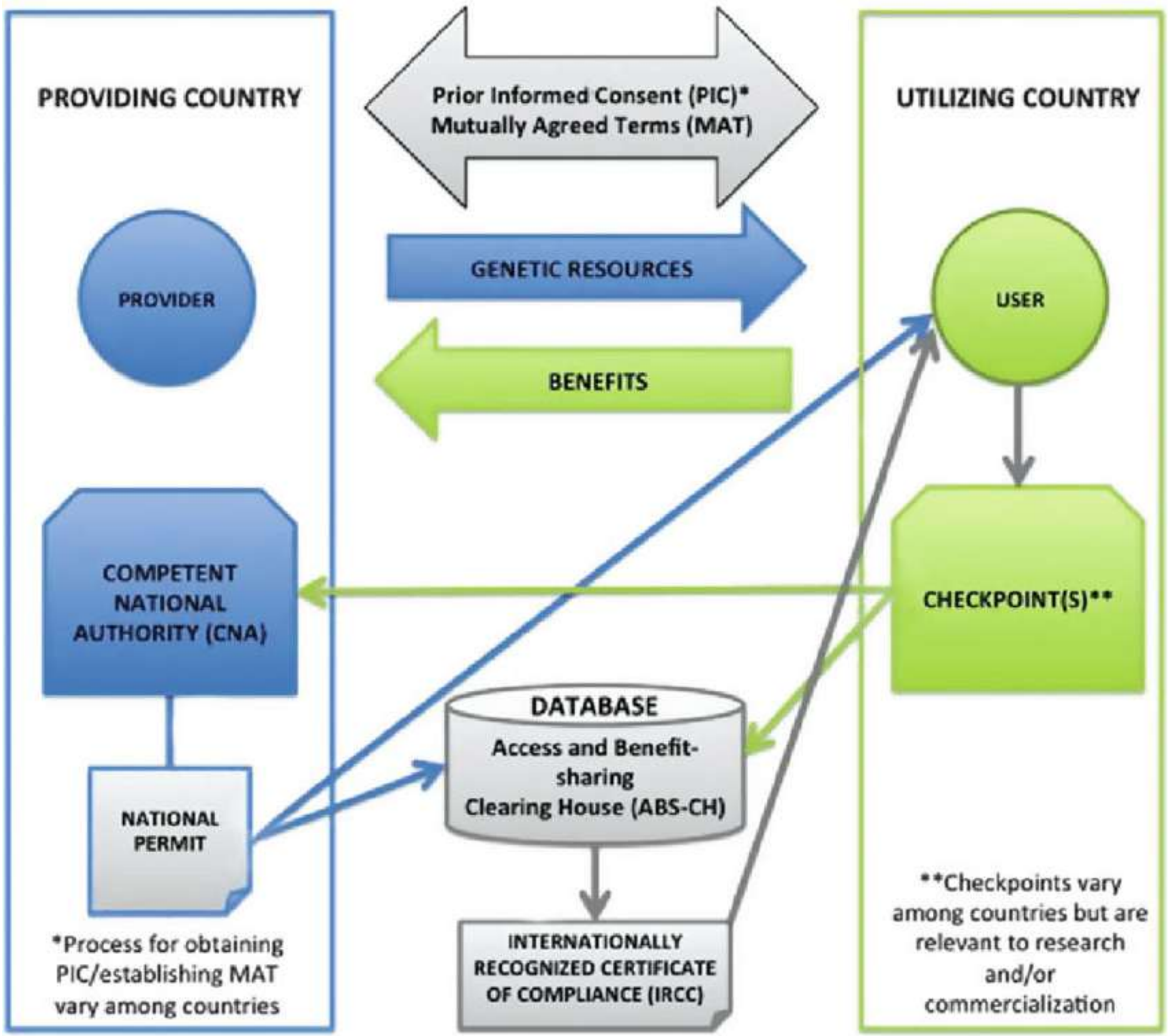
research-article

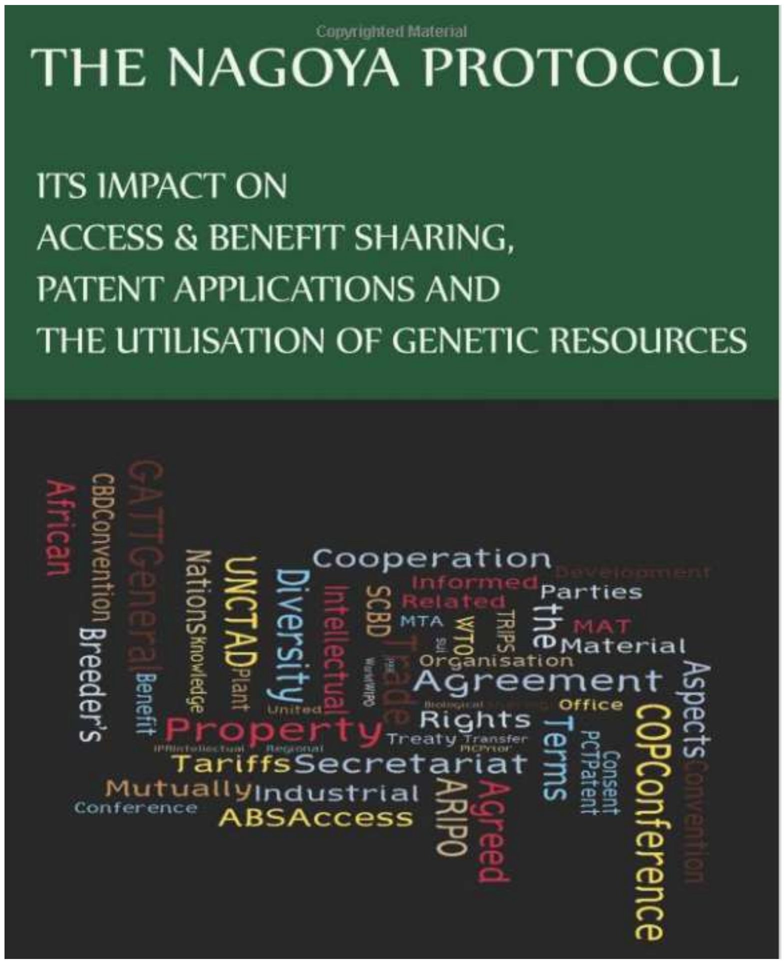
Self-organization and Social Capital
(building public goods)

ELINOR OSTROM

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

Benefit sharing, genetic ressources

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THE NAGOYA PROTOCOL
ITS IMPACT ON
ACCESS & BENEFIT SHARING,
PATENT APPLICATIONS AND
THE UTILISATION OF GENETIC RESOURCES

RIO 1992 Diversity, sustainability and equal access to natural ressources

Conference	United Nations Conference on Environment and Development (UNCED), Rio de Janeiro, 3-14 June 1992
Informal name	The Earth Summit
Host Government	Brazil
Number of Governments participating	172, 108 at level of heads of State or Government

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

بالعربية 中文 English Français Русский Español

Other Global Agreements and Commitments

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.

UN 2015, 2020

Nearly all the countries in the world have promised to improve the planet and the lives of its citizens by 2030.

They've committed themselves to 17 life-changing goals, outlined by the UN in 2015. These Global Goals, also known as the Sustainable Development Goals (SDGs), include ending extreme poverty, giving people better healthcare, and achieving equality for women.

The aim is for all countries to work together to ensure no one is left behind. You can read about the goals below, and learn how Sightsavers is helping to achieve them.

Watch the video to learn more about the Global Goals.

Take Action for the Sustainable Development Goals

The Sustainable Development Goals are the blueprint to achieve a better and more sustainable future for all. They address the global challenges we face, including poverty, inequality, climate change, environmental degradation, peace and justice. Learn more and take action.

Watch the global broadcast 'Nations United"

On the 75th anniversary of the United Nations and the 5th anniversary of the adoption of the Sustainable Development Goals – in the midst of a pandemic

Sustainable Development Goals (SDG)

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)

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

1) End poverty in all its forms everywhere
2) End hunger, achieve food security and improved nutrition, and promote sustainable agriculture

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

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

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

What is the WTO?

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

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.

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.

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

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

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

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

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

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.

Definition of an SPS Measures

To protect

- animal or plant life

From

- pests,
- diseases or
- disease-causing organisms

Beneficiaries of the SPS Agreement:

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

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.**

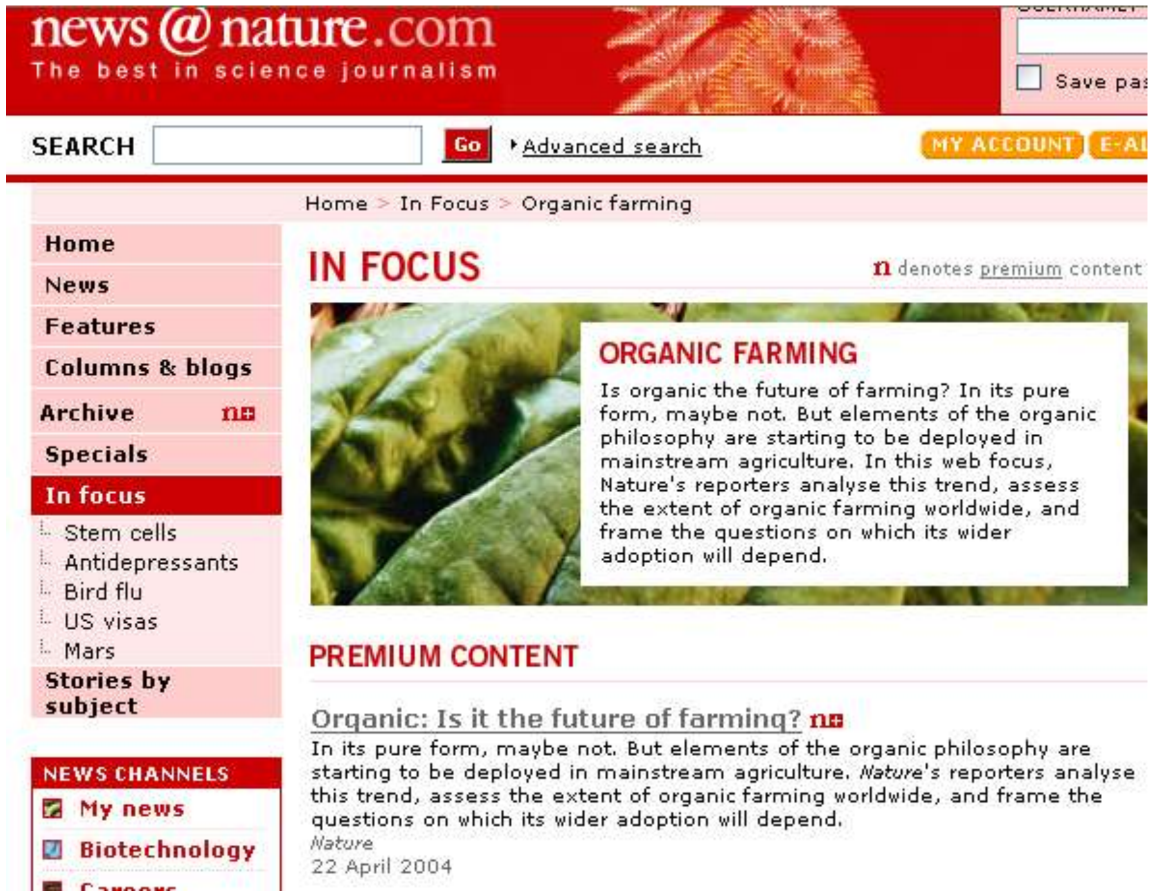
Many countries refer to this concept as the "acceptable level of risk".

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).

Organic farming

Organic farming; Nature: Elements for mainstream farming ?



Entwicklung Biolandbau

FiBL BIOSUISSE

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

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

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

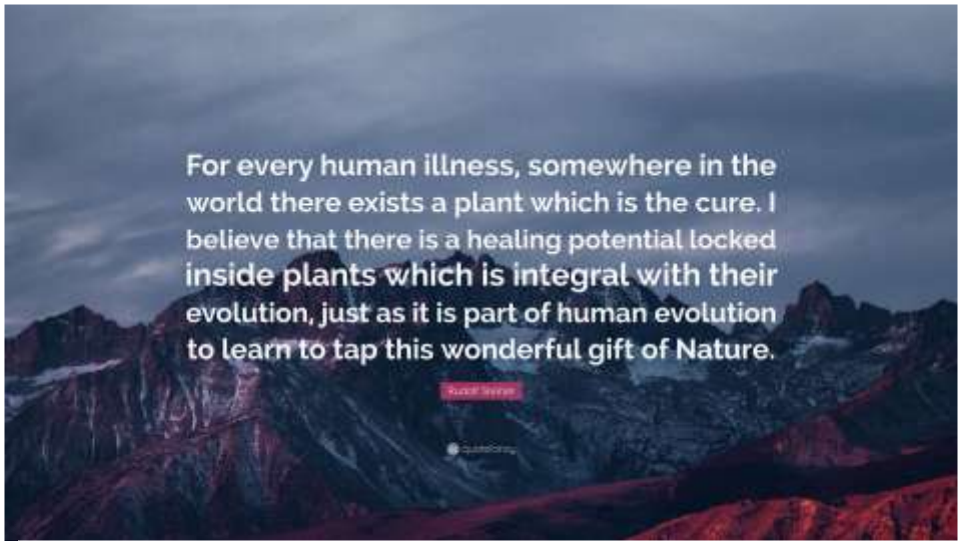
Attending the First Organic Agriculture Course: Rudolf Steiner's Agriculture Course at Koberwitz, 1924

Rudolph Steiner (1861-1925)

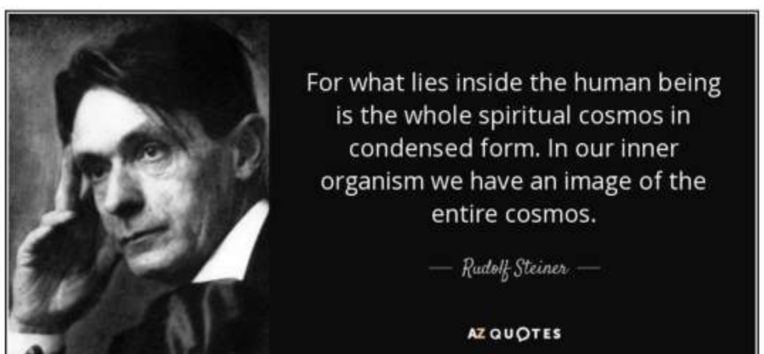
In the early 1920s, Rudolf Steiner, an Austrian philosopher, gave a series of lectures on the "Spiritual Foundations for the Renewal of Agriculture" which inspired the development of Biodynamic agriculture.

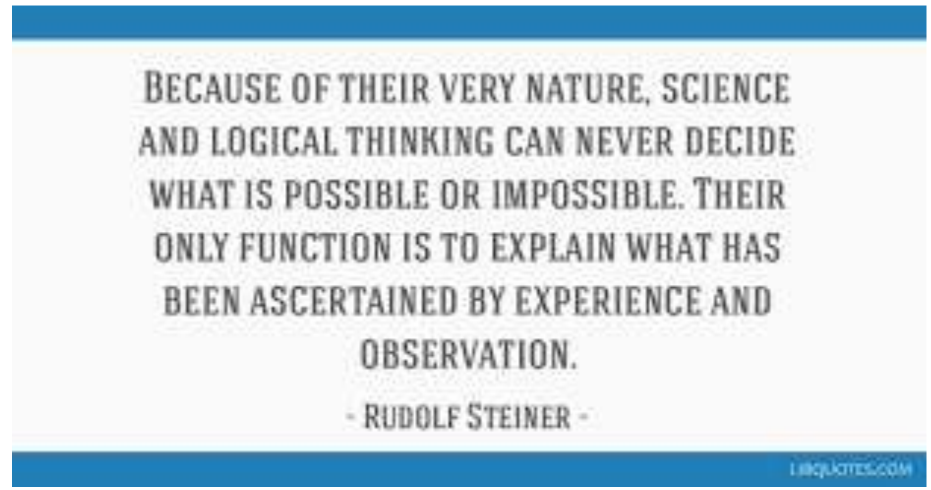
Biodynamic farming has much in common with other organic approaches, such as emphasizing the production and use of compost and excluding of the use of synthetic inputs.

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.

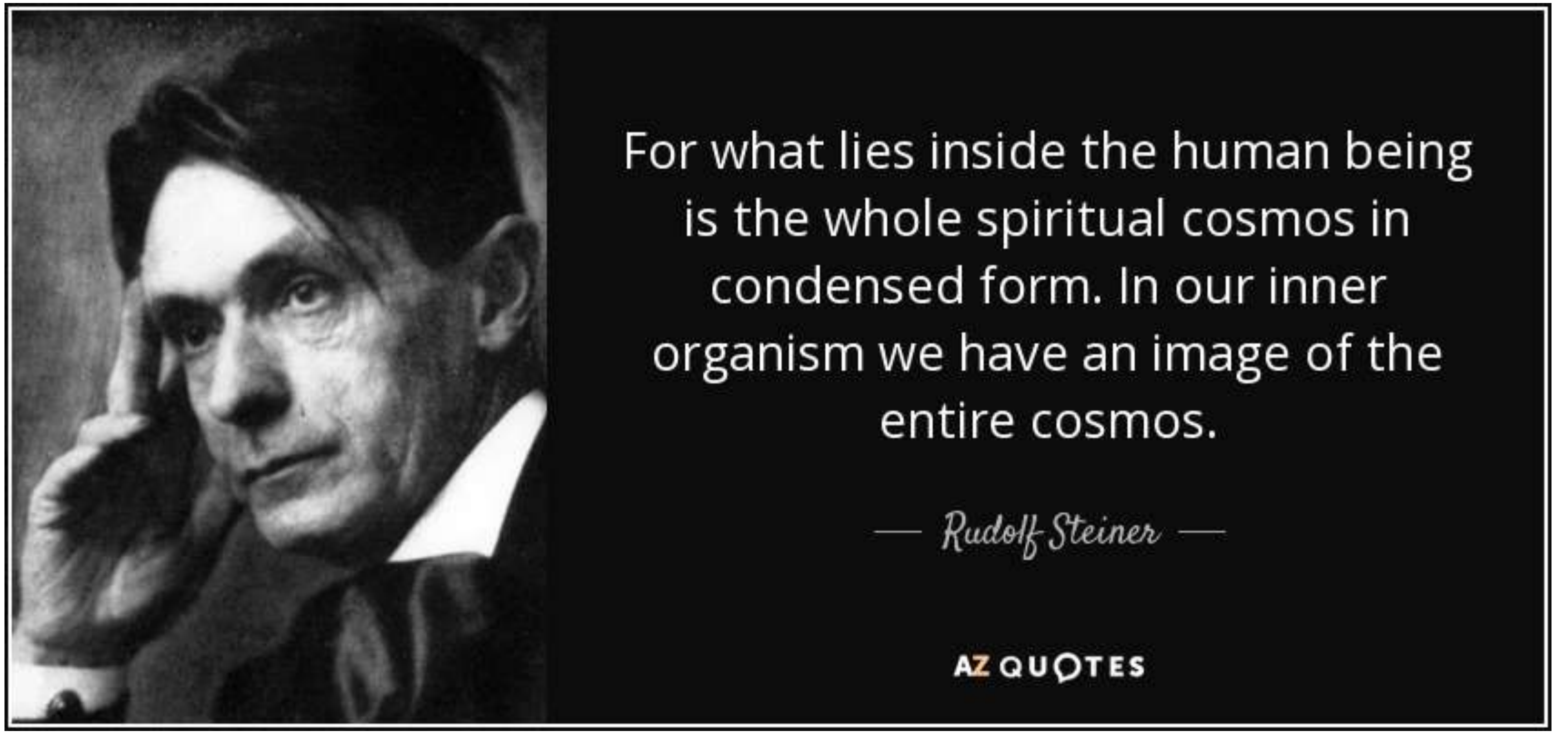


Rudolf Steiner





Rudolf Steiner



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

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)

In Switzerland in 1930, politician Hans Mueler gave impetus to organic-biological agriculture

Australias demeter farm

Australia's original Demeter Farm (1934-1954)

Dr John Paull
School of Land & Food, University of Tasmania

A self portrait of Ernesto Genoni (private collection).

Two members of Rudolf Steiner's Experimental Circle were the first to establish a Demeter Farm in Australia. In 1934 Ileen Macpherson (1898-1984) and Ernesto Genoni (1885-1964) founded their 'Demeter Biological Farm' on the Princes Highway in Dandenong, Victoria. They were guided by Steiner's book of his Agriculture Course (1924). They managed their 40 acre farm using biodynamic (BD) practices for the next two decades (Paull, 2014a).

Ernesto first met Rudolf Steiner (1861-1925) at the Goetheanum, Dornach, Switzerland, in 1920. He spent 1924 studying with Steiner at the Goetheanum. In that year, he learned German, experimented with painting in the Anthroposophic style, and he was accepted into Steiner's First Class. This was the year of Steiner's Agriculture Course and Steiner's final year of public life (Paull, 2011a).

Ernesto migrated to Australia in 1926. He was the first Australian to join the Experimental Circle of Anthroposophic Farmers and Gardeners (in 1928). In his application he stated he would farm at Dalmore (it is about 70 km south east of Melbourne). Ernesto's Dalmore Farm was a short-lived venture with his brother Fred Genoni. It came to an end when it was flooded out.

Ernesto embarked on a grand tour of biodynamics in Europe. "In 1930 I went to Dornach again to become acquainted with the B.D. farming" (Genoni, c.1955, p.21). Ernesto visited BD farms in Switzerland, Germany, Holland and England (Genoni, 1932). In his travels he met the European legends of BD including Dr Ehrenfried Pfeiffer, Erika Riese, Ernst Stegemann, Erhard Bartsch, Max Schwarz, and Carl Mirbt (Genoni, c.1955).

Ernesto (along with Anne Macky) had already founded an Anthroposophy study group in Melbourne (in 1928). It was at one of his lectures on Anthroposophy that Ileen met Ernesto. Ernesto was an Italian artist, he had trained at the Brera Academy of Fine Art in Milan. He was handsome, dapper and somewhat other-worldly. "He was dark, with flashing eyes, hair swept back off his forehead, and an exotic look ... Ernesto was slender, serious, aesthetic and elegant. His voice was clipped, his sentences crisp and his manner refined" (Triaca, 1985, p.116). He was known in his family as 'the philosopher'.

Ileen's niece, Peggy Macpherson, recalled: "With Ileen and Ernesto, in the very beginning ... she was searching ... for something, she had lived in the country for all of her life and she was down here, had moved to Melbourne to live and spent her time going to lectures and everything that was on, and one day she was at a lecture ... at the Anthroposophical Society

The Farm as Organism:
The Foundational Idea of Organic Agriculture

John Paull

School of Geography and Environmental Studies, University of Tasmania.

The term *organic farming* was coined by Oxford University agriculturalist Lord Northbourne, in his book *Look to the Land*, and published in wartime England in 1940. It was a response to what he dubbed *chemical farming*, and from the outset he presented these as two mutually incompatible, and contesting, agricultural methodologies. The terms are introduced in contention: "organic versus chemical farming" in the Chapter 3 heading (Northbourne, 1940, p. 81).

Northbourne's key contribution is the idea of *the farm as organism*. He wrote of "the farm as a living whole" (p.81). In the first elaboration of this concept, he wrote that "the farm itself must have a biological completeness; it must be a living entity, it must be a unit which has within itself a balanced organic life" (p. 96). A farm that relied on "imported fertility … cannot be self-sufficient nor an organic whole" (p.97). For Lord Northbourne "the farm must be organic in more senses than one" (p. 98), and he presents the holistic view that "The soil and the microorganisms in it together with the plants growing on it form an organic whole" (p. 99).

Northbourne was influenced by the thoughts of Rudolf Steiner (1924), and he implemented those ideas on his own estate in Kent. He wrote that: "the *bio-dynamic* method, evolved in accordance with the recommendations of the late Dr. Rudolf Steiner. The ... method has been highly developed in the course of some fifteen years' work on the Continent, and its effectiveness can be said to be proved" (Northbourne, 1940, p. 173). In his bibliography he includes Dr. Ehrenfried Pfeiffer's: *Bio-dynamic Farming and Gardening*, which he describes as an account of Steiner's methods.

The first occurrence of *organic farming* as a distinct phrase appears where he warns: "In the long run, the results of attempting to substitute chemical farming for *organic farming* will very probably prove far more deleterious than has yet become clear. And it is perhaps worth pointing out that the artificial manure industry is very large and well organized. Its propaganda is subtle, and artificials will die hard'" (p. 103). It ap-

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

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»

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

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

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

INTERNATIONAL FEDERATION OF ORGANIC AGRICULTURE MOVEMENTS

- IFOAM, internationale Dachorganisation der Bioorganisationen mit etwa 800 Mitgliedern in 120 Ländern (Gründung 1972)

Bilder: FiBL, IFOAM

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)

BIOSUISSE

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

Bilder: Bio Suisse

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

Initiative von Pionieren wächst zur Bewegung

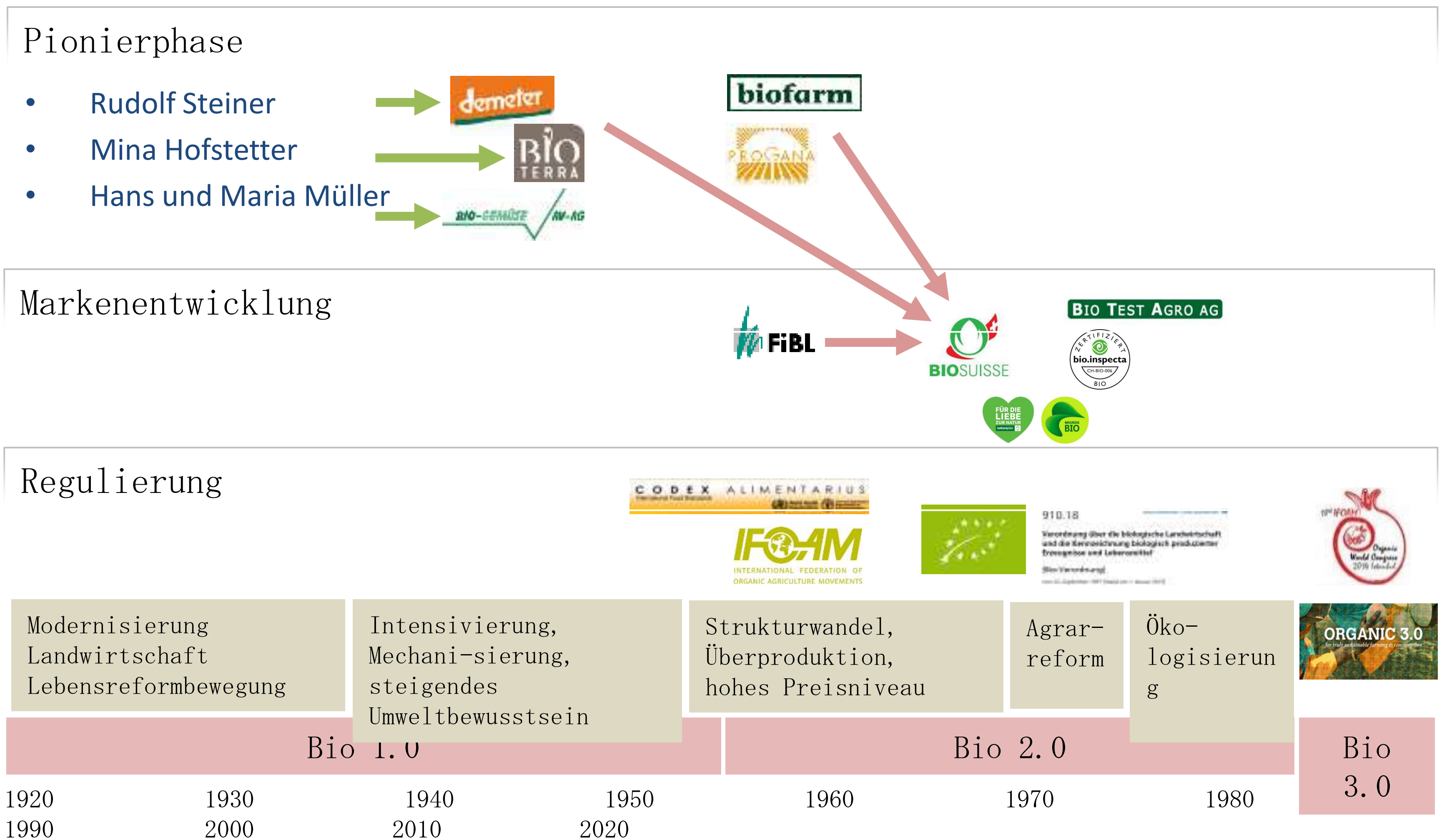
Einstieg der Grossverteiler führt zu Bio-Boom

- 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

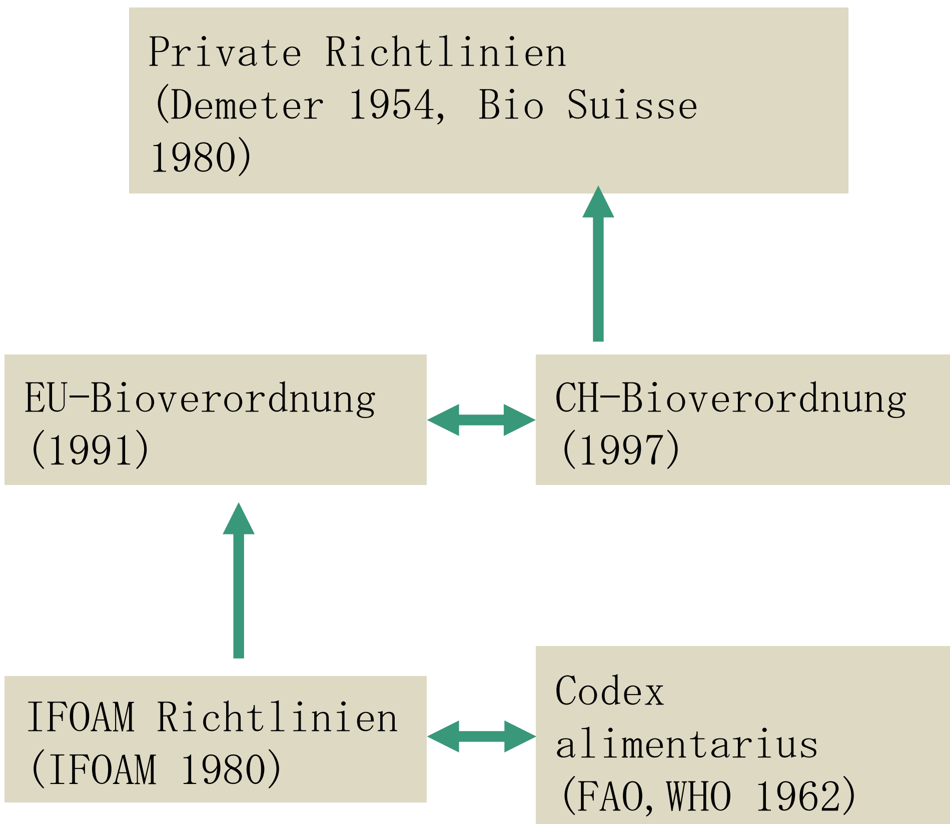
Übersicht: Meilensteine in der Bio-Geschichte

Personen, Organisationen und Meilensteine



Übersicht: politische Verankerung von Bio

Anerkennung der Biorichtlinien bringt gesetzl. Schutz



- 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

Übersicht: Agrarsysteme im Vergleich

Zeitliche Entwicklung und Ökologisierungsgrad

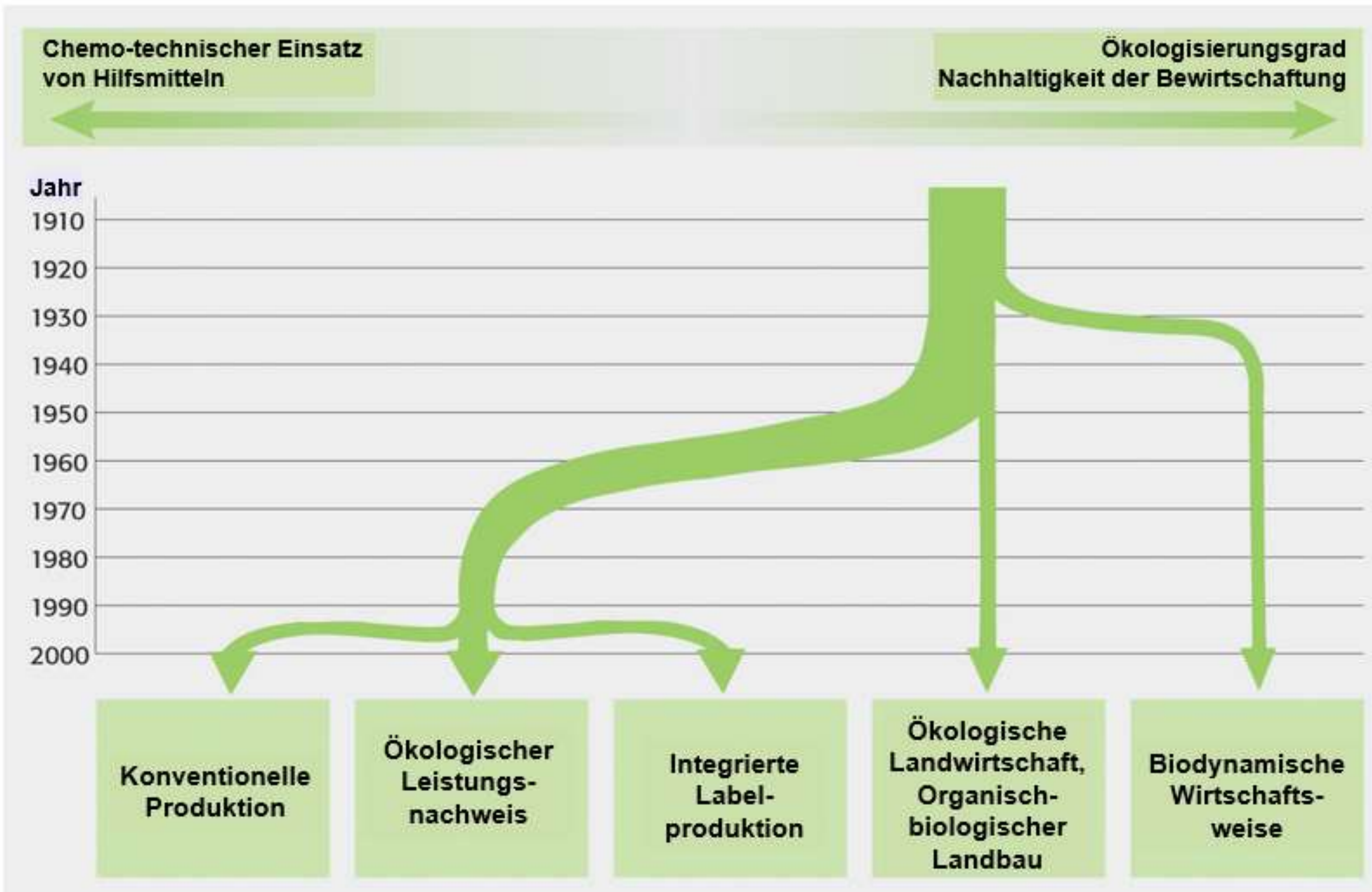


Bild: «Biologischer Landbau» LmZ (O. Schmid, R. Obrist)

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)

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:

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)

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, Ressourceneffizienz, 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)

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)

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**

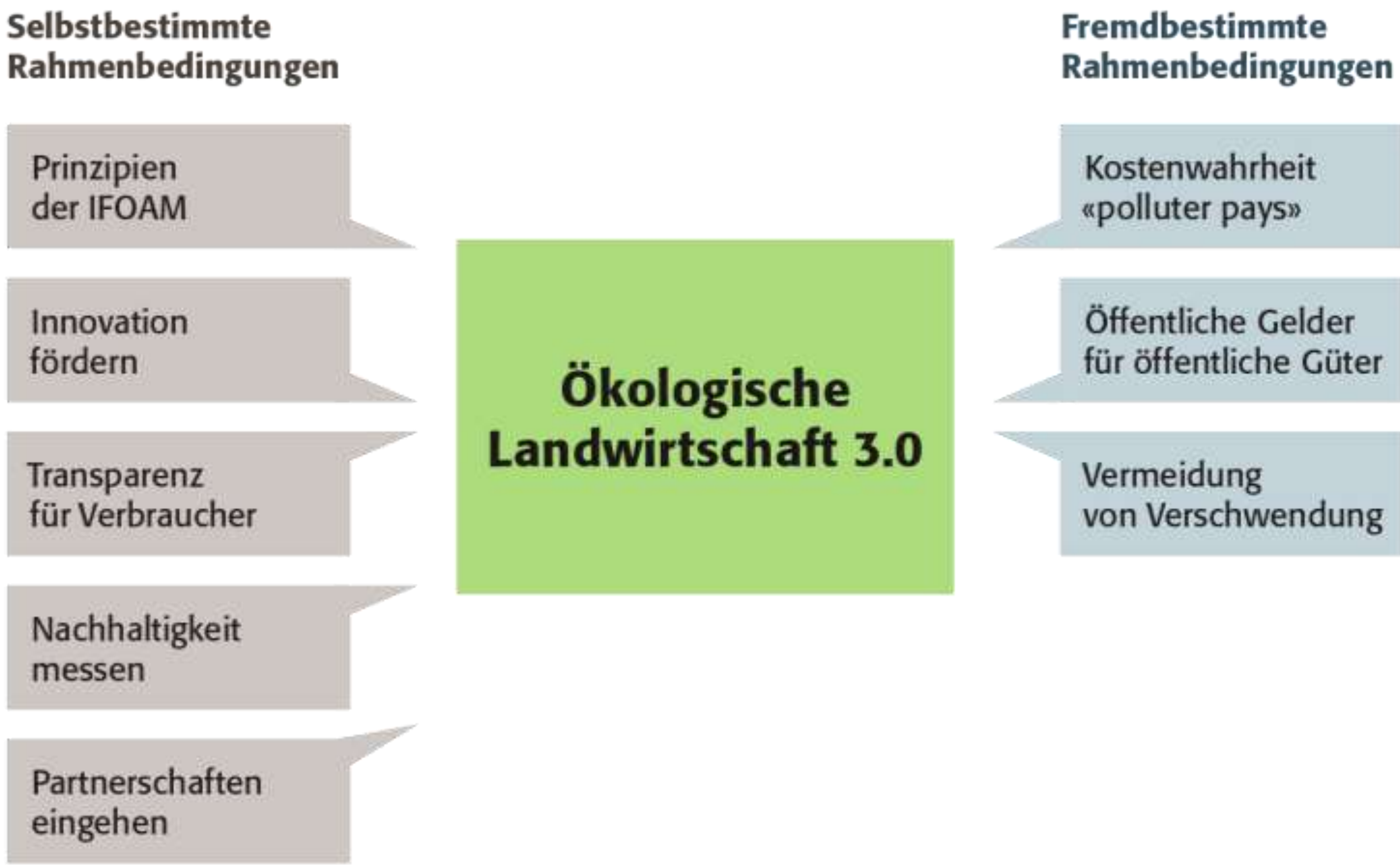
- **Transparenz und Sicherheit** in den Wertschöpfungsketten

- Zu verbessernde differenzierte **Kommunikation mit Verbrauchern**

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

Bio 3.0

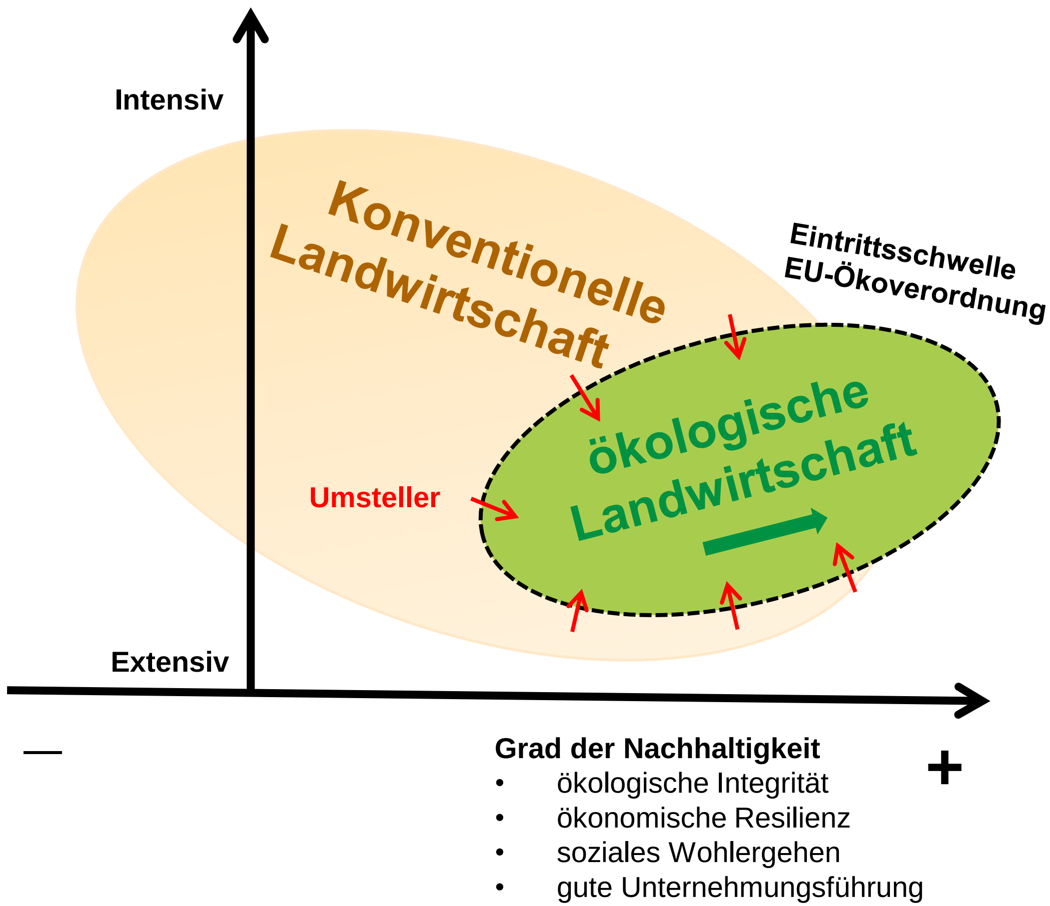
Rahmenbedingungen Weiterentwicklung Biolandbau



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

Bio 3.0

Erhöhte Produktivität dank ökologischer Intensivierung



- Biolandbau kann Produktivität steigern dank noch besserer Nutzung betriebseigener Kreisläufe und Ressourcen (Nachhaltigkeit erhalten).

- Konventionelle Land-wirtschaft kann nur dann ökologisch nachhaltiger werden, wenn betriebs-fremde Abhängigkeiten von Stoffflüssen und Mitteln (Dünger, PSM) reduziert werden.

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

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)

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

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

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

Pflanzenbau

Foliensammlung

Pflanzenbau: Bodenfruchtbarkeit

Biomasse in 1 Hektare Boden

- 1 Hektare Boden (Grünland) ernährt

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

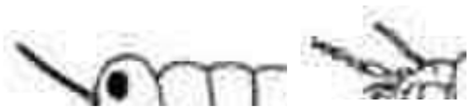
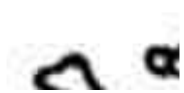
unterirdisch
bis 3 Mio. Regenwürmer
(Gesamtgewicht bis 1t)

unterirdisch
übrige Bodenlebewesen (Gesamtgewicht bis 5t)

Bild: FiBL

Pflanzenbau: Bodenfruchtbarkeit

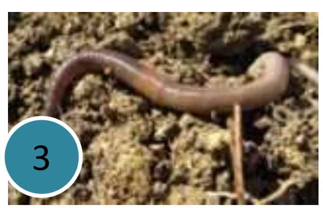
Lebewesen in einer Handvoll Gartenerde

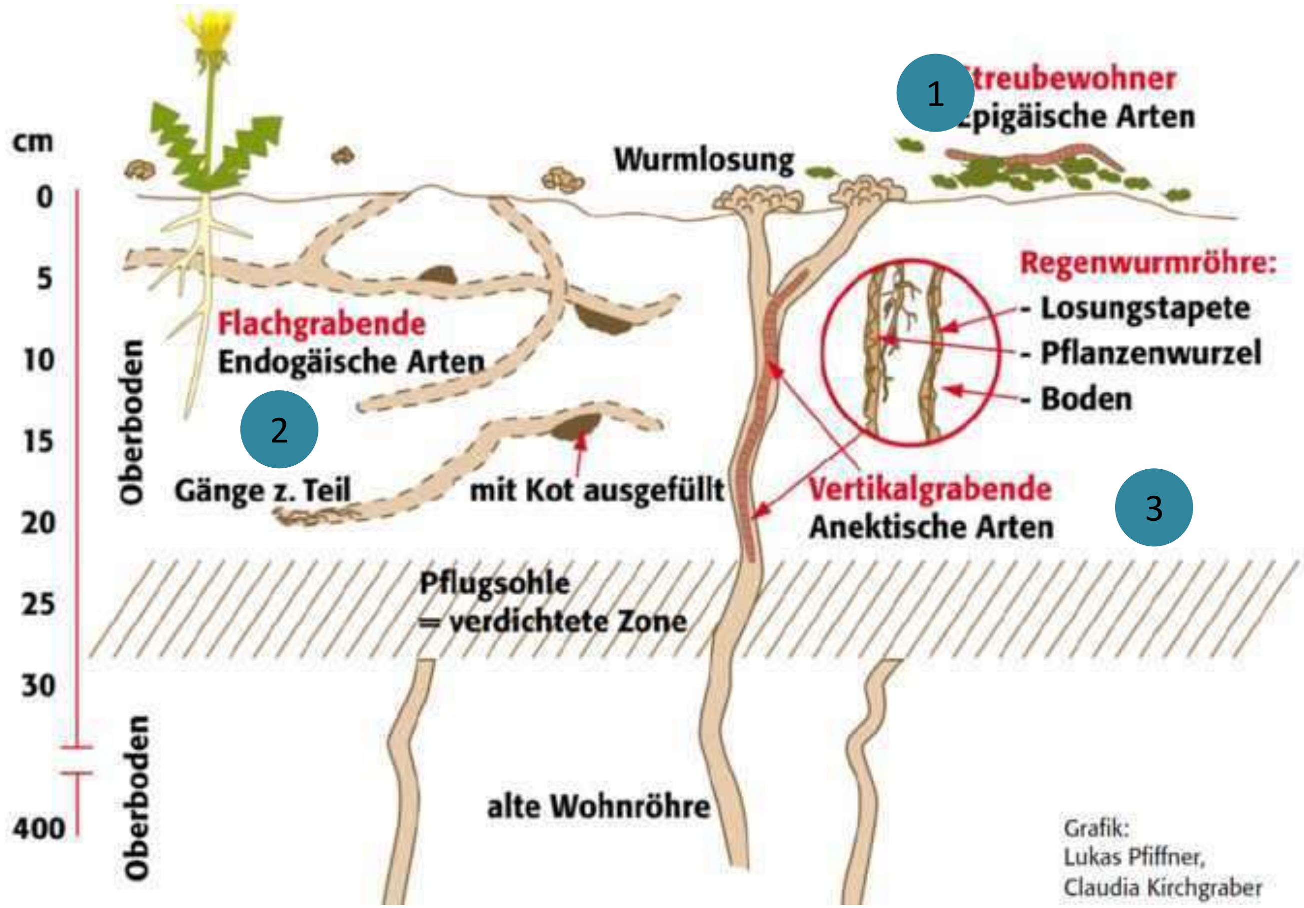
	0,2 mm bis wenige cm	100	Insekten und Milben
	20 –180 mm	110	Gliederwürmer
	0,3 – 9 mm	250	Springschwänze
	bis 2 mm	25’000	Fadenwürmer
	bis 200 µm	7’500’000	Protozoen
	5 – 50 µm	12’500’000	Algen
	5 – 50 µm	100’000’000	Pilze
	1 – 2 µm	125’000’000	Bakterien

Pflanzenbau: Bodenfruchtbarkeit

Regenwürmer: Baumeister fruchtbarer Böden

- Drei ökologische Arten



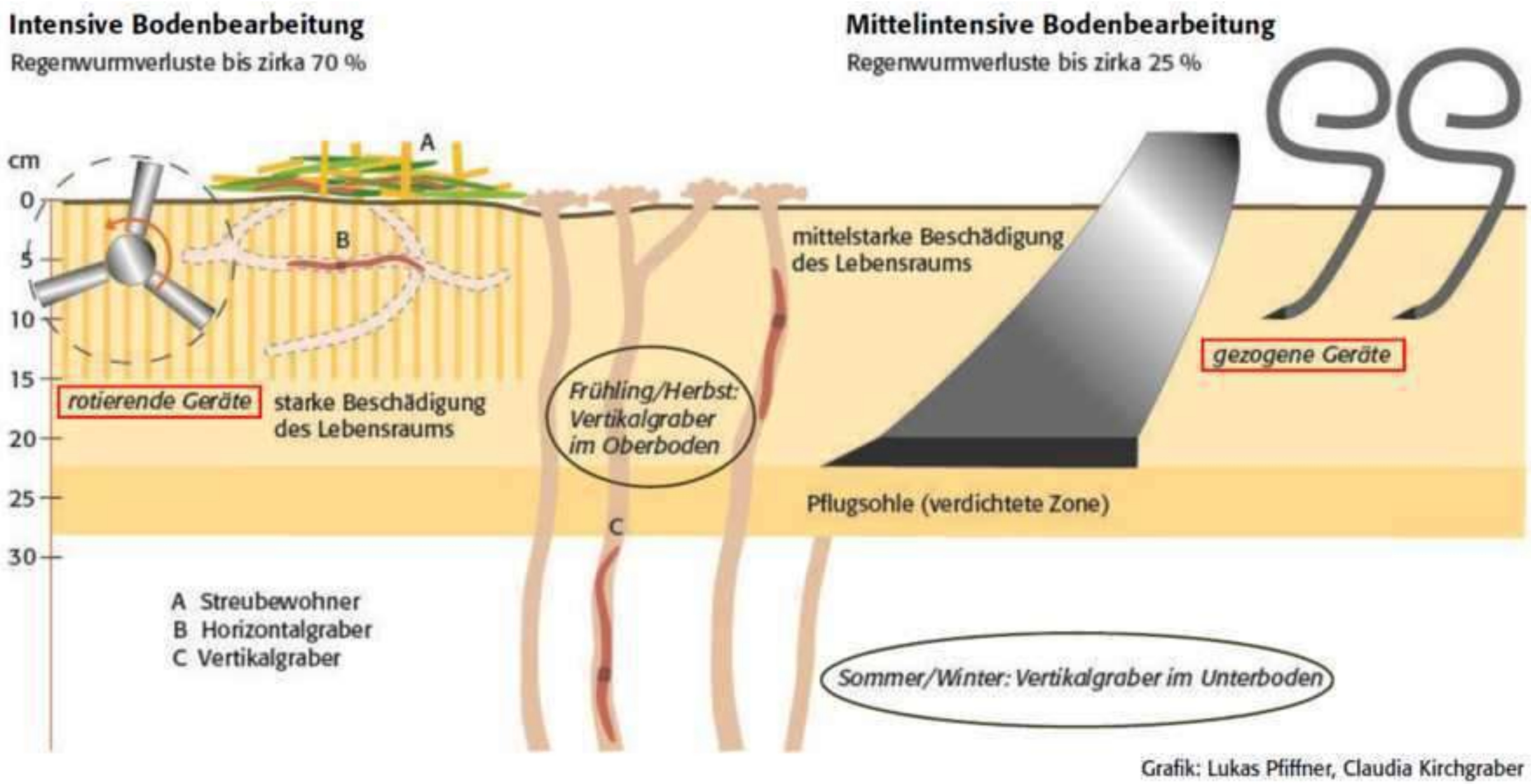


Fotos: L. Pfiffner, FiBL.

Grafik: L. Pfiffner, C. Kirchgraber, FiBL

Pflanzenbau: Bodenfruchtbarkeit

Schonung der Regenwürmer



Grafik: L. Pfiffner, C. Kirchgraber, FiBL

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

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

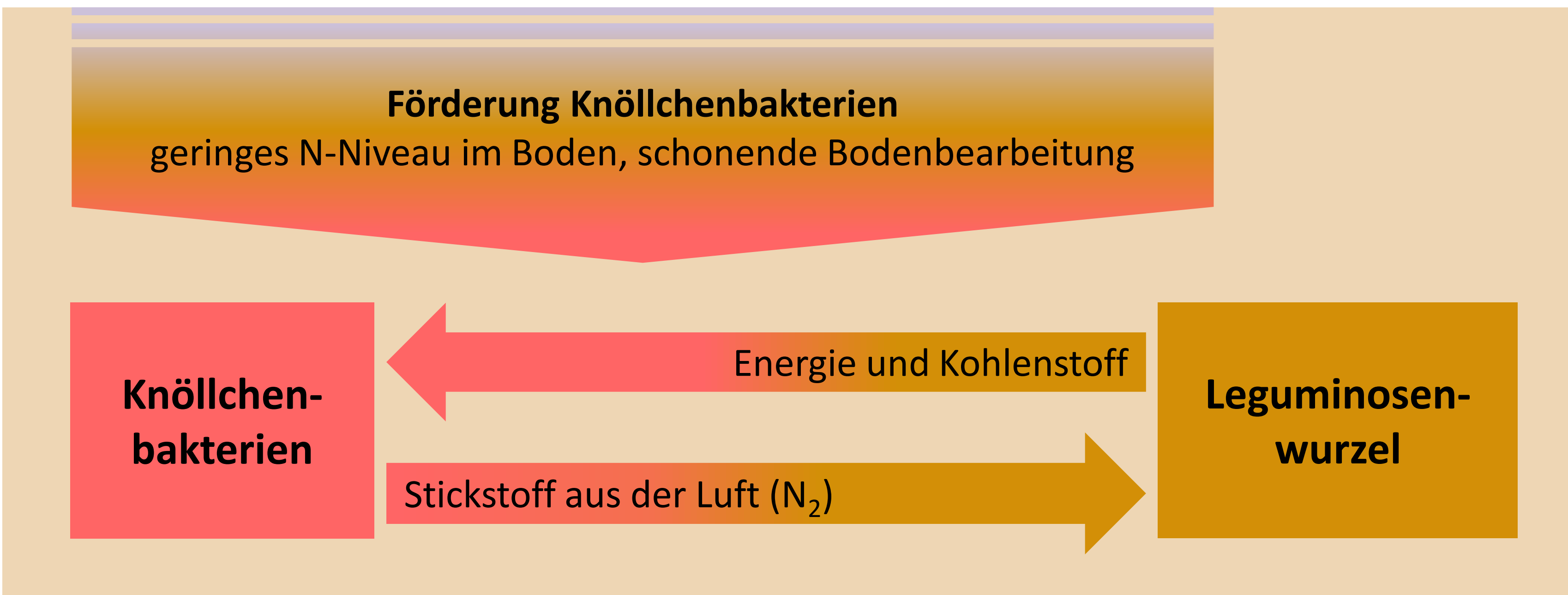


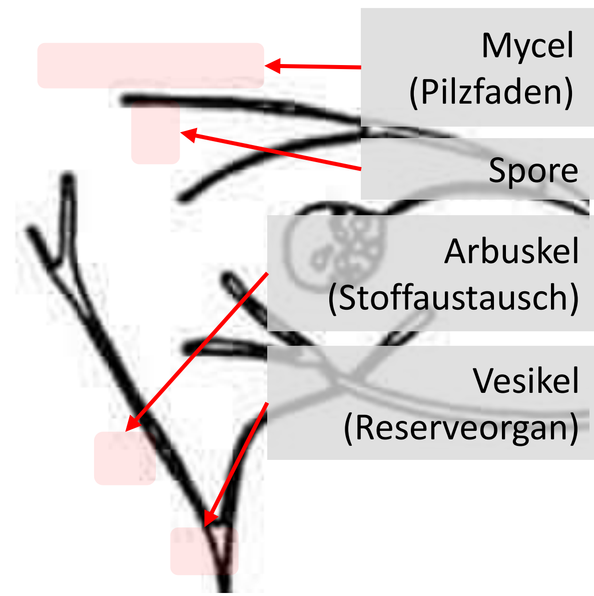
Bild: FiBL

Pflanzenbau: Bodenfruchtbarkeit

Mykorrhiza-Pilze: verbesserte Nährstoffaufnahme

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

Quelle: FiBL-Dossier «Bio fördert Bodenfruchtbarkeit und Artenvielfalt»



Wurzel (Längsschnitt)

Bild: P. Mäder, FiBL

Pflanzenbau: Bodenfruchtbarkeit

Symbiose mit Mykorrhiza-Pilzen

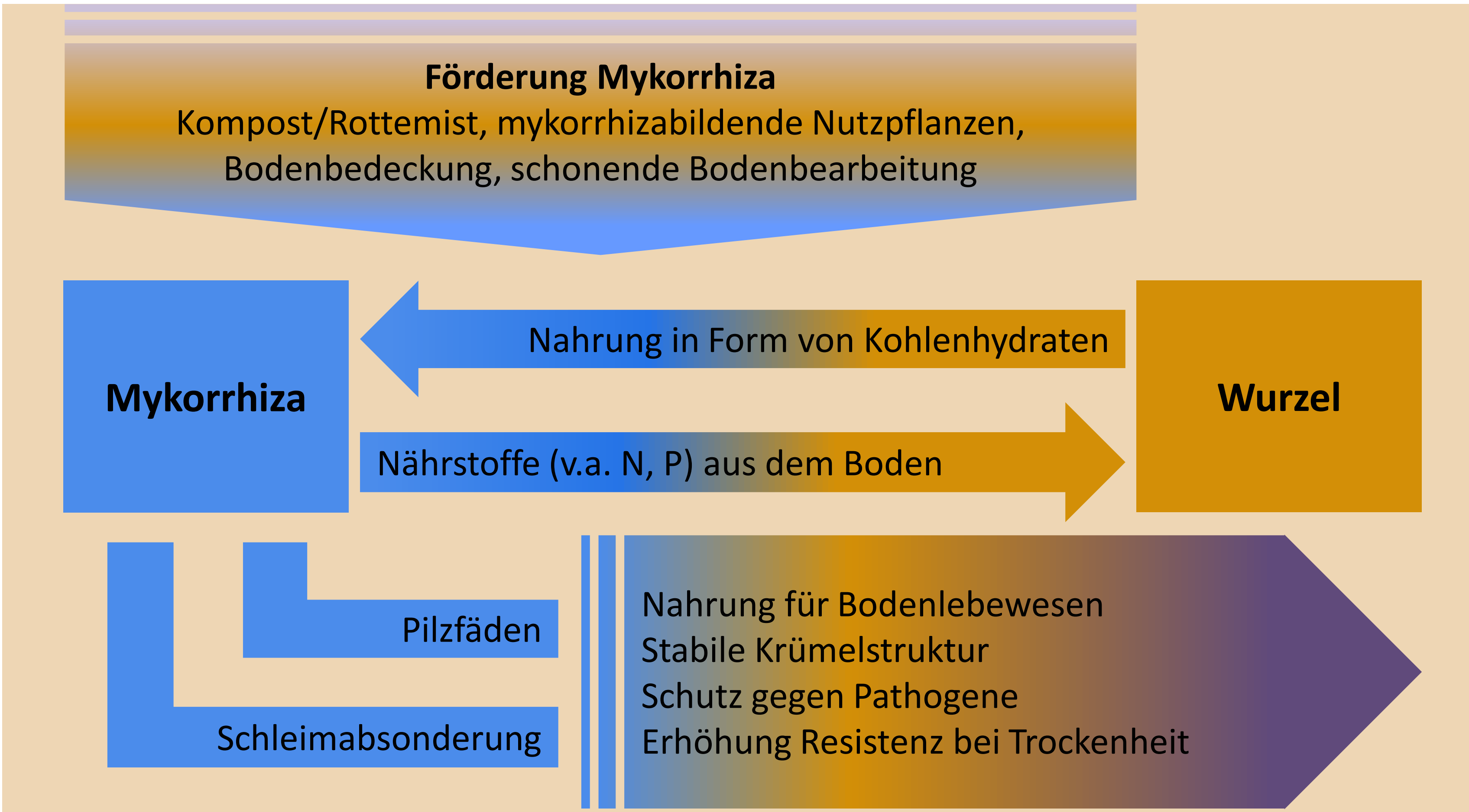


Bild: FiBL

Pflanzenbau: Bodenfruchtbarkeit

Einflüsse und Faktoren der Bodenfruchtbarkeit

Mineralzusammensetzung
P-Verfügbarkeit
Steinmehleinsatz
Bodenbeprobung

Bodenbearbeitung
Pflugeinsatz
Bearbeitungstiefe
Zapfwellengetrieben

Ernährung Bodenleben
Hofdüngeraufbereitung
Futtermenge
Vielfalt Gründüngung

Bodenlebewesen
Vielfalt
Menge

Humusgehalt
Humusbilanz
Humusauf- und -abbau
Kohlenstoffeinbindung

Gründigkeit
Bedeutung Tiefwurzler
Durchwurzelung
Bewirtschaftung

Bodenstruktur
Wasser-, Luftaustausch
Verdichtung
Stabilität

Bild: T. Alföldi, FiBL

Pflanzenbau: Bodenfruchtbarkeit

Humuswirtschaft im Biolandbau

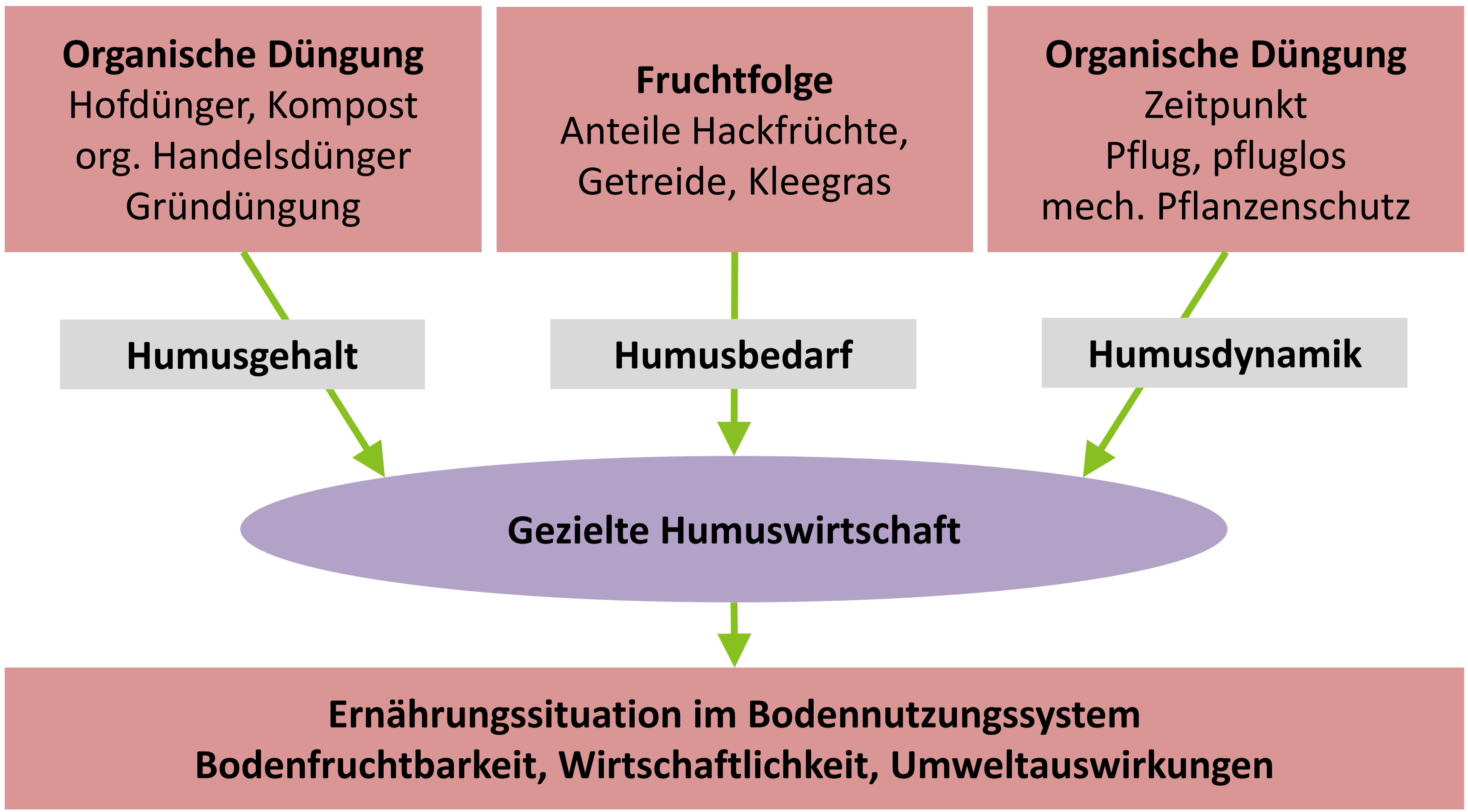
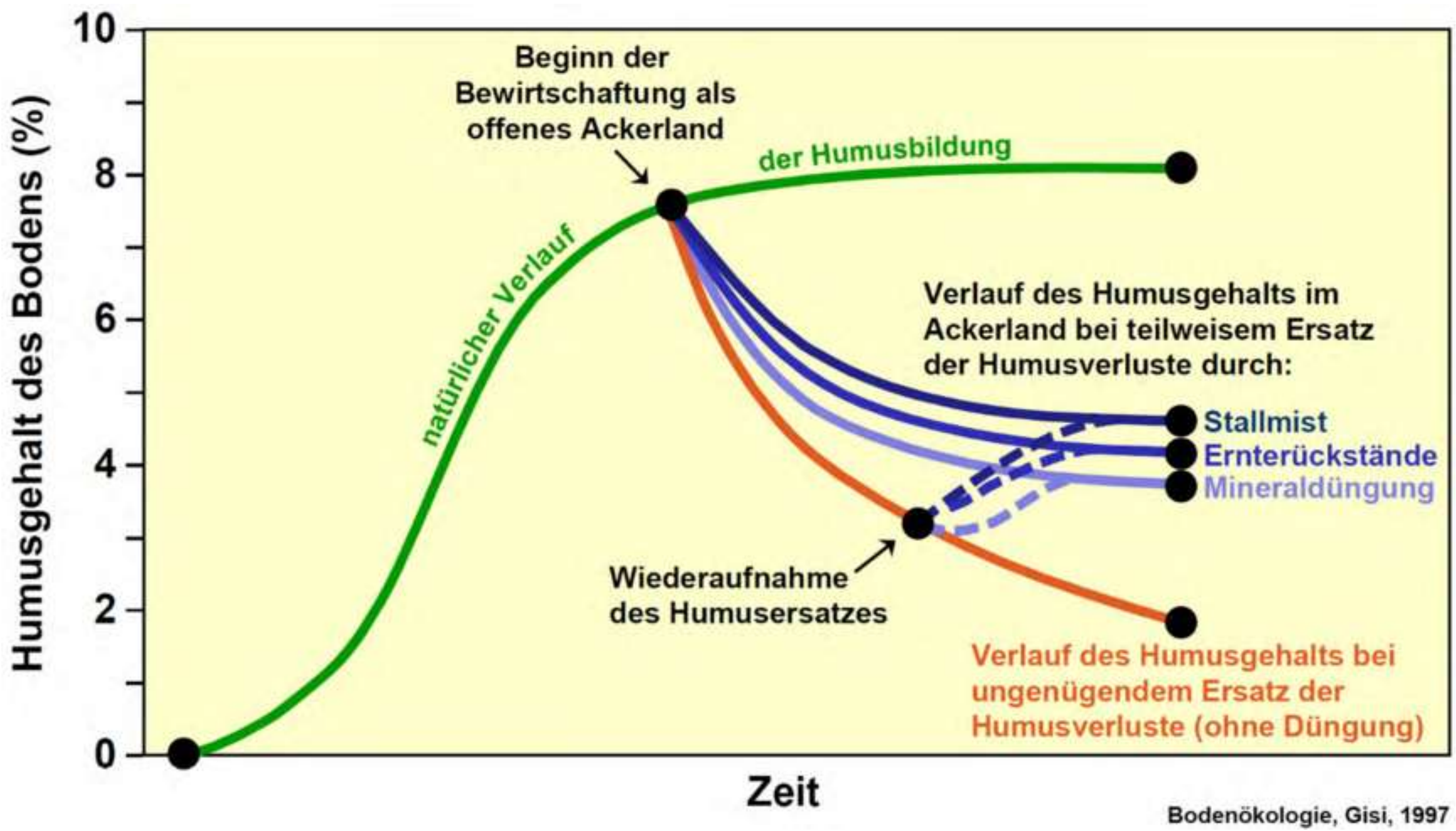


Bild: nach T. Alföldi 1999, FiBL

Pflanzenbau: Bodenfruchtbarkeit

Humusbildung in Abhängigkeit von Bewirtschaftung



Pflanzenbau: Bodenfruchtbarkeit

Förderung der Bodenfruchtbarkeit

Schonende, effektive Bodenbearbeitung
Nur bei trockenem Boden
Keine schweren Maschinen
«Flach wenden, tief lockern»
Ansaatverfahren (Direkt-, Streifen, Mulchsaat)
Keine schnell rotierende, schneidende Bodenbearbeitungsgeräte

Struktur-, humusmehrende Bewirtschaftung
Hoher Kleegrasanteil
Zwischenkulturen
Ausbringen von Kompost
Einarbeiten org. Material
Möglichst ganzjährige Bodendeckung
Keine leichtlöslichen Dünger und Pestizide

Fotos: FiBL

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

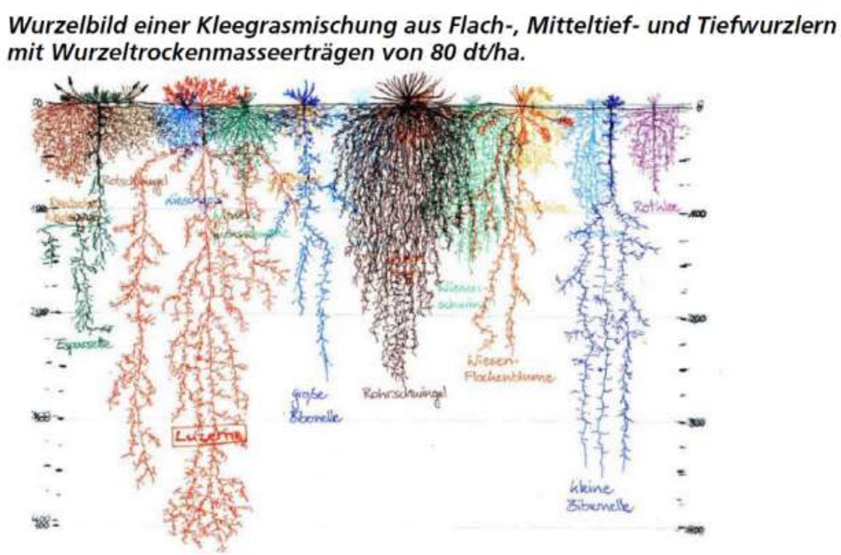
Quelle: nach Kahnt, 1983

Pflanzenbau: Bodenfruchtbarkeit

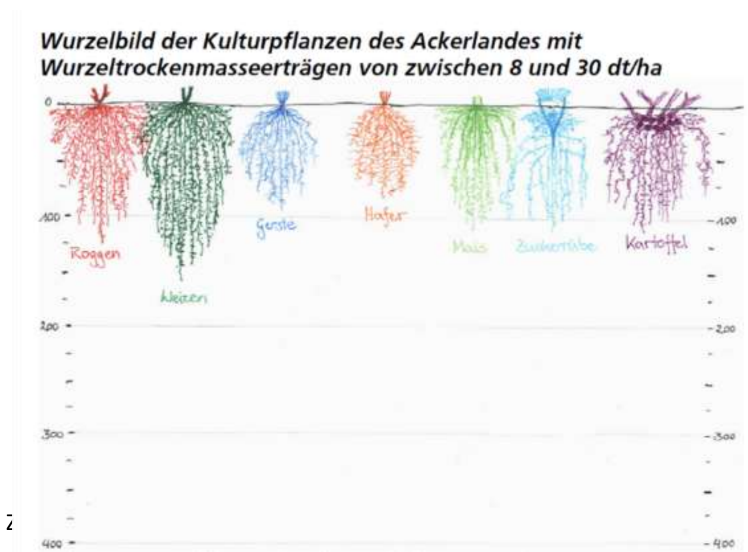
Durchwurzelung des Bodens

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

- Wurzelbild Kleegrasmischung

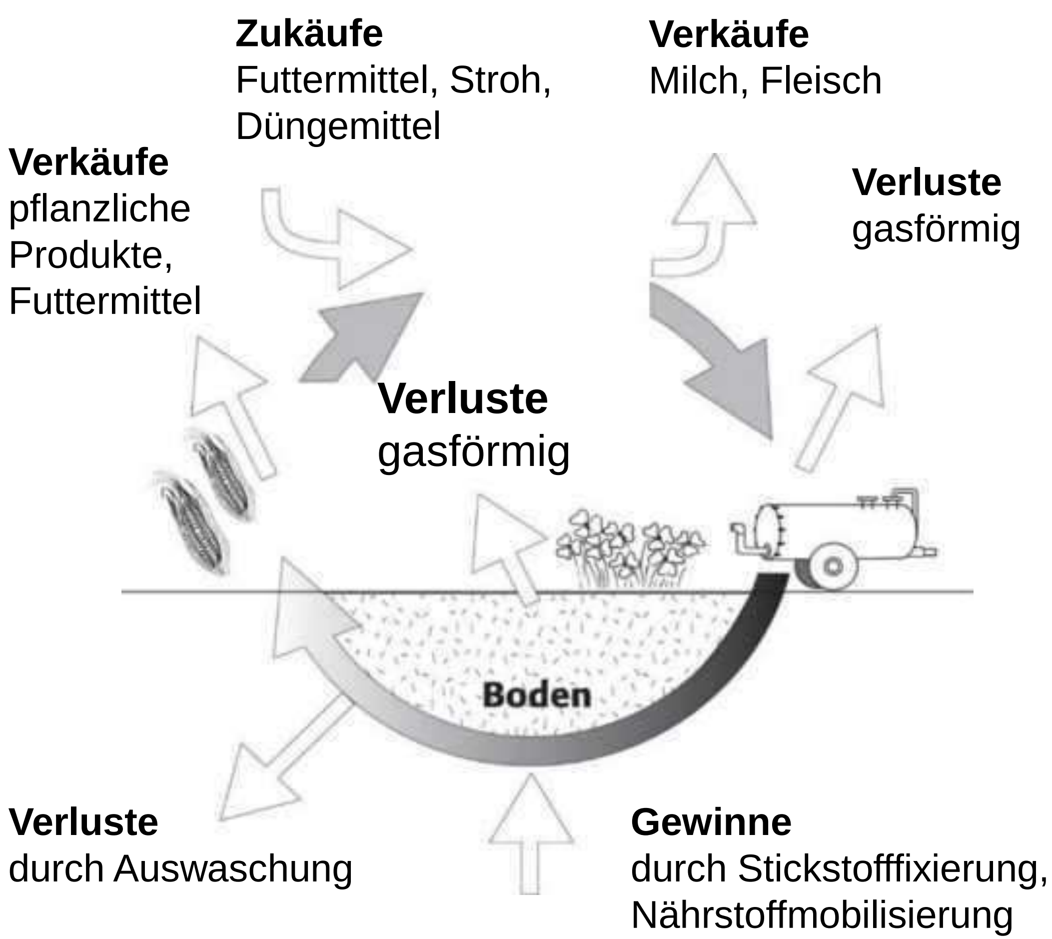


- Wurzelbild Ackerkulturpflanzen



Pflanzenbau: Nährstoffversorgung

Nährstoffkreisläufe

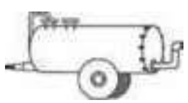


- Biolandbau
  - Möglichst geschlossene Nährstoffkreisläufe anstreben
  - «Abfallprodukt» wird zum Betriebsmittel (Futter, Dünger, usw.)

- **Vorteile**
  - Geringe Inputs von Aussen
  - Geringere Kosten
  - Weniger Energie für Düngerherstellung und Transporte

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

Pflanzenbau: Nährstoffversorgung

Nährstoffgehalte in einem Mineralboden

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

Foto: H. Dierauer, FiBL

stabil gebunden

labil gebunden

gelöst im Wasser

In kg pro Hektare in 0-30 cm Bodentiefe, (Orientierungs- werte)

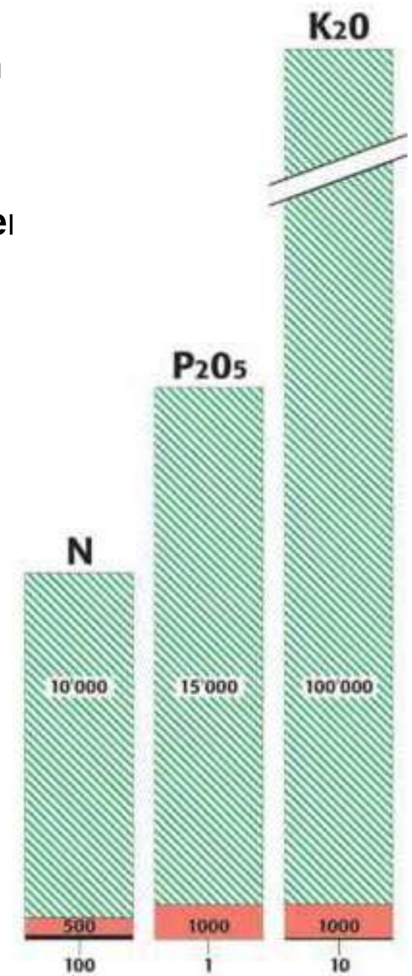


Bild: FiBL

Pflanzenbau: Nährstoffversorgung

Indirekte Nährstoffversorgung

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

Bild: FiBL

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

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	

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.)

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

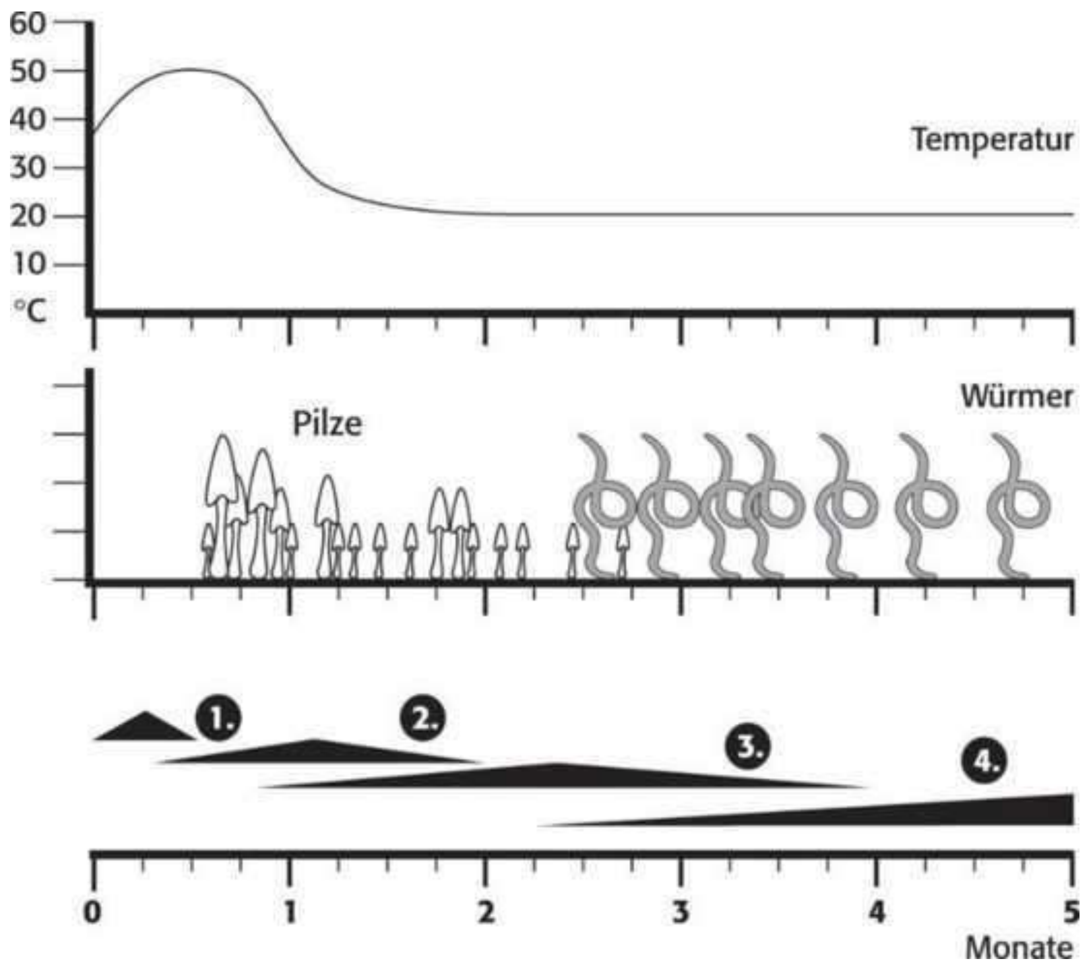
Pflanzenbau: Düngung

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

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

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

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.

Pflanzenbau: Düngung

Stickstoffkreislauf im Boden

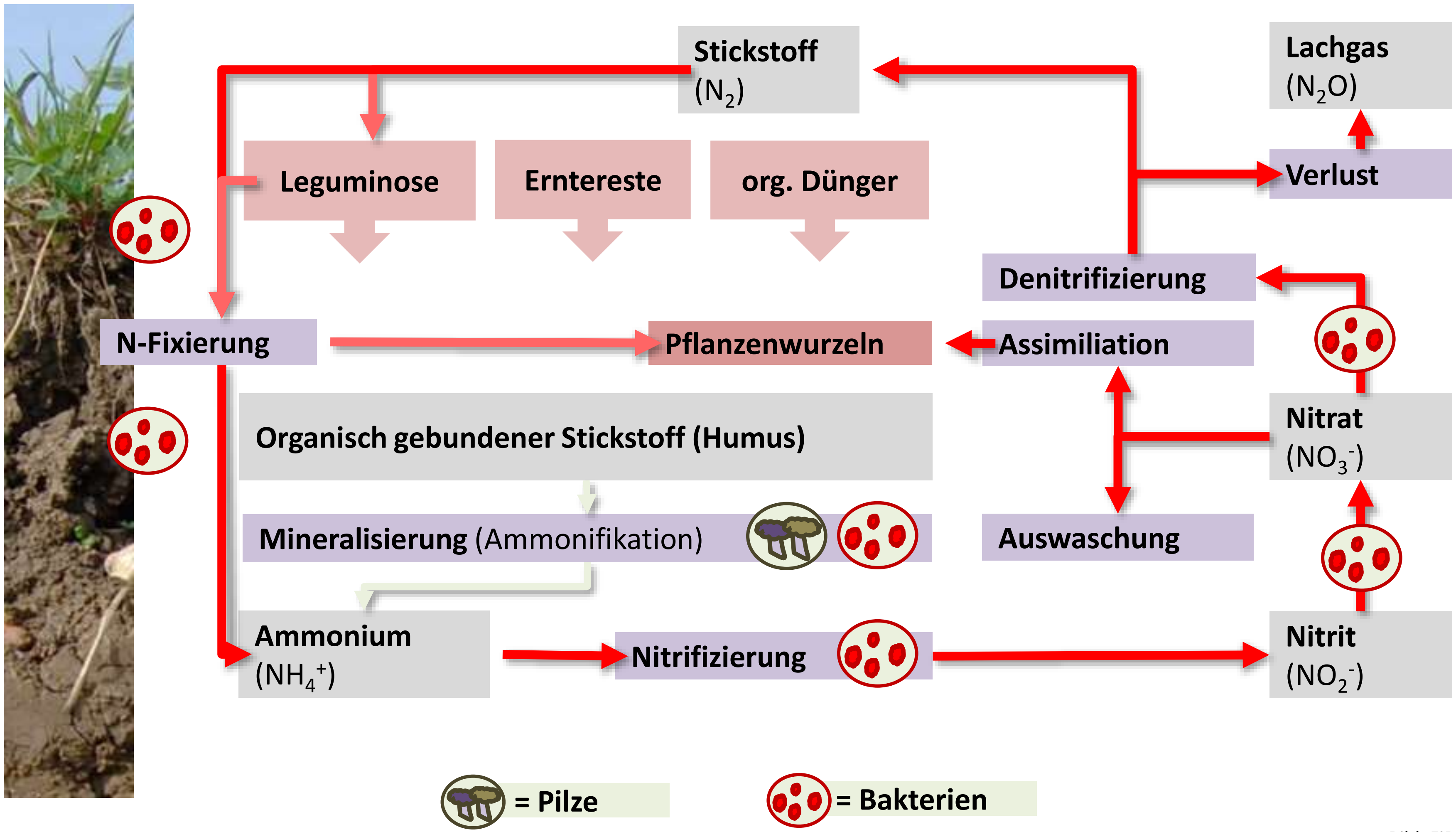


Bild: FiBL

Pflanzenbau: Düngung

Pflanzenverfügbarkeit von Stickstoff

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

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

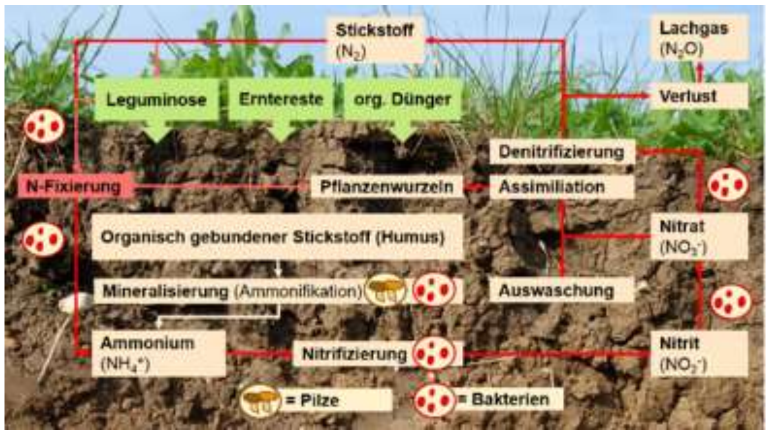
- **Nitrat**
- (NO_3^-)

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

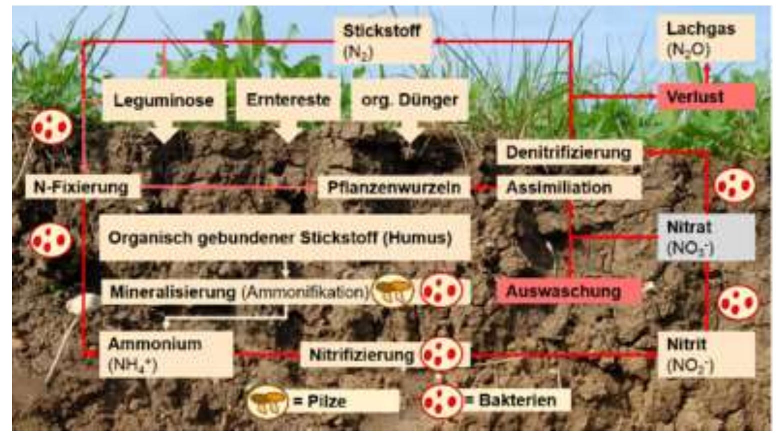
Pflanzenbau: Düngung

Strategie nachhaltiges N-Management

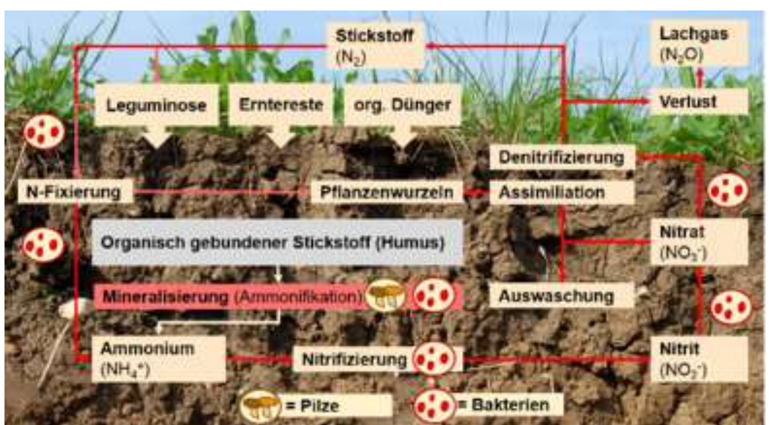
- Optimierung N-Input



- Minimierung Nitrat-Verluste



- Optimierung N-Mineralisierung



- N-Mineralisierung ←→ N-Assimilation

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

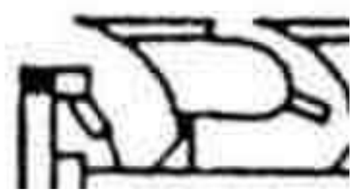
Pflanzenbau: Bodenbearbeitung

Ziele der Bodenbearbeitung

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

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

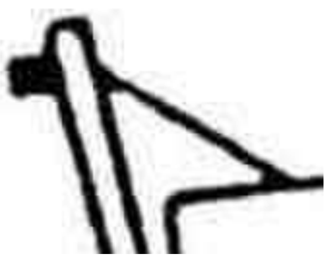
Grubber
Gerät für tiefes Lockern
Nur im Sommer und bei sehr gut abgetrocknetem Boden

Grafiken: LMZ

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

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

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

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

Pflanzenbau: Bodenbearbeitung

Bodenbearbeitungsverfahren, nach Intensität

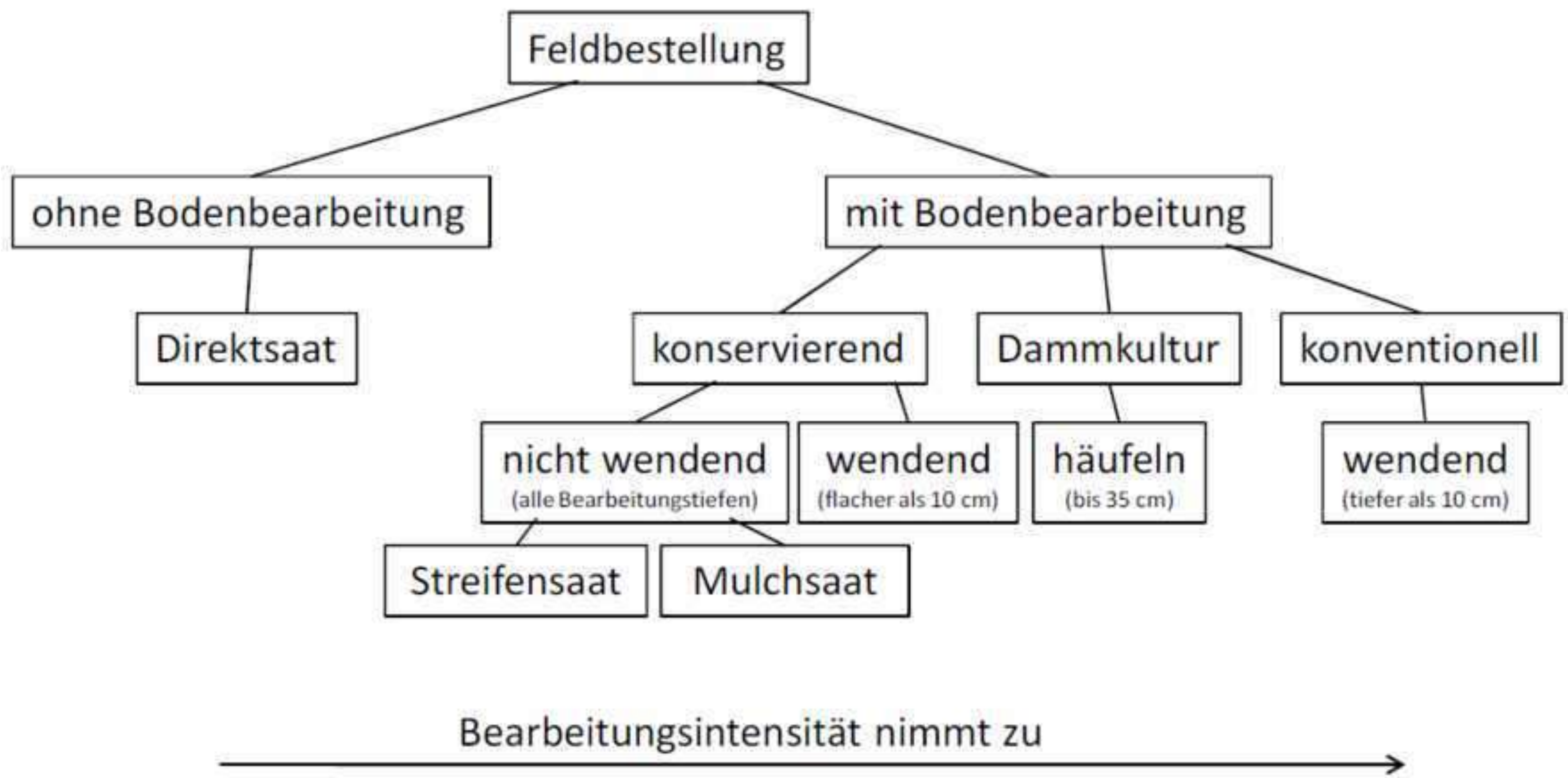


Bild: Wilhelm, 2010

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

Pflanzenbau: Bodenbearbeitung

Vergleich Pflug – reduzierte Bodenbearbeitung

- Einfluss auf Unkraut

- Einfluss auf Bodenfruchtbarkeit

Fotos: H. Dierauer, FiBL

Pflanzenbau: Bodenbearbeitung

Konservierende Bodenbearbeitung im Biolandbau?

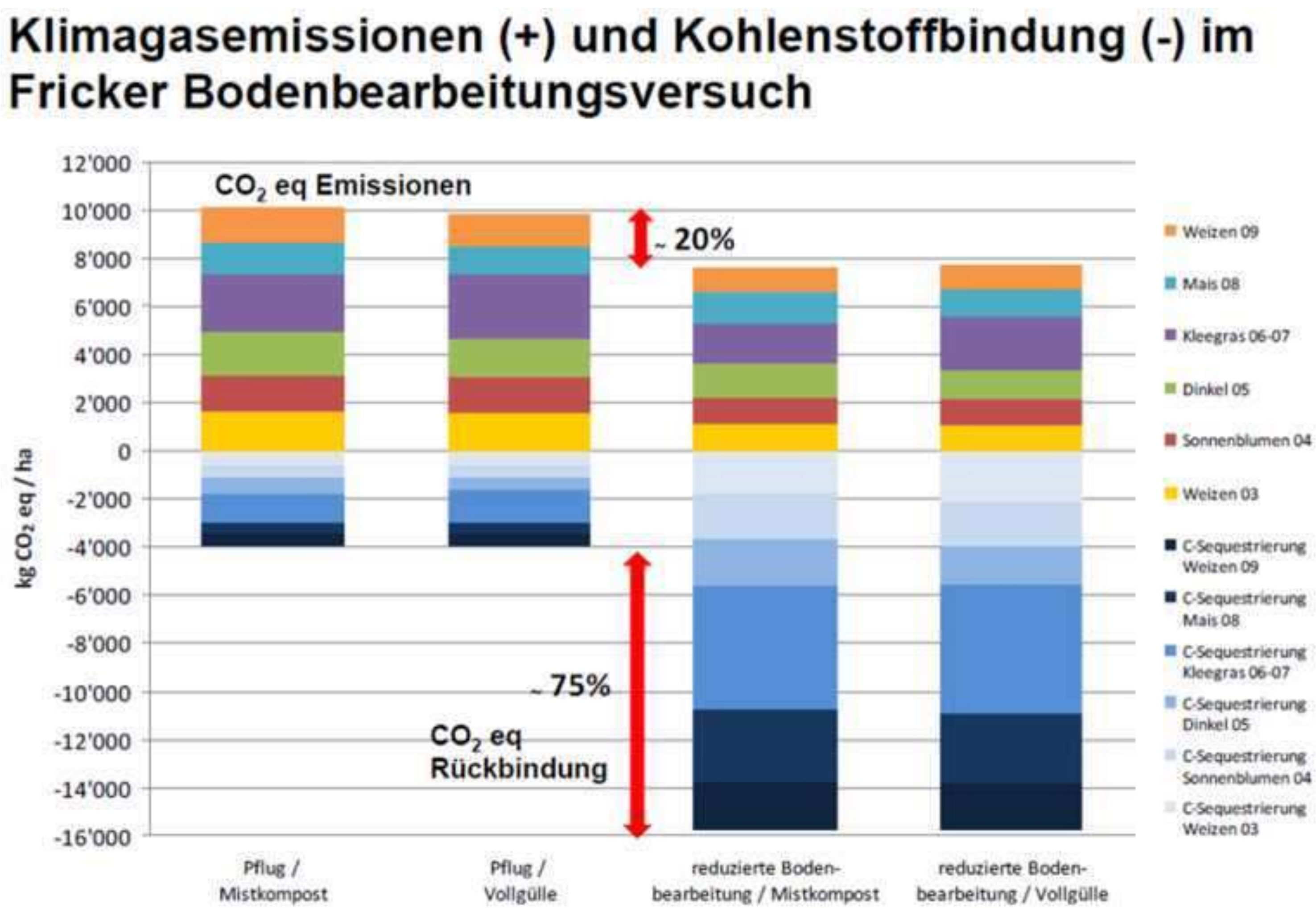
- Schäden an der Bodenstruktur und Bewirtschaftungs-fehler können im Biolandbau nicht ohne weiteres korrigiert werden!

- **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

Pflanzenbau: Bodenbearbeitung

CO_2-Emissionen und CO_2-Bindung



Quelle: FiBL

Pflanzenbau: Fruchtfolge

Grundsätze

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

Einkommen

Absatz

1. **Boden-verbessernde, tragende Kultur** (z.B. KW)

2. **Anspruchs-volle, abtragende Kultur** (z.B. Mais)

3. **Anspruchs-lose, abtragende Kultur** (z.B. Gerste)

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

Pflanzenbau: Fruchtfolge

Fruchtfolgeregeln

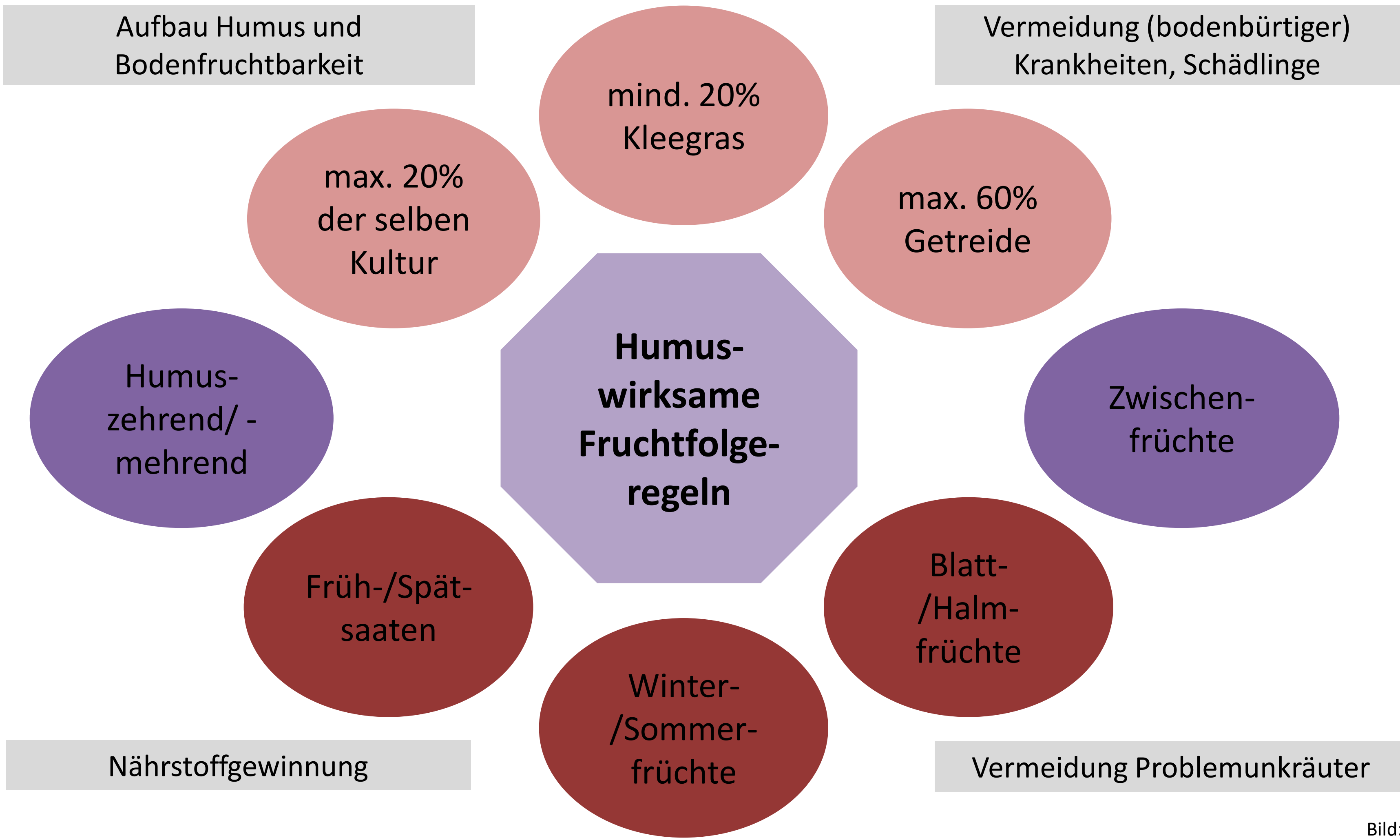
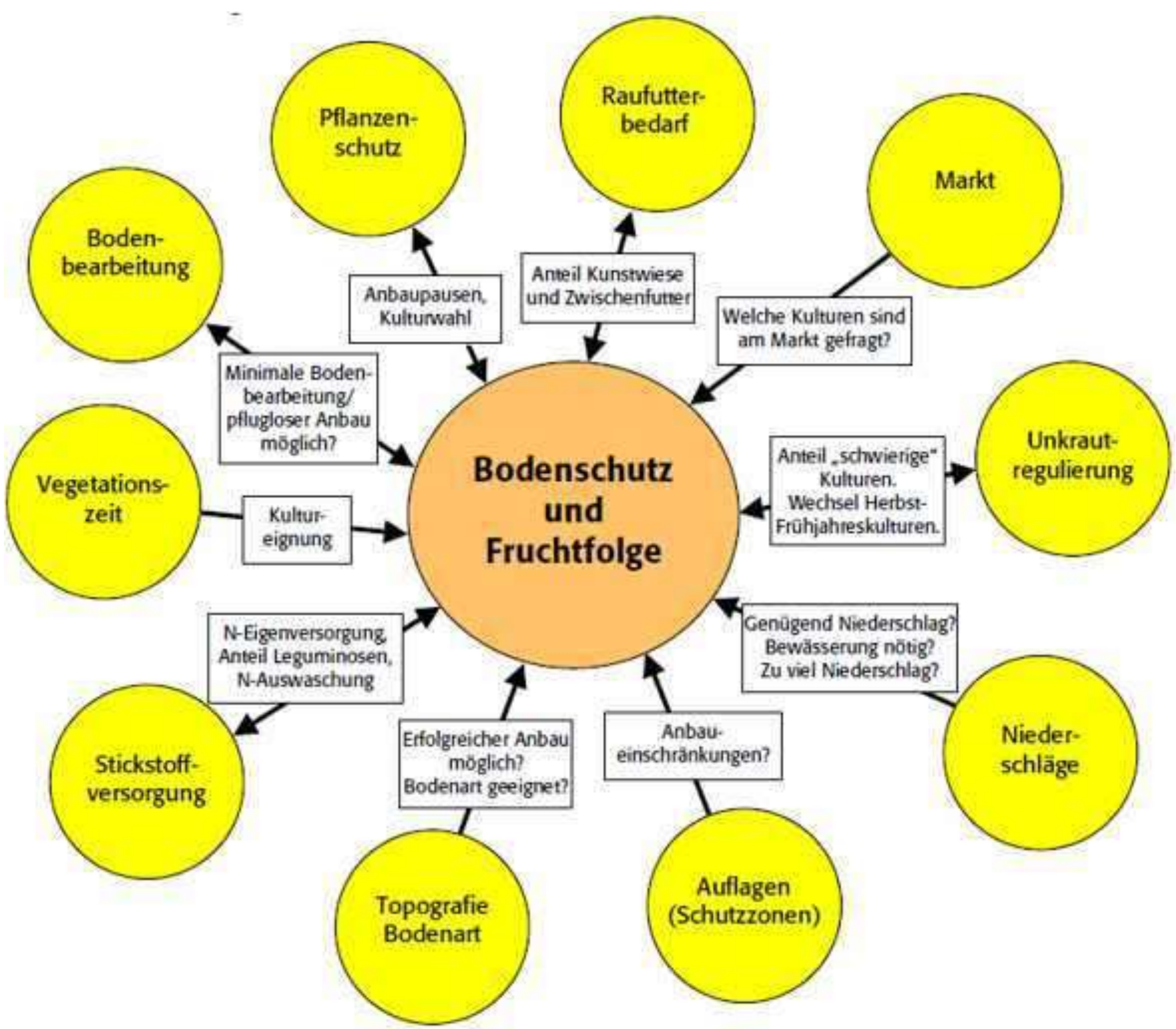


Bild: FiBL

Pflanzenbau: Fruchtfolge

Bodenschutz



- Bodenschutz und Fruchtfolge im Biolandbau zentral
  - Stickstoffsverfügbarkeit und Regulierung Wurzelunkräuter vor allem über Fruchtfolgegestaltung und gezielte Bodenbearbeitung gesteuert

Bild: FiBL

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)

Pflanzenbau: Fruchtfolge

Fruchtfolgebeispiele

- **Gemischter Betrieb**

(mit Ackerbau und Hackfrüchten)

- **Gemüsebetrieb**

Bild: FiBL

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

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?

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

Pflanzenbau: Unkrautregulierung

Direkte Unkrautregulierung

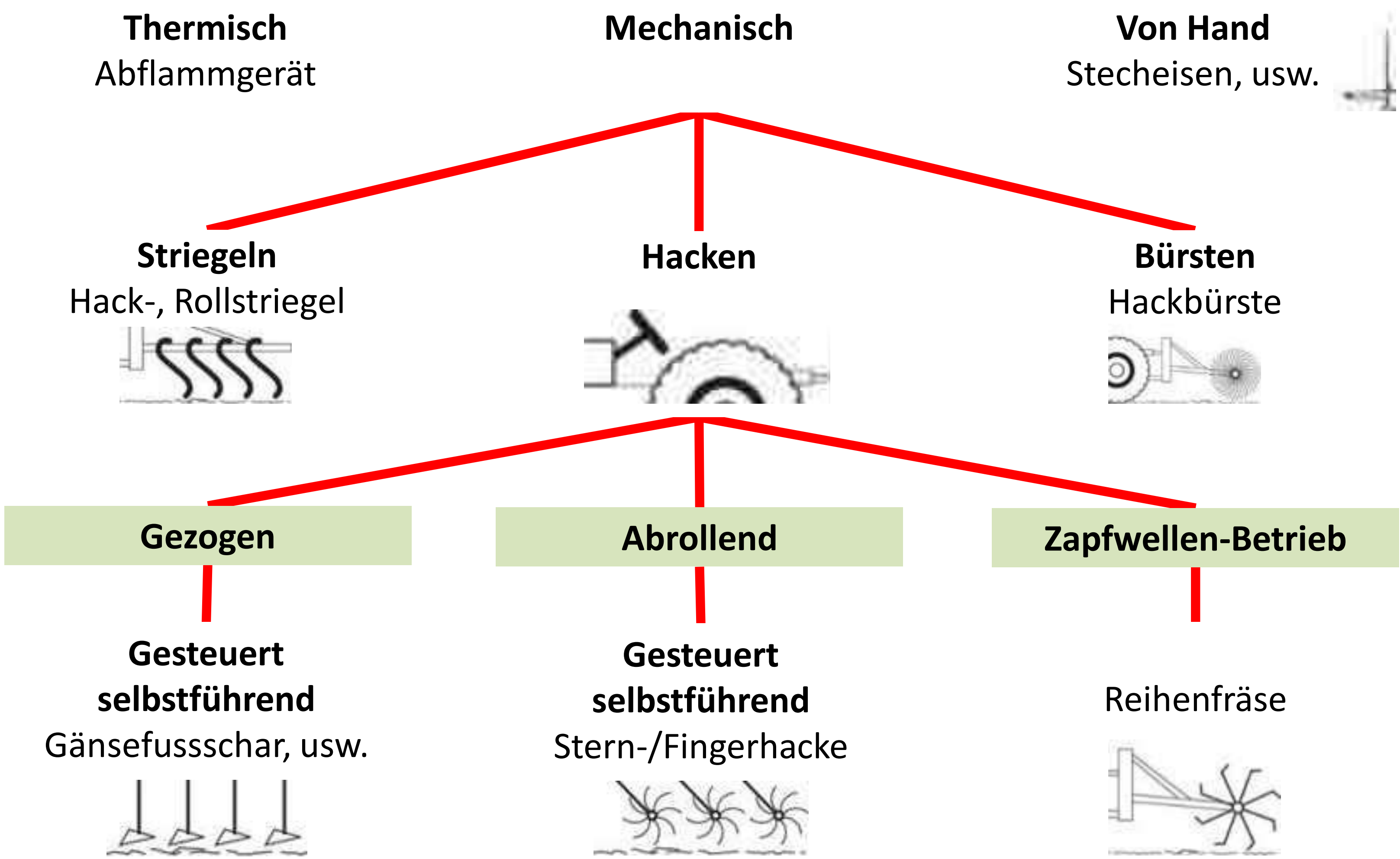


Bild: FiBL

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.

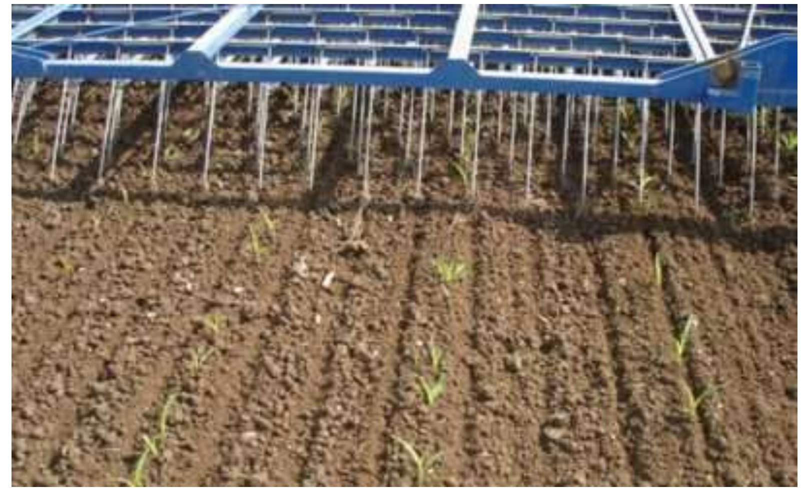
Kann Nützlinge gefährden.

Geringe Wirkung auf Wurzelunkräuter und Gräser.

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

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

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

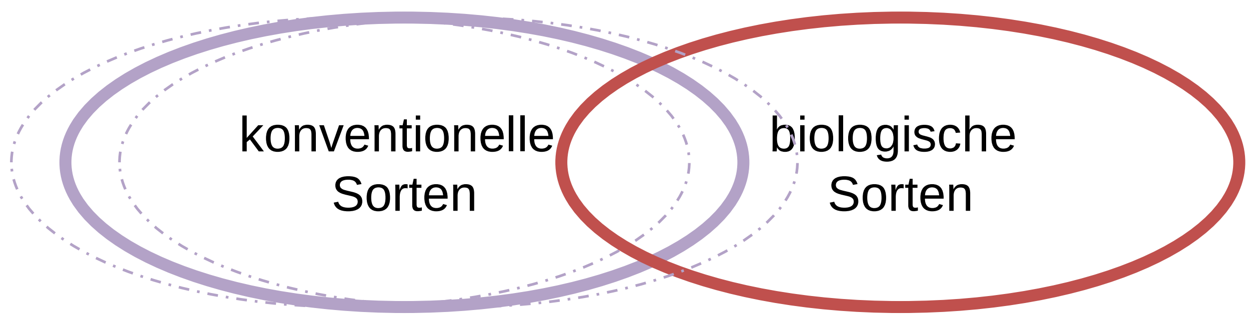
Pflanzenbau: Saatgut, Sorten, Pflanzenzüchtung

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



Pflanzenbau: Saatgut, Sorten, Pflanzenzüchtung

Sortenzüchtung ganzheitlich betrachten

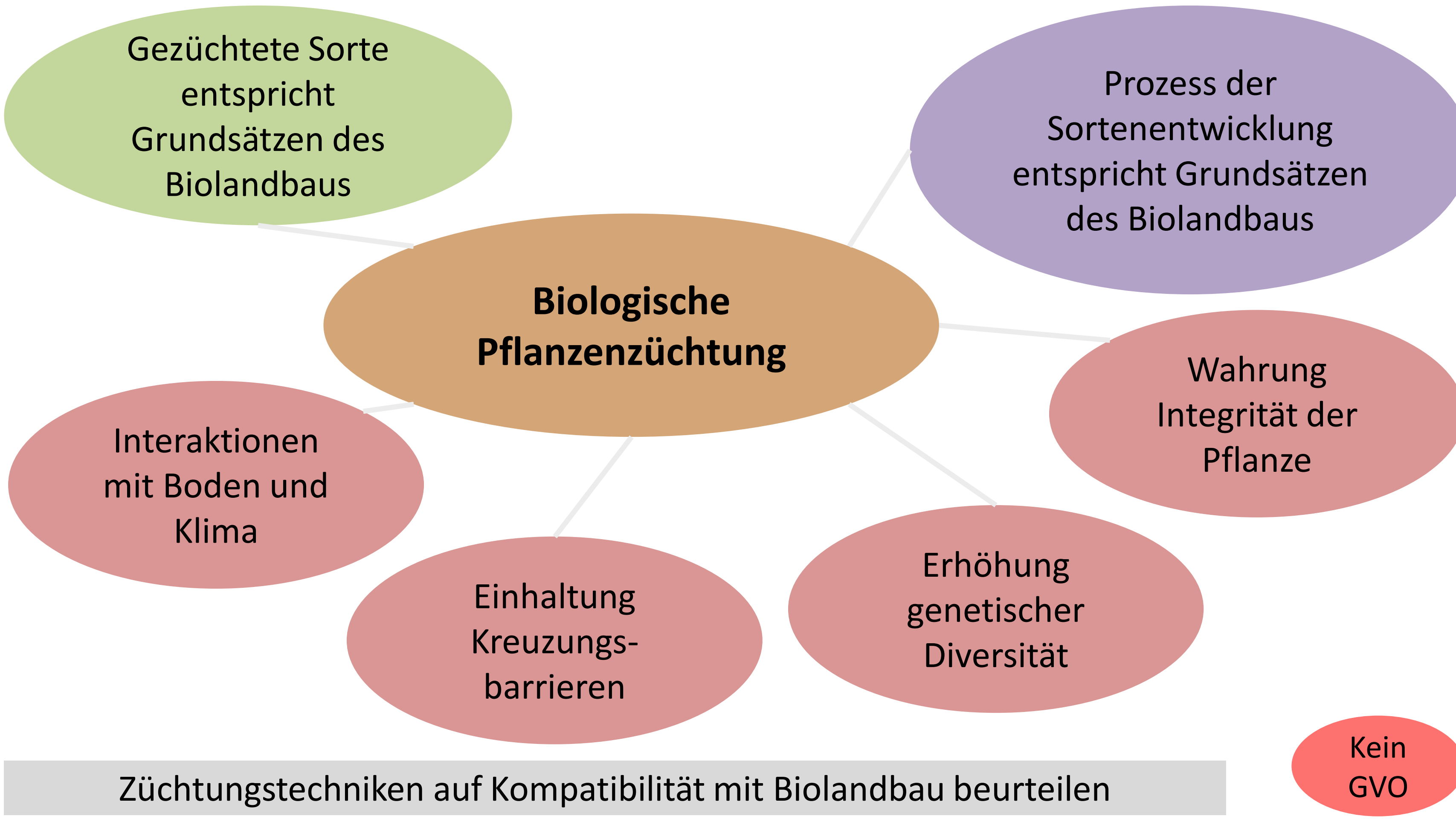


Bild: FiBL

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?

Pflanzenbau: Saatgut, Sorten, Pflanzenzüchtung

Vielfalt erhalten am Beispiel Bioäpfel

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

Vielfalt ermöglichen, Information vereinfachen

Produktion	Handel	Konsumenten
x Sorten	**6 Archetypen (AT)**	**3 Geschmacksgruppen** **3 Farbetiketten**
	AT Golden	mild bis süsslich
	AT Jonagold	mild bis süsslich
	AT Idared	mild bis süsslich
	AT Cox	kräftig-würzig
	AT Gravensteiner	kräftig-würzig
	AT Boskoop	säuerlich-aromatisch

Bild: FiBL

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


FiBL
organicinputs

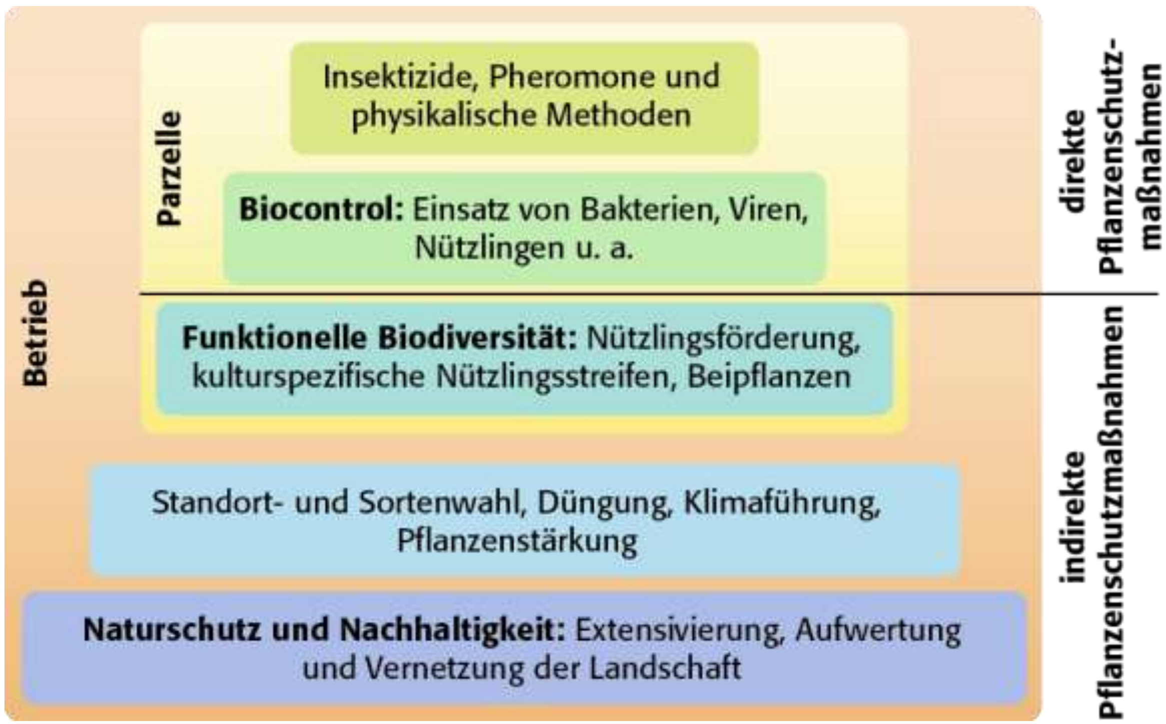
Betriebsmittelliste
2016

Hilfsstoffe für den biologischen Landbau
in der Schweiz

Pflanzenbau: Pflanzenschutz

Schädlingsbekämpfung im Biogemüsebau

- **Pflanzenschutzpyramide zur biologischen Schädlingsbekämpfung**



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

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

Pflanzenbau: Pflanzenschutz

Schädlingsbekämpfung im Biogemüsebau (2)

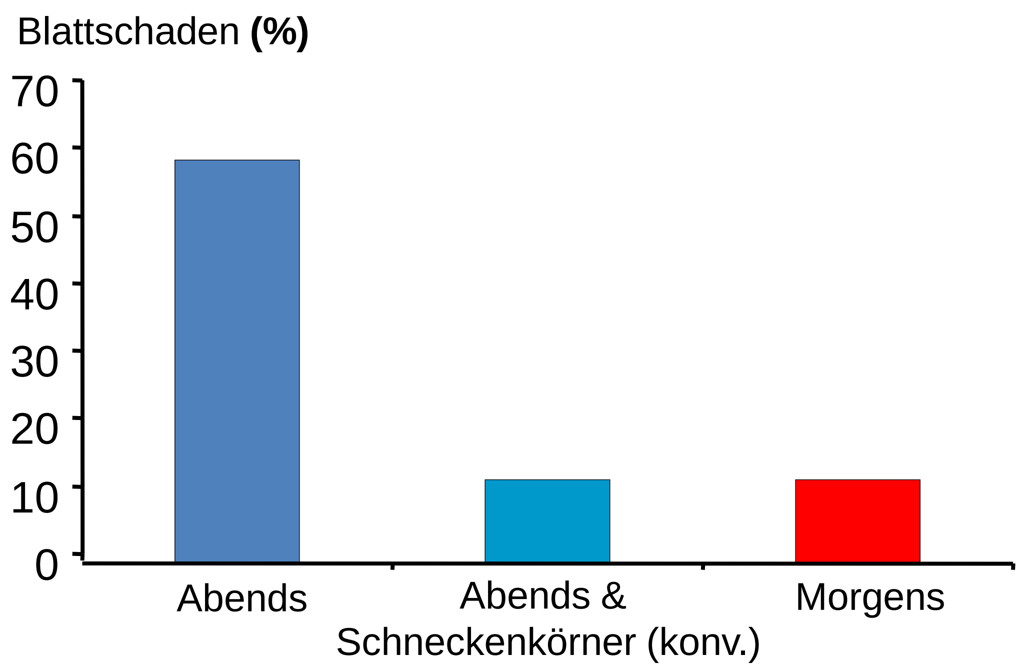
- **Sortenwahl**
  – Salat: Resistenz gegen Grosse Johannisbeerblattlaus (*Nasonovia ribisnigri*)
- **Standortwahl**
  – Windoffene Lagen zur Vorbeugung gegen Möhrenfliege

Foto: M. Koller, FiBL

Pflanzenbau: Pflanzenschutz

Schädlingsbekämpfung im Biogemüsebau (2)

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



Quelle: Speiser, FiBL

Foto: T. Alföldi, FiBL

Pflanzenbau: Pflanzenschutz

Schädlingsbekämpfung im Biogemüsebau (2)

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

Gurken in

Proben von Parzellen **ohne** Kompost

Proben von Parzellen **mit** Kompost

Quelle: Fuchs, FiBL

Pflanzenbau: Pflanzenschutz

Schädlingsbekämpfung im Biogemüsebau (3)

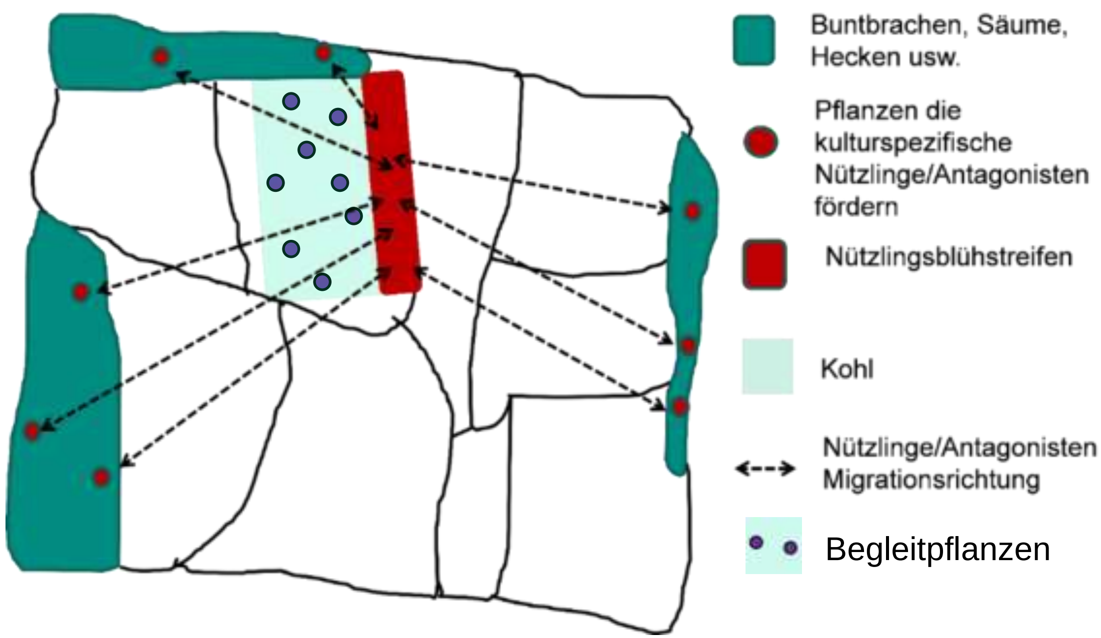
- **Funktionelle Biodiversität**
  im Kohl (ein Beispiel)
- Nützlingsförderung > Schädlingsreduktion > weniger Insektizid > höhere Biodiversität

- 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?

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)



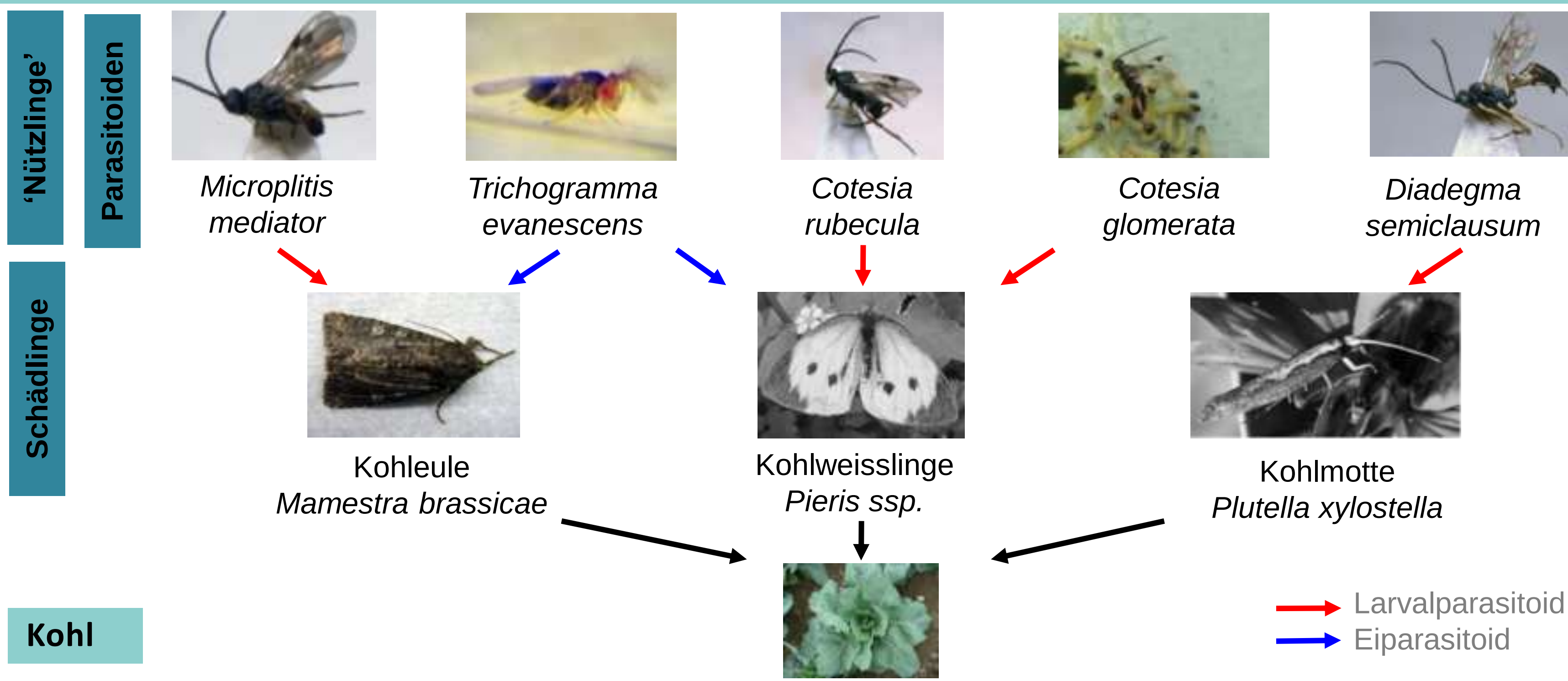
Quelle: Landschaftsschema, Luka et al., 2012.

Foto: M. Born

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

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

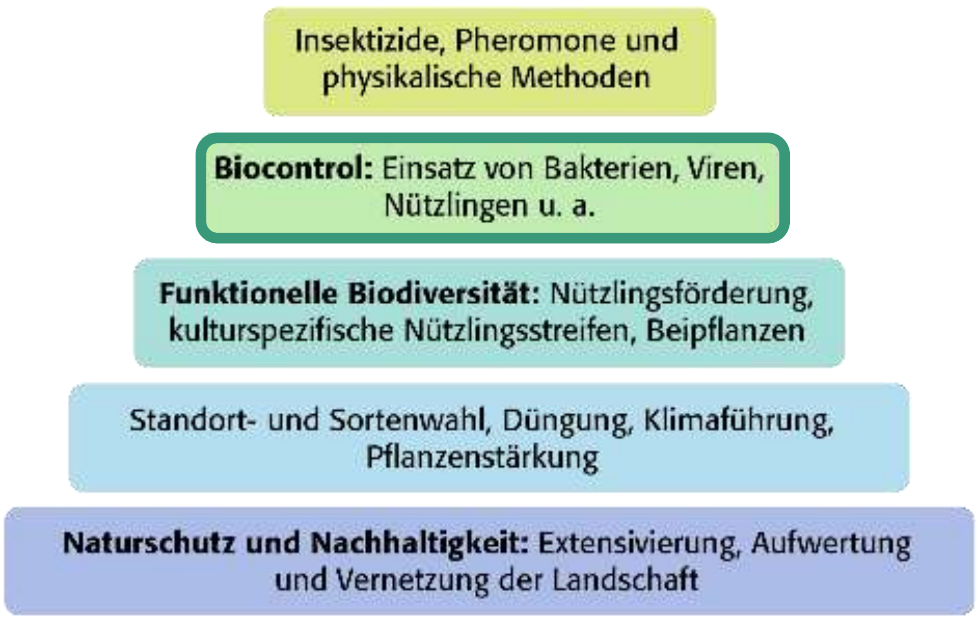
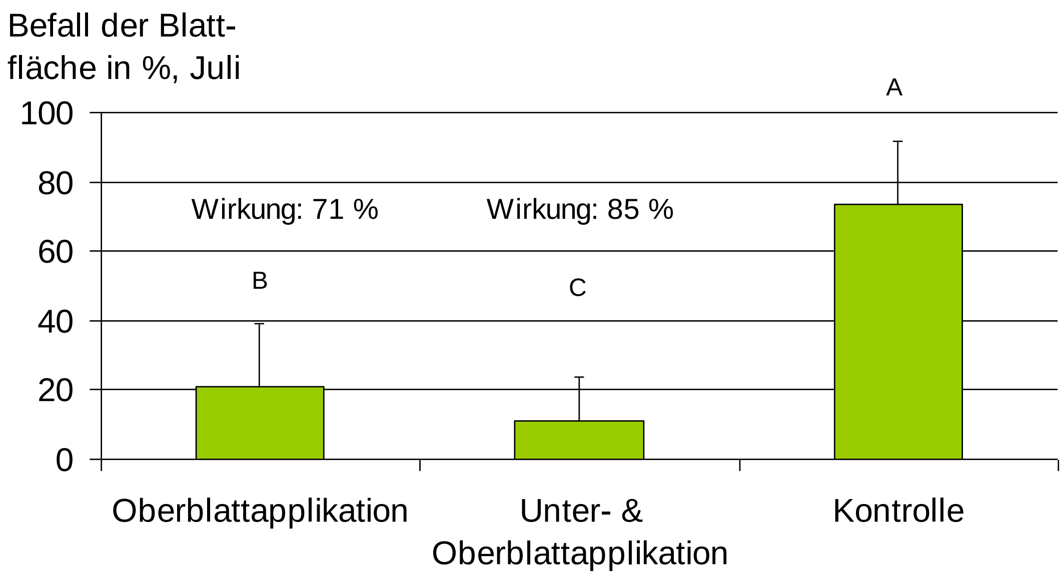


Foto: A. Vieweger, FiBL

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

Pflanzenbau: Pflanzenschutz

Schädlingsbekämpfung im Biogemüsebau (5)

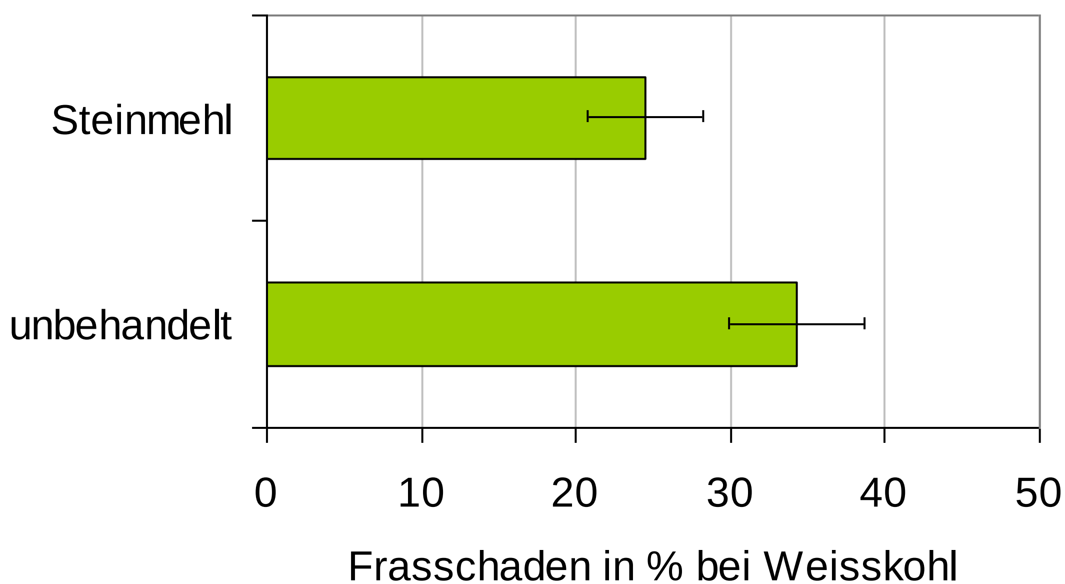
- **Physikalische Methoden und Pheromone**
  - Mechanisch: Fallen, Gelbtafel, Insektennetze, Schneckenzäune, Leimschutznetze, Leimschutzringe, Kälte- / Hitzebehandlung
  - Biotechnisch: Akustische/optische Reize, Frasslockstoffe, Frasshemmstoffe, Sexualduftstoffe, Verwirrungstechnik

Foto: E. Wyss, FiBL

Pflanzenbau: Pflanzenschutz

Schädlingsbekämpfung im Biogemüsebau (5)

- **Direkte Schädlingsbekämpfung mit Insektizid**

- 

Fotos: M. Koller, A. Vieweger, FiBL

Pflanzenbau: Pflanzenschutz

Pflanzengesundheit im Bioobstbau

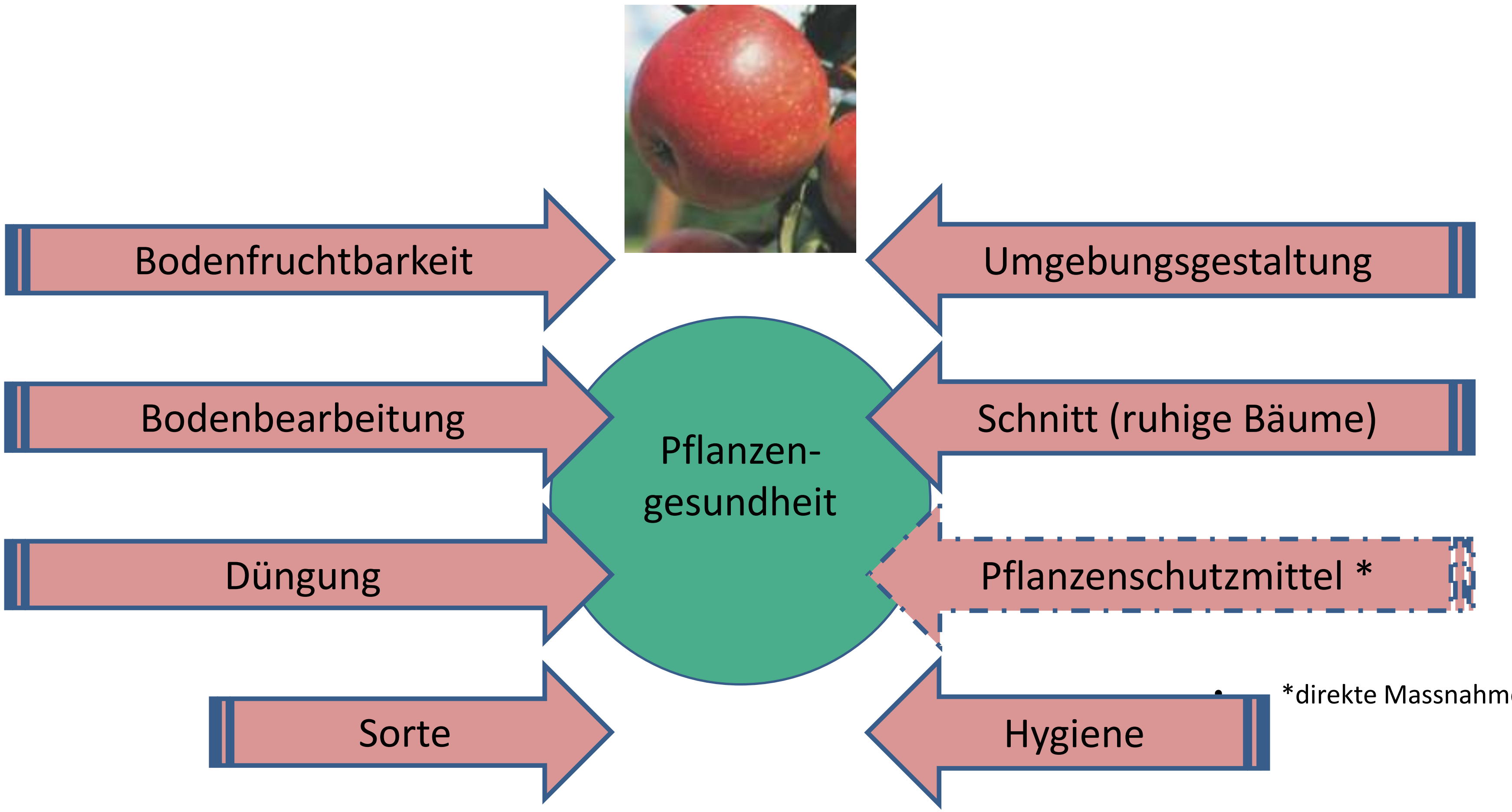


Bild: FiBL

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			

Pflanzenbau: Pflanzenschutz

Voraussetzungen für eine Schorfinfektion

Anfällige Apfelsorte

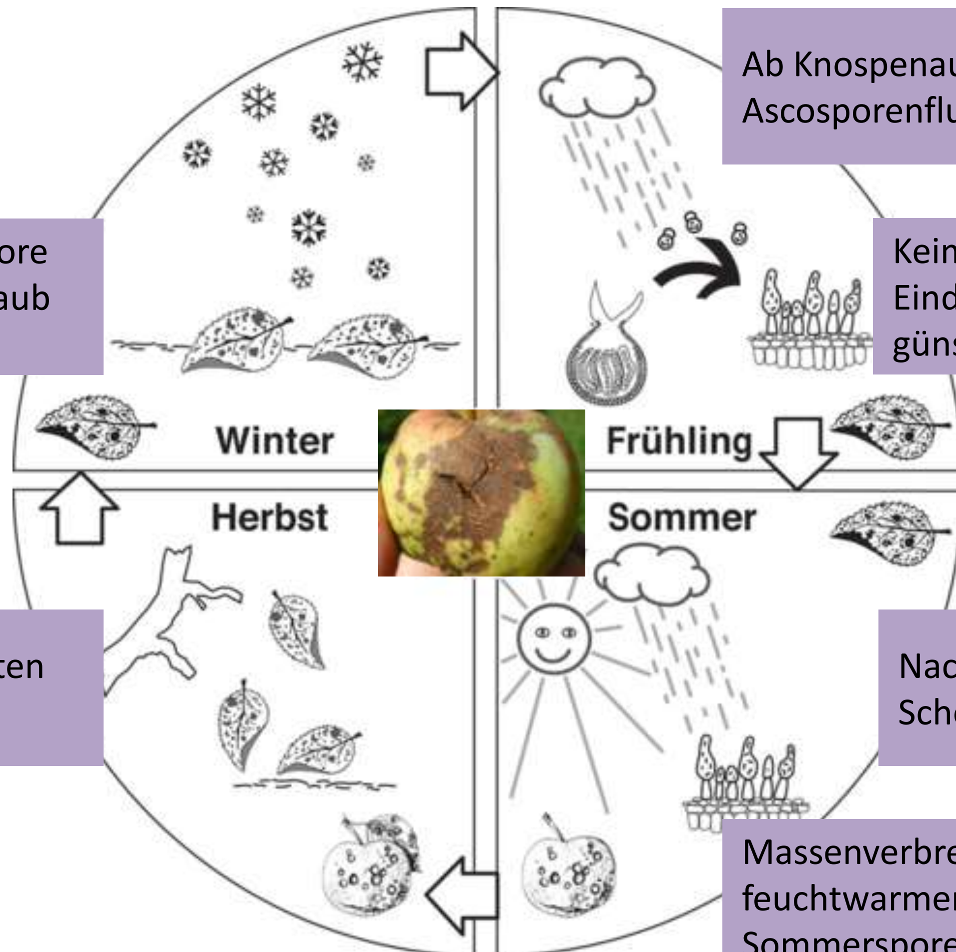
Genügend Feuchtigkeit

Keimfähige Pilzsporen

Günstige Temperatur

Pflanzenbau: Pflanzenschutz

Entwicklung des Schorfpilzes



Ab Knospenaufbruch Auslösung des Ascosporenfluges durch Regen

Keimung der Spore und Eindringen ins Blatt bei günstigen Bedingungen

Nach Inkubation erste Schorfflecken auf Blättern

Massenverbreitung bei feuchtwarmer Witterung durch Sommersporen; Befall von Blättern und Früchten

Bildung von dauerhaften Wintersporen

Überwinterung als Spore vorwiegend im Apfellaub am Boden

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

Pflanzenbau: Biodiversität

Als Basis von Ökosystemdienstleistungen

Biodiversität

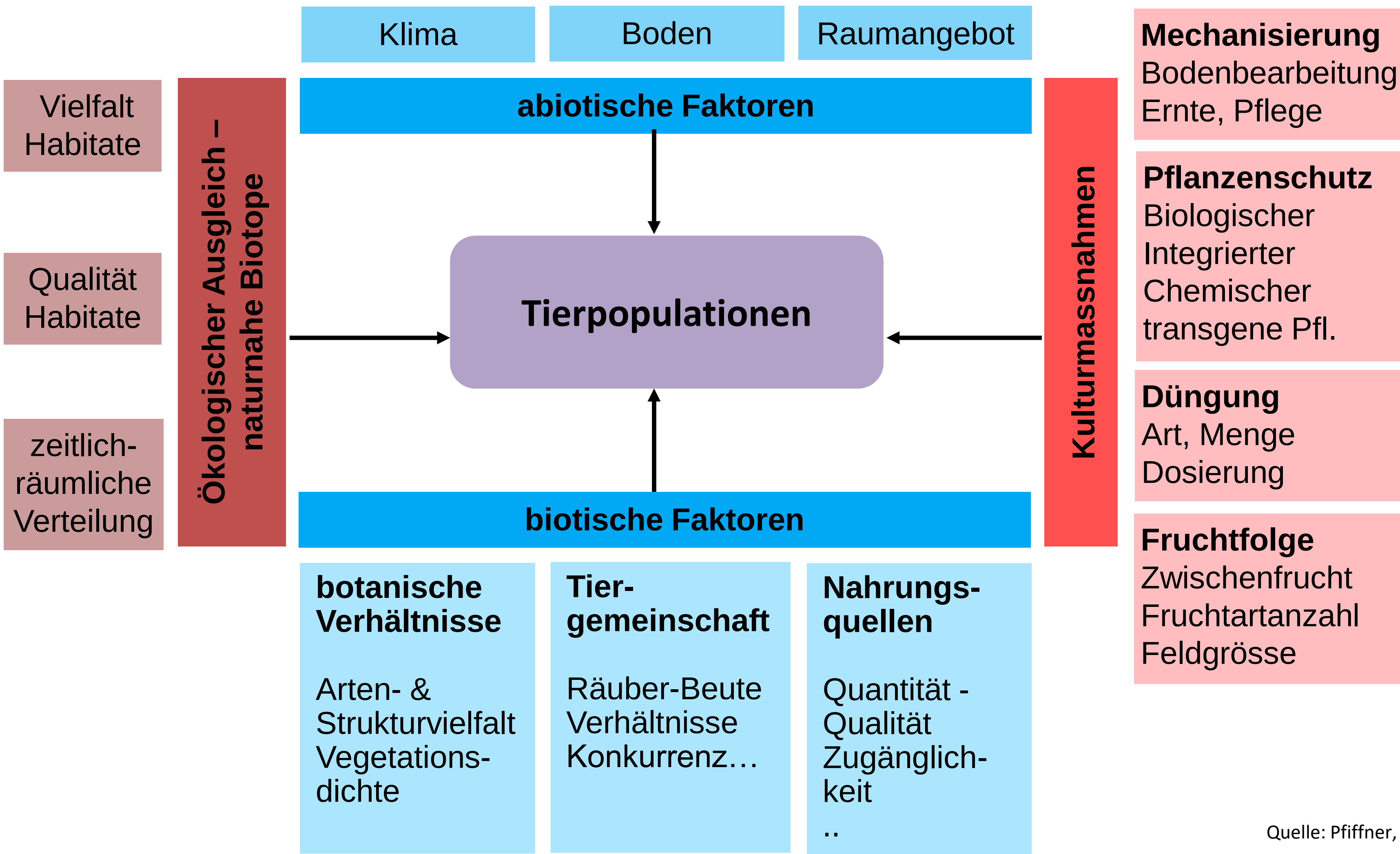
- Erbe
- Bodenstabilisierung
- Züchtungsgrundlage
- Schädlingsregulierung
- Sicherung Bestäubung
- Bodenfruchtbarkeit
- Regionale Identität
- Ressource

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

Fotos: L. Pfiffner, FiBL

Pflanzenbau: Biodiversität

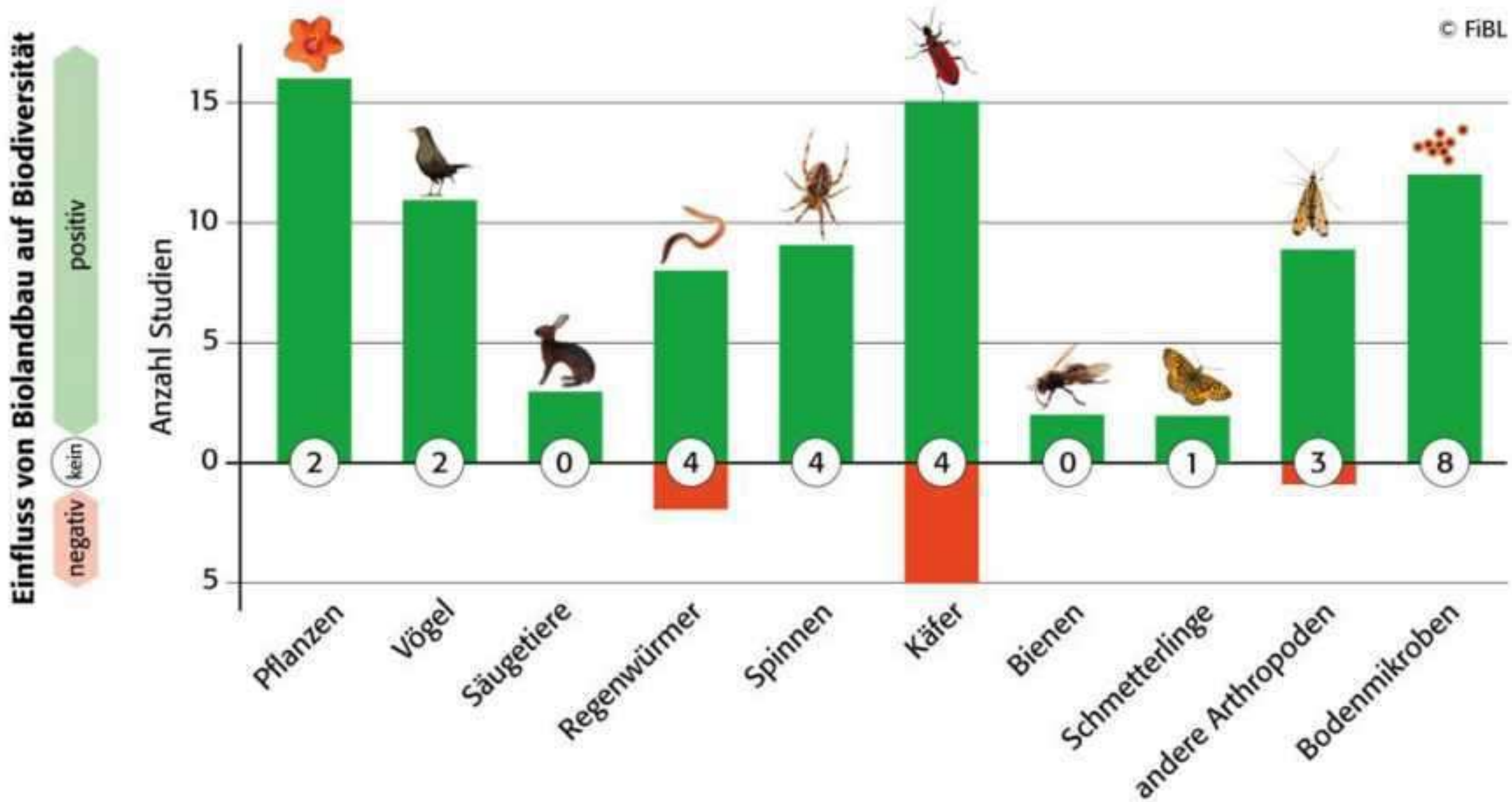
Faktoren zur Förderung der Tierwelt (Fauna)



Quelle: Pfiffner, 1997

Pflanzenbau: Biodiversität

Mehr Pflanzen- und Tierarten auf Biobetrieben



Quelle: FiBL; Hole et al. 2005, Bengtsson et al 2005, Fuller et al 2005, neuere Studien

Pflanzenbau: Biodiversität

Besonders wirksame Massnahmen

- **Landwirtschaft hat eine grosse Bedeutung für die Biodiversität.**
- **- und umgekehrt -**

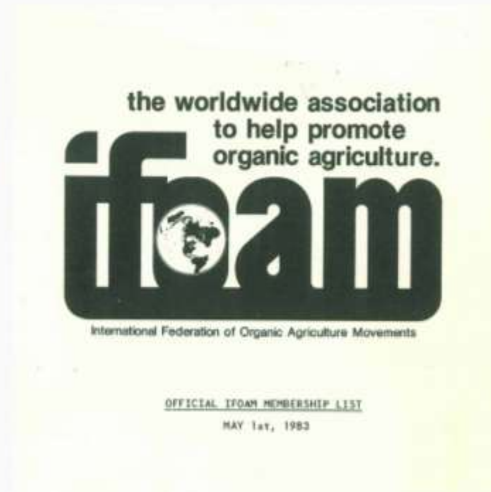
- Besonders wertvolle Wiese (Qualitätsstufe II)
- Mahd Extensivwiesen später (zweiter Schnitt)

- Mehrjährige Säume oder Blühflächen
- Qualitätsniederhecken mit Saum und 20% Dornensträuchern
- offene Bodenstellen und Kleinstrukturen

Fotos: L. Pfiffner und T. Alföldi, FiBL

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

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

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)*.

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"

Principle of health

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

Principle of ecology

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

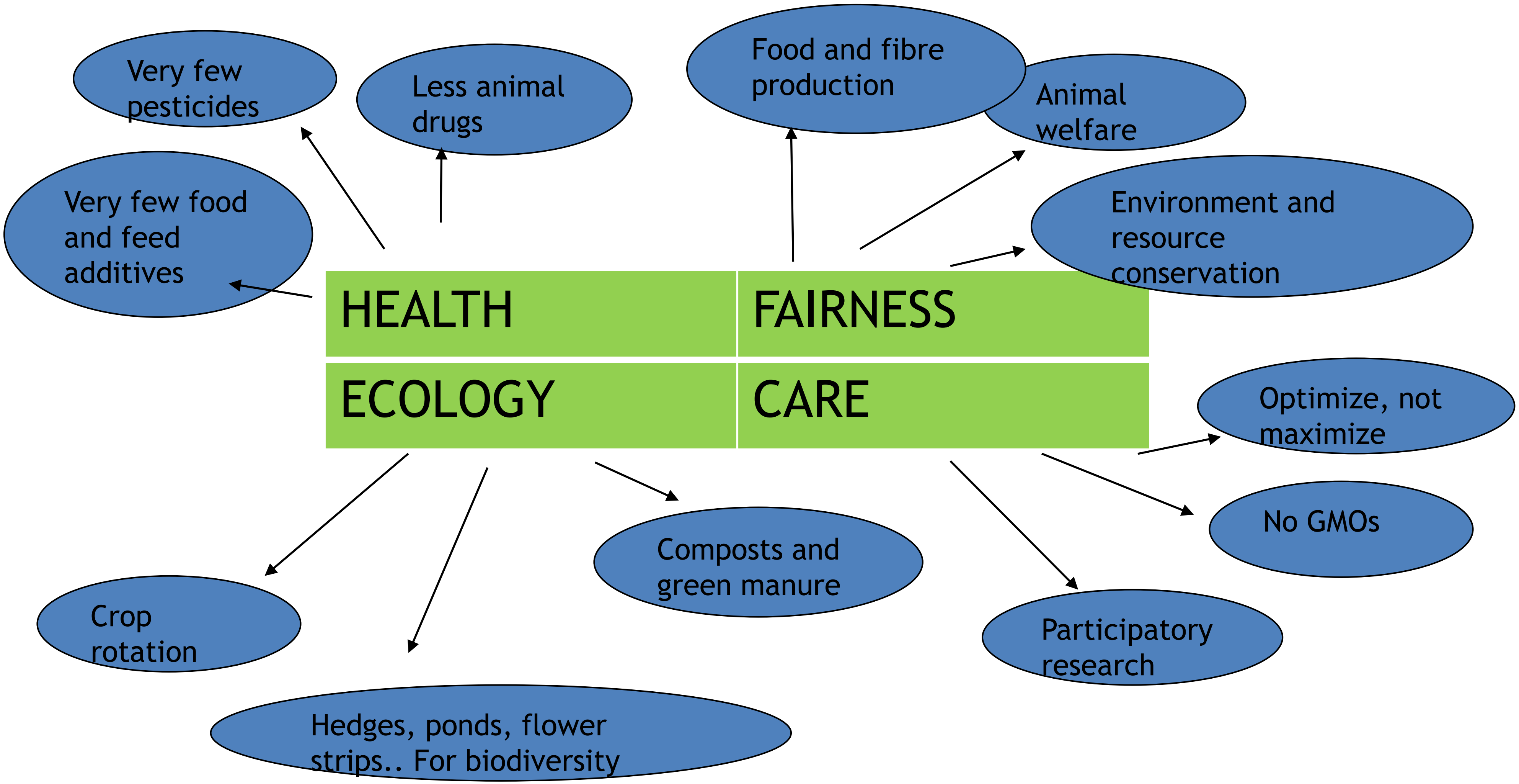
Principle of fairness

- Organic agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities.
- Fairness is characterized by <u>equity</u>, <u>respect</u>, <u>justice</u> and stewardship of the <u>shared</u> 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.

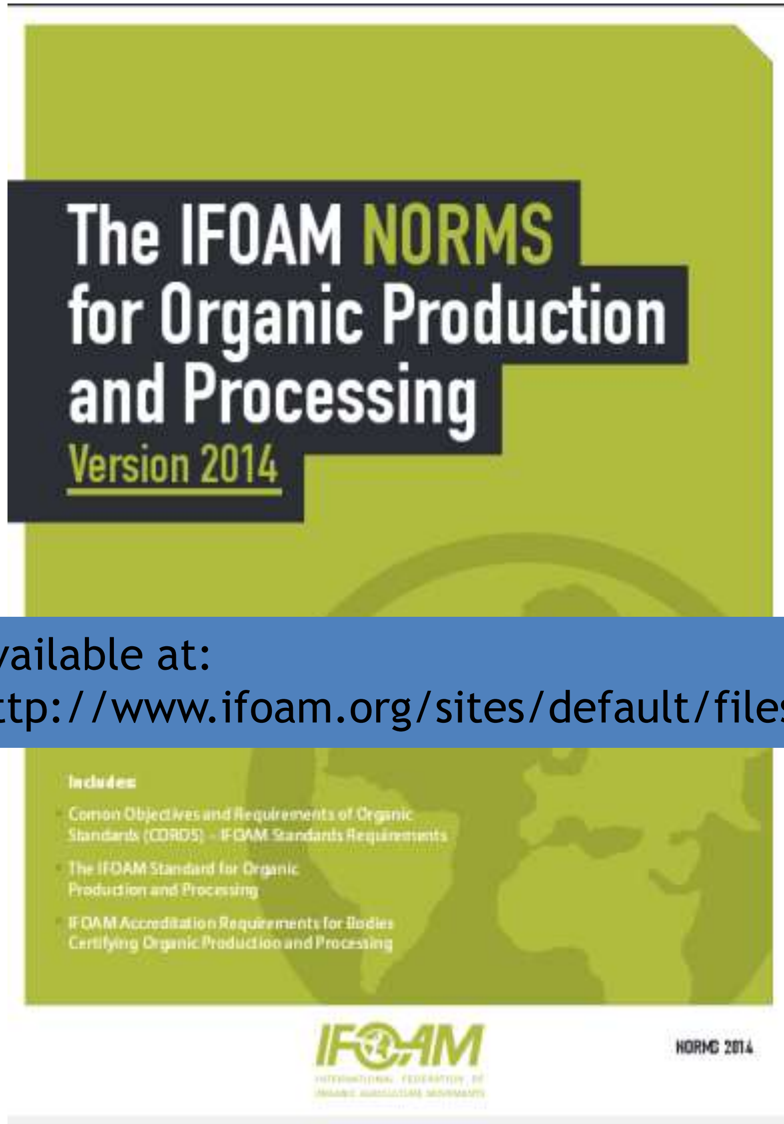
Principle of care

- 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.

Principles and practices

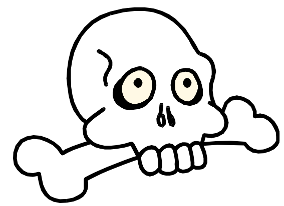


Certification and standards



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

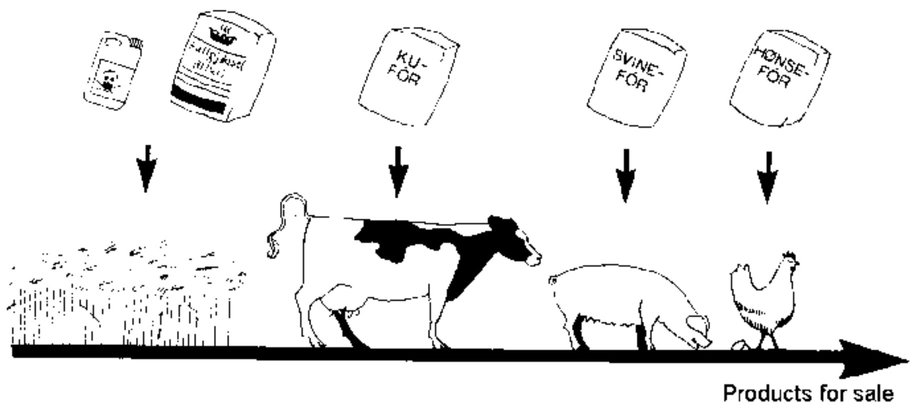
What is organic farming?

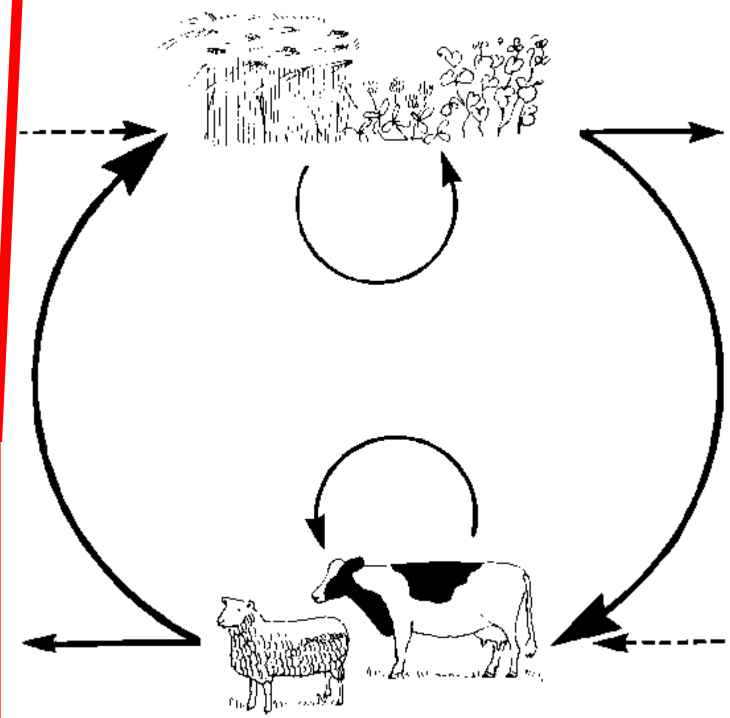


The simple explanation:

Organic agriculture = Refraining from mineral fertilizers and synthetic pesticides

Cycles versus linearity





A more conceptual one:

- Thinking like industry (input makes output), maximizing profit, controlling nature

  versus

- Thinking like nature (cycles of energy, nutrients and organic matter), optimizing the system to create a surplus, cooperate with nature

A really conceptual one:

Organic agriculture is a practice where all parts of the production are unified as a whole, which is larger than the sum of the parts. It is environmentally friendly, fair, and socially sustainable.

- A farm individuality?

Farm individuality, farm design

- Using the resources on the farm to fulfill highly different aims
- Study the farms history and biography, link with current resources and frame conditions to plan the future

Simplify farm management for a convenient life for a family

Maximize output of food for humans

Specialize in a production, posibly including processing and selling food

Cultivate and establish biodiversity habitats

Self-sufficiency in fodder and fertiliser, balanced system

Use the farm as an arena for social work

The farm as a living organism

- Crop rotation
- Balanced animal husbandry
- Green manures, biological N fixation
- Composting organic materials
- Diverse productions supporting each other
- Maximum of self-sufficiency, still producing a surplus for sale
- Protect and enrich the natural environment

= organs of the living organism

Bio, eco, biodynamic, organic…

- Organic agriculture developed, and develops differently in different countries and parts of the world

- Different associations and categories of organic merged into «organic» (in Norwegian: økologisk) during the late 70-ties

- The diversity of OF practices is still reflected in labels, certification bodies and associations

Organic = Certified- and much more

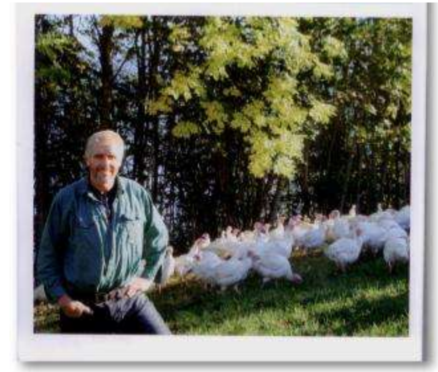
- Fulfilling conditions in EU regulations = minimum
- Several certification bodies have stricter regulations
- In several countries, producers «only» fulfilling EU regulations are seen as «second class» organic farmers
- Regulations grow very fast in volume! Simplify basic requirements, and earn «Michelin-stars» for special fields of interest?

Developing organic regulations – the EU commission «goes organic»

- 2011:
- Current regulations state that >50 % of the feed for ruminants shall be produced on the farm. No similar regulation is found for monogastric animals.
- The commission has launched a proposal to increase the demand for ***self-sufficiency*** to 70-80 % for ruminants, and 40-50 % for pigs and poultry.

- 2012 (hearing in Norway before implementation):
- Demand for feed ***self-sufficiency*** increased from 60 to 70 % for ruminants
- Demand for feed ***self-sufficiency*** increased from 0 to 20 % for pigs and poultry
- Feed should come from own farm, or be produced by cooperating farmers in the same region
- Demand for organic livestock of chicken postponed from 2012 to 2015 due to lack of detailed regulations
- Due to lack of organic protein feed, up to 5 % conventional protein feed may be used for pigs and poultry until 2015

Trends to consider for organic farming in 2014



- Organic market increases
- But the proportion of Norwegian products is decreasing!
- Still lot of scepticism among many large food actors
- Increasing imports of organic food that could have been produced in Norway threatens Norwegian agriculture in general

- Local products highly popular

- Local sells much better than organic.. Why bother about certification?

- A significant amount of farmers conduct «close to», but not certified organic

-When farming is a part-time business, the farmers has no energy to comply 100% with complicated regulations

- Most farmers wanting to stay in business specialize and increase the volume of production
  - Diverse organic production has a hard time

- Rapid decline in milk production in general

  -(When) Will organic farmers establish their own dairy company?

  - Can organic milk be an instrument to maintain Norwegian agriculture?

- When will TINE accept more organic producers of dairy cow milk, and pay premium price for organic goat milk?

EU regulations organic farming

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.

The EU Regulation

- Regulations have therefore been introduced to ensure the authenticity of organic farming methods, which have evolved into a comprehensive framework for the organic production of crops and livestock and for the labelling, processing and marketing of organic products

- The first regulation on organic farming [Regulation EEC N° 2092/91] was drawn up in 1991 and, since its implementation in 1992, many farms across the EU have converted to organic production methods

- In August 1999, rules on production, labelling and inspection of the most relevant animal species (i.e. cattle, sheep, goats, and poultry) were also agreed [Reg. EC N° 1804/1999]

Control measures

- Equally important are the associated enforcement procedures, ensuring that all producers claiming organic status are registered with the competent inspection body in their country

- These bodies are themselves designated by and subject to regulation by authorities whose task it is to verify their capability to administer the schemes fairly and efficiently

- Inspection covers all stages in the production process, including storage, processing and packing

Basic steps to organic certification

Research & Prepare
- Field (s) must be free of prohibited inputs for 36 months
- Seeds must be organic or at the very least non-GMO

Application
- Determine where markets will be
- Compare organic certification agencies service and market access
- Present 3 years of field histories
- Fulfill questionnaires
- Show accurate field maps
- Appropriate fees

1 Pre-Inspection Review
- Check for any problem areas
- Prepares applicants for inspections
- Saves operations time and money on their inspections

Inspection
- Annual
- Must allow access to the inspector to all organic and non-organic portions of the operation
- Documents and operation will be reviewed
- Can be a learning tool for the farmer

Final review and decision
- Inspection report & other documents are sent for review
- Decision is made
- Certificate (s), recommendations and requirements issued
- Applicants are certified until they surrender or are suspended
- Must reapply annually

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*

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

The European Action Plan for Organic Farming

- The European Action Plan for Organic Farming is a pivotal point for the attempts to integrate all policies affecting organic farming

- The development of a European action plan was initiated by the European conference on organic farming held in Copenhagen in May 2001 (Danish Ministry of Food, Agriculture and Fisheries 2001), and subsequently supported by the Council of Agricultural Ministers in June 2001

- A working document from the EU Commission was presented to the Council of Ministers in December 2002 (EC 2002) and submitted to public consultation in March 2003

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

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

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)

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**

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

The New European Organic Regulation

Technical Handbook on the impacts of Regulation (EU) 2018/848

german cooperation

Supported by

Invest for Jobs
Opportunities for Growth in Africa

Alliance for Product Quality in Africa

Implemented by

giz

CONTENT

INTRODUCTION

PLANT PRODUCTION

ANIMAL HUSBANDRY

AQUACULTURE

PROCESSING

LABELLING

IMPORT/EXPORT

GROWER GROUPS

SUMMARY

BACKGROUND

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").*

REGULATORY FRAMEWORK

Regulatory framework

The new texts on organic farming are composed of three types:

- The basis act is the Regulation (EU) 2018/848
- The secondary acts, which include (1) implementing acts and (2) delegated acts

Legend:
- Draft IA or DA
- Official published IA or DA
- TC Applicable in Third Countries
- EU Applicable in the EU

Regulation (EU) 2018/848

Production Rules

Delegated Acts:
- 2020/1794 Seeds & PRM (TC, EU)
- 2020/2146 Exceptional production rules (TC, EU)
- 2020/427 + 2021/269 Detailed production rules (TC, EU)
- 2021/716 Prod. Rules sprouted seeds, chicory heads, aquaculture (TC, EU)
- 2021/642 Labeling of organic products (TC, EU)
- 2021/1189 PRM Marketing (EU)
- 2021/1691 Amendment annex II 2018/848 (TC, EU)
- 2022/474 Production and use of non-organic, in conversion, organic seedling (TC, EU)

Implementing Acts:
- 2020/464 + 2020/2042 field recognition of conversion period (TC, EU)
- 2021/1165 Annexes of substances authorised (TC, EU)
- 2020/1693 Report of dates (TC, EU)

Control Rules

Delegated Acts:
- 2021/771 Traceability and mass balance during inspection Controls of OGG (TC, EU)
- 2021/715 OGG-ICS rules (TC, EU)
- 2021/1691 Operator Recordkeeping (TC, EU)
- 2021/1006 Model of UE certificate (EU)
- 2021/2304 Certificate of non-use of antibiotics on organic animal products (EU)

Implementing Acts:
- 2021/279 Suspicion of noncompliance Investigation Labeling requirements OGG size and records, ICS management % of control and sampling Exchange of information (TC, EU)
- 2021/2119 Records and declaration required by the operator and technical means for issuance of certificate (TC, EU)

Trade Rules

Delegated Acts:
- 2021/1342 CB recognition in third country (TC)
- 2021/1697 Conditions for CB recognition (TC)
- 2021/1698 Requirements for recognition of CB and their supervision (TC)
- 2021/2305 Conditions under which products are exempt from official controls (TC, EU)
- 2021/2306 COI template, issuance and verifications (TC, EU)

Implementing Acts:
- 2021/1378 Template Certificate of conformity and list of recognized CB (TC)
- 2021/2307 Rules on documentation and notification requirements for import (TC, EU)
- 2021/2325 List of third countries and the list of recognised inspection authorities and bodies (TC, EU)

BEFORE

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

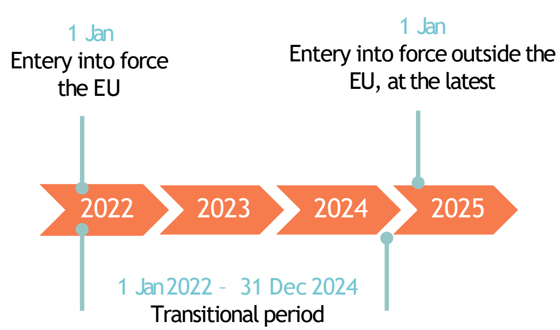
- *Coming from countries whose regulation is considered as equivalent*
- *To be certified by a Control Body (CB) recognized and supervised by the European Commission. The standards used by the CB must be validated as equivalent to the EU regulation (Control Body Organic Standard CBOS)*

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».

PLANT PRODUCTI ON

REPRODUCTIVE MATERIAL

PERENNIAL CROPS

Point 1.8.2 Annex II Part I of Regulation (EU) 2018/848

For a plant to be certified organic, the rootstock must come from a mother plant* that has been organically grown for at least two (2) growing seasons.

PLANT REPRODUCTIVE MATERIAL (PRM)

Articles 10.4.a and 30.3
The sale of PRM* marketed *in Conversion* will now be possible for PRM* from plots after 12 months of conversion.

Points 1.7.3 and 1.8.5.3 Annex II Part I
No more derogation for the use of conventional treated PRM*.

Regulation (EU) 2020/1794
Possible use of conventional PRM* until 31/12/2036 under conditions:

- With derogation
- Only for non-treated PRM*
- Proof of unavailability as organic /in conversion

For PRM* in conversion, possibility to use without derogation, if there is a proof of unavailability as organic.

Regulation (EU) 2022/474
Use of in conversion and non-organic seedlings possible under conditions.

PRM

Plant Reproductive Material

= any type of plant material, capable of producing plants: seeds, seedlings, cuttings...

MOTHER PLANT

= Identified plant from which plant reproductive material is taken for the reproduction of new plants (article 3 of Regulation (EU) 2018/848).

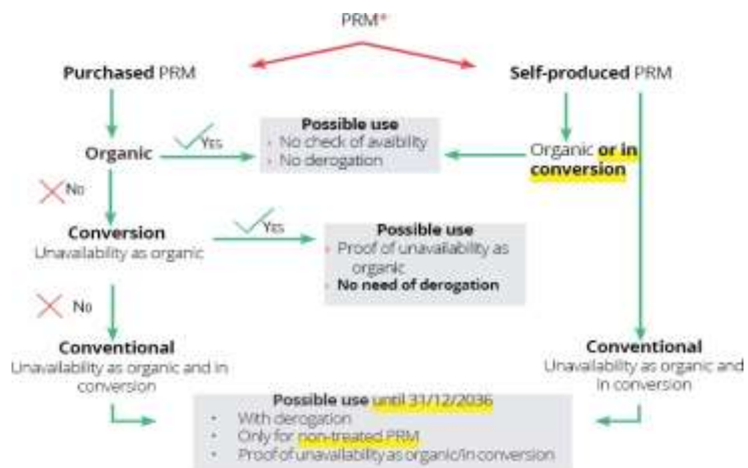
SEEDLING

= a young plant originating from seed and not from cutting (annex III of Regulation (EU) 2020/464)

#1 – PLANT REPRODUCTIVE MATERIAL

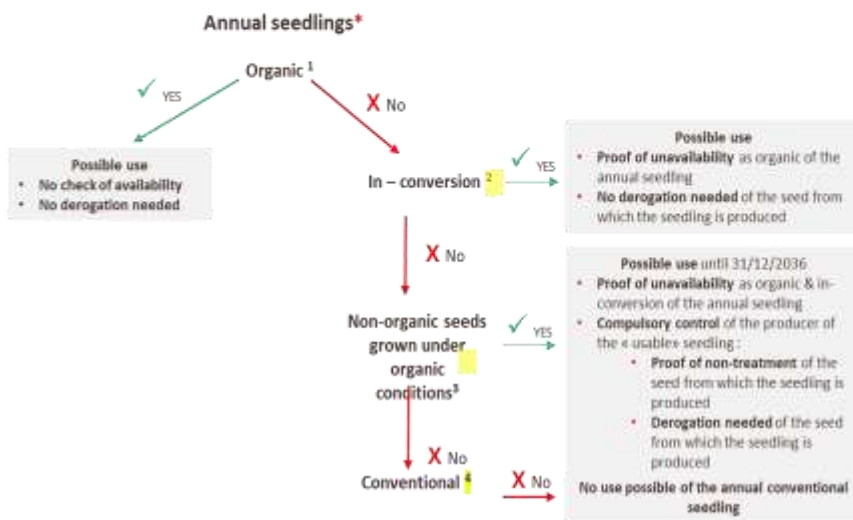
PLANT PRODUCTION

USE OF PRM



* *This flow chart applies to all types of PRM except for seedlings*

USE OF ANNUAL SEEDLINGS



* : young plant originating from seeds and not cutting. Self produced and/or purchased annual seedlings.

#2 – CONVERSION AND PARALLEL PRODUCTION

RETROACTIVE RECOGNITION OF THE CONVERSION PERIOD

Article 24 of Regulation (EU) 2021/1698

The conditions for accessing retroactive recognition of the land conversion period are expected to become more stringent.

Derogation for an immediate conversion of a land to organic will only be granted as follows:

- an official and detailed request from the operator, and
- a thorough analysis by his control body of the risks of treatment and/or contamination of the land over the last 3 years. This analysis will lead to an on-site audit which must take place before any cultivation practice, during which samples for analysis could be taken.

The derogation can only be accepted if the risks / doubts about a possible contamination of the plots over the last 3 years are removed.

PARALLEL PRODUCTION

Article 9.8 of Regulation (EU) 2018/848

On derogation, it is still possible to grow organic and conventional perennial crops of the **same variety** *(new precision in Regulation (EU) 2018/848)* or of different varieties that are difficult to distinguish to the eye. One condition of the derogation is the implementation of a 5-years conversion plan for conventional crops.

However, this condition changed: conversion will have to start **not later than year 2** (before: no later than year 5).

#3 – INPUTS AND PRACTICES

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.

ANIMAL HUSBANDRY

#4 - HERBIVORES

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.

#4 - HERBIVORES

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.

#5 - PORK

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 REPLACERBEFORE 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.

#5 - PORK

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.

#5 - PORK

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.

#6 - POULTRY

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.

#6 - POULTRY

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

#6 - POULTRY

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 m^2 will no longer be considered as today for the minimum stocking density, but only the live weight per m^2 (21 kg /m^2).

Mobile poultry houses: minimum density of 30 kg live weight/m^2 instead of 16 birds/m^2 (for houses of less than 150 m^2).

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 Regulation (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.

#6 - POULTRY

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

#6 - POULTRY

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 taken into account in the calculation of stocking densities and minimum indoor areas, unless the space meets the criteria for indoor rearing: the space in question is accessible 24 hours a day, meets the animal welfare conditions and is covered and insulated in such a way as to provide 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.

#7 - BEEKEEPING

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 ins pection (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.)

– for all types of 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.

AQUACULTURE

#8 – GENERAL CHANGES

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%)

#9 – ALGAE

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

#9 – ALGAE

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 <u>high ecological status</u>, 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 <u>the A or B classified area of Regulation</u> (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

#10 - FISH

ANIMAL ORIGIN

WILD CATCH AND NON-ORGANIC AQUATIC ANIMALS

POINT 3.1.2. OF ANNEX II, PART III of Regulation (EU) 2018/848

For breeding purposes, wild caught or non-organic aquatic animals may be introduced into a holding only in duly justified situations :

- Where **no organic breeds** are available;
- Or where **new genetic stock for breeding** is introduced into the production unit **after authorization by the control body**, for the purpose of improving the quality of the genetic stock.

These animals will have to **undergo a 3-month conversion period** before they can be used as breeding stock (no organic valuation of the fish).

For animals listed in the IUCN Red List of Threatened Species, permission to use wild-caught specimens may only be granted in the context of conservation programs recognized by the competent public authority responsible for the conservation effort.

INTRODUCTION OF NON-ORGANIC JUVENILES

POINT 3.1.2. OF ANNEX II, PART III of Regulation (EU) 2018/848

Control Bodies or Control Authorities may allow the introduction for fattening purposes into an organic production unit of **up to 50 % of non-organic juveniles** of species which have not been organically reared in either the Union or the territory of the country in which the holding is located.

Non-organic juveniles must then be subject to **organic farming rules at least the last 2/3 of their production cycle**.

These derogations may be granted for a **maximum period of two years and are not renewable.**

EASING OF RESTRICTIONS

There are no longer **any restrictions on the taking of eels/scallops in the wild** for breeding purposes *(deletion of Art. 25.4b of 889/2008)*.

In regard to the taking of **wild fry and crustacean larvae in extensive aquaculture** *(Point 3.1.2.1.e)ii) of the 2018/848)*, there is no longer a requirement for dykes or banks to close off the taking areas *(Art 25.4c 889/2008)*.

#10 - FISH

ANIMAL PURCHASE

ARTICLE 26 of Regulation (EU) 2018/848

All requests for the purchase of non-organic juveniles will be subject to derogation after verification by the control body of an unavailability attestation.

JUVENILES PRODUCTION

ANNEX II, PART III, POINT 3.1.2.3 of Regulation (EU) 2018/848, amended by Regulation (EU) 2020/427

For larval rearing of marine fish species, rearing systems meeting the following criteria may be used:

- The initial stocking density is **less than 20 eggs** or larvae per litre;
- The larval rearing tank has a **minimum volume of 20 m3;**
- The **larvae feed on natural plankton** growing in the tank (possible addition of externally produced phytoplankton and zooplankton)

#10 - FISH

ANIMAL FEED

ANNEX II, PART III, POINT 3.1.3.3 of Regulation (EU) 2018/848, amended by Regulation (EU) 2021/716 and Regulation (EU) 2021/1165 ANNEX A.2.

FATTENING PHASE AND EARLY STAGE OF LIFE CYCLE IN HATCHERIES

Organic and non-organic (in case organic is not available) **cholesterol** may be used to supplement the diets of penaeid shrimps and freshwater prawns (Macrobrachium spp.), in order to cover their quantitative dietary requirements.

CARNIVOROUS AQUACULTURE ANIMALS

There is **no longer a limit on the percentage of non-organic feed of plant origin** *(compared to a maximum of 60% under R(EC) 889/2008)*.

CRUSTACEANS AND MOLLUSCS

Are included in the categories of organic aquaculture oils and trimmings **allowed in feed** for carnivorous aquaculture animals.

PRODUCTION FACILITY

FOULING

ANNEX II, PART III, POINT 3.1.4.1.e of Reg. (EU) 2018/848

Organic fouling shall be removed by physical means and discharged into the sea at a **safe distance from the aquaculture facilities** for fish, shellfish and molluscs.

LAND-BASED AQUACULTURE FARMS

ANNEX II, PART III, POINT 3.1.5.5.b of Reg. (EU) 2018/848

At **least 10%** of the perimeter area of the farm (water/land interface) is **natural vegetation** *(so far 5%)*.

LIGHTING

ANNEX II, PART III, POINT 3.1.6.3.b of Reg. (EU) 2018/848

The accumulation of daylight and artificial lighting is limited to 14 hours per day *(so far 16 hours)* except, if necessary, for reproduction purposes.

VETERINARY TREATMENTS

ANNEX II, PART III, POINT 3.1.4.2.e of Regulation (EU) 2018/848

The number of treatments is limited :

FOR SALMONS

Maximum of 2 treatments per year or 1 treatment per year when the production cycle is less than 18 months.

FOR ALL SPECIES OTHER THAN SALMON

Maximum of 2 treatments per year or 1 treatment per year when the production cycle is less than 12 months.

FOR ALL SPECIES

Maximum of 4 treatments in total, regardless of the length of the production cycle of the species.

MOLLUSCS SPECIFICITIES

SEEDS

ANNEX II, PART III, POINT 3.2.1.d of Reg. (EU) 2018/848

The use of **wild seeds** may be collected after **authorization by the Control body.**

ENVIRONMENTAL MANAGEMENT

ANNEX II, PART III, POINT 3.2.3. of Reg. (EU) 2018/848

The farming of molluscs on the flat and on the ground is possible if it **does not have a significant impact on the environment at the collection and production sites.**

- **A study and report setting out the evidence of minimal environmental impact shall be attached to the sustainable management plan** and returned to the control authority or control body before the start of the activities.

#10 – FISH

WATER QUALITY

ANNEX II, PART III, POINT 3.1.3.2 of Regulation (EU) 2018/848

Over the entire production cycle (= for catchment, the start of the production cycle is the date of harvesting of the collectors), **shellfish growing areas** must comply with at least one of the following three criteria:

CRITERIA

1	Have a **very good ecological status**, according to the 2000/60 EC Directive *(EU Directive will not apply in Third Countries, however the target values described in this Directive are valid).*
OR	
2	Have a **Good environmental status** as defined by Directive 2008/56/EC *(EU Regulation will not apply in Third Countries, however the target values described in this Regulation are valid).*
OR	
3	Have equivalent quality to the corresponding classification zones defined in the implementing acts adopted by the Commission in accordance with Article 18(8) of Regulation (EU) 2017/Art 53 of the EU Regulation 2019/627. ***(= according to 834/2007 we could have zones in classification A or B. From 1/1/2022, according to 2018/848, only A zones can be used)*** *(EU Regulation will not apply in Third Countries, however the target values described in this Regulation are valid).*

PROCESSI NG

#11 - COMPOSITION RULES

USE OF NON-ORGANIC AGRICULTURAL INGREDIENTS

Regulation (EU) 2021/1165 article 7

Regulation (EU) 2021/1165 Annex V part B

The list of non-organic products that can be used as ingredients in processed organic foods without a request for a derogation has been revised and greatly reduced (compare Appendix V, Part B).

Non-organic agricultural ingredients of Annex IX of 889/2008 can continue to be used until 31 December 2023. Processed organic foodstuffs that have been produced before January 1, 2024 with these non-organic agricultural ingredients can be placed on the market after this date until stocks are exhausted.

USE OF ADDITIVES, PROCESSING AIDS

Regulation (EU) 2021/1165 article 6

Regulation (EU) 2021/1165 – Annex V part A

Authorised products and substances for use in the production of processed organic food and of yeast used as food or feed are listed in Annex V, Part A, of the EU Regulation 2021/1165.

Several of these products and substances can be used only from organic production, such as lecithins and guar gum.

It is recalled that their use must be consistent with the Regulation (EC) No 1333/2008 on food additives.

#12 – SPECIFICCASES

USE OF FLAVOURINGS

Flavorings are now considered as agricultural ingredients.

Authorized flavorings are now to be considered when calculating the percentage of organic agricultural ingredients in the finished product, which was not the case previously.

Only substances classified as "Natural Flavoring of X"* (organic or not) may be authorized.

The "natural flavorings of X with other natural flavorings" and the "natural flavorings" (without flavoring specification) will no longer be usable.

Regulation (EU) 2018/848: Part IV of Annex II Points 2.2.4.b and 2.2.2.b: Rules for the use of flavorings

Article 30.5.a.iii : Rules for the certification of organic flavorings

Regulation (EC) 1334/2008 , article 16 points 2, 3 and 4

"NATURAL FLAVOURING OF X"

= flavouring component obtained by at least 95% of the X*

(article 16. 4 of Regulation (EC) 1334/2008)

** The X designates the source used to produce the flavour (e.g., thyme, strawberry, jasmine, etc.). The natural flavour of X (organic or not) respects the following rules:*

*1)its **components are natural** and provide the total taste of X. **The flavour must be recognisable** (lemon, mint, etc. compliant but not smoky, grenadine, cookie, etc.).*

*2)the natural flavouring part **comes from at least 95% of X***

The flavouring component

Natural flavouring substance and/or flavouring preparation

Minimum 95% organic

Maximum 5% NON-organic
without derogation

Carriers

Non-flavouring ingredients of the flavouring and additives

Minimum 95% organic
agricultural ingredients
Organic agricultural additives (with*) listed in Annex V Part A of Regulation (EU) 2021/1165

Maximum 5% NON-organic
Non-organic ingredients listed in Annex V Part B of Regulation (EU) 2021/1165 until 1.1.2024 or with derogation
Non-organic additives (with*) listed in Annex V Part A of Regulation (EU) 2021/1165

#12 – SPECIFICCASES

YEAST PRODUCTION

Regulation (EU) 2018/848 - Annex II Part VII

For the production of organic yeast, only organically produced substrates can be used.

The authorized processing aids will be the same as at present (Regulation (EU) 2021/1165 Annex V Part A), however until December 31, 2024, the addition of extract or autolysate of non-organic yeast up to 5% remains authorized in the substrate in case of unavailability in organic production.

SALT PRODUCTION

Regulation (EU) 2018/848 - Annex 1

Sea salt and rock salt for food and feed are included in the scope of the new organic regulation. However, the rules of production have not yet been defined.

Non-organic salt will remain usable in organic food and there will be no need for proof of non-availability. Salt is also not taken into account in the calculation of the organic percentage of the finished product.

#13 - PROCESSING METHODS

ION EXCHANGE RESIN

Regulation (EU) 2020/464 considering 7 and Article 23.2

Ion exchange resin and adsorption techniques are allowed for the following baby foods:

-infant formulae, follow-on formulae, processed cereal-based foods and baby foods referred to in Article 1(1), (a) and (b) of Regulation (EU) No 609/2013

- products covered by Directive 2006/125/EC

NANOMATERIALS

The certification of foodstuffs containing or consisting of engineered nanomaterials* is prohibited.

NANOMATERIALS

= intentionally produced material of the order of 100 nm or less or composed of parts of the order of 100 nm or less Regulation (EU) 2015/2283 art. 3, § 2, point f

TRANSPORT

Regulation (EU) 2018/848 - Annex III point 2.2

It is now specified that the transport of bulk goods (except feed) is carried out only between two controlled operators and must include only organic products OR only in-conversion products.

CLEANING AND DISINFECTION PRODUCTS

A list of authorized products for cleaning and disinfection of processing and storage facilities is planned (EU Regulation 2021/1165 article 5.3.). This is Annex IV part C of this regulation.This annex is currently empty. Pending the inclusion of products on this list, the products currently authorized remain (EU Regulation 2021/1165 Article 5.4.).

LABELLI
NG

#14 - COMPULSORY INDICATIONS

NO MAJOR CHANGE

The compulsory indications remain unchanged: organic production logo of the European Union (green leaf), code of the control body, origin of the product, etc.

Certified by MA-BIO-154

Non-EU Agriculture

PLACE OF ORIGIN

ARTICLE 32 of Regulation (EU) 2018/848

No origin needs to be mentioned for ingredients present in small quantities: as of now, ingredients that make up less than 5% of the total quantity do not have to be declared (2% under the previous regulation).

PRODUCTS IN CONVERSION

ARTICLE 30.3 of Regulation (EU) 2018/848

With the new regulation, the label of some products exported to the European Union can now include the words "in conversion" after 12 months of conversion: plant reproductive materials and products containing a single plant ingredient of agricultural origin: for example, wine made with in-conversion grapes, if they are the unique plant ingredient of agricultural origin.

REFERENCE TO ORGANIC IN A NAME

ARTICLE 30.2 of Regulation (EU) 2018/848

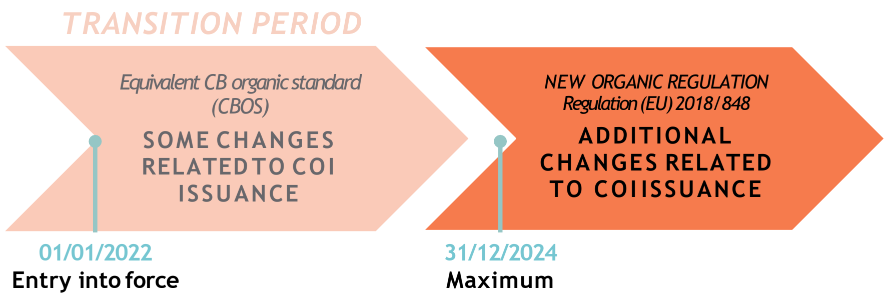
As with brand names, if your company name refers to organic farming, you will not be able to put that name on the label of conventional products if you produce some.

EXPOR
T

#15 - CHANGES IN TRADE RULES WITH THIRD COUNTRIES

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

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.

#16 – CERTIFICATE OF INSPECTION

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)

#17 - SPECIFIC CASE OF UNITED KINGDOM

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.

ORGANIC GROWER GROUPS

#18 – ELIGIBILITYCRITERIA

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:

AND

OR

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 € peryear
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	

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.

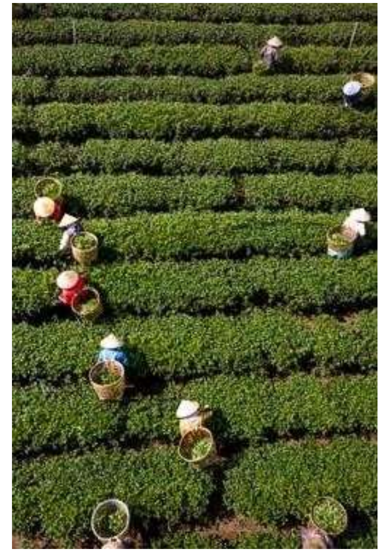
#18 – ELIGIBILITYCRITERIA

MAXIMUM GROUP SIZE

REQUIREMENT

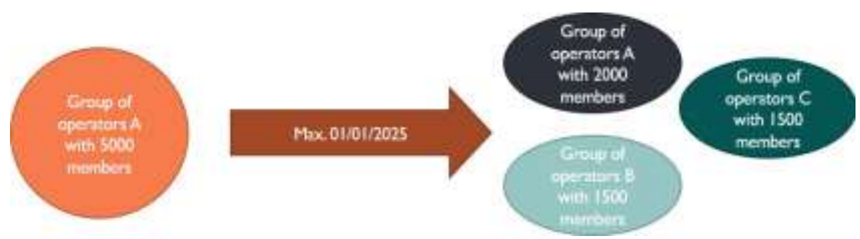
ARTICLE 4 of Regulation (EU) 2021/279

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



TRANSITIONAL PROVISIONS

ARTICLE 10.1 of Regulation (EU) 2021/279



#19 – INTERNAL CONTROL RULES

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.

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 betweem 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.

#19 – INTERNAL CONTROL RULES

INTERNAL INSPECTOR

ARTICLE 36.1 c f 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

#20 – EXTERNAL CONTROL RULES

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.

SUMMARY

MAIN CHANGES

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.

MAIN CHANGES

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

FISH AND 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.)

MAJOR CHANGES

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.

© *Ecocert SA*

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.

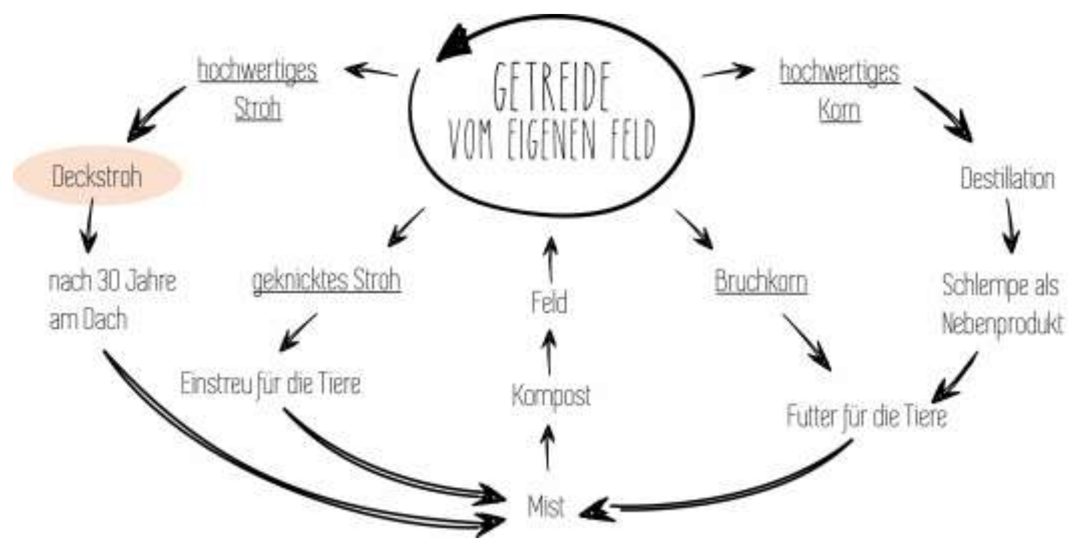
Subsistence Farming

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.

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//

Richtlinien von 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/

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

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:

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

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

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

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

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

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]

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]

Comparing the yields of organic and conventional agriculture

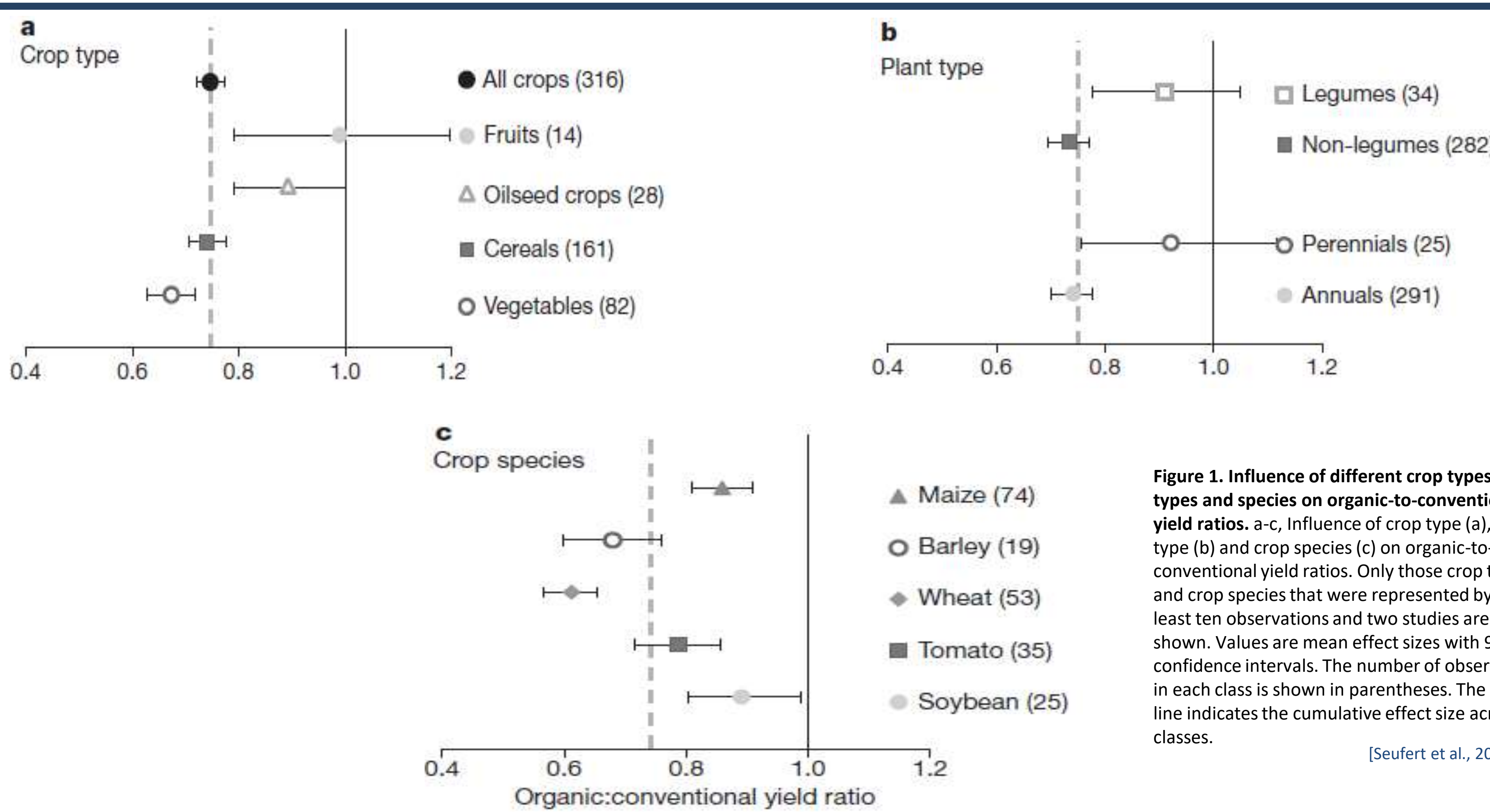


Figure 1. Influence of different crop types, plant types and species on organic-to-conventional yield ratios. a-c, Influence of crop type (a), plant type (b) and crop species (c) on organic-to-conventional yield ratios. Only those crop types and crop species that were represented by at least ten observations 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]

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]

The crop yield gap between organic and conventional agriculture

Ergebnis:

20% niedrigere Erträge im Durchschnitt bei ökologischer Landwirtschaft

Standardabweichung: 21%

Erträge variieren

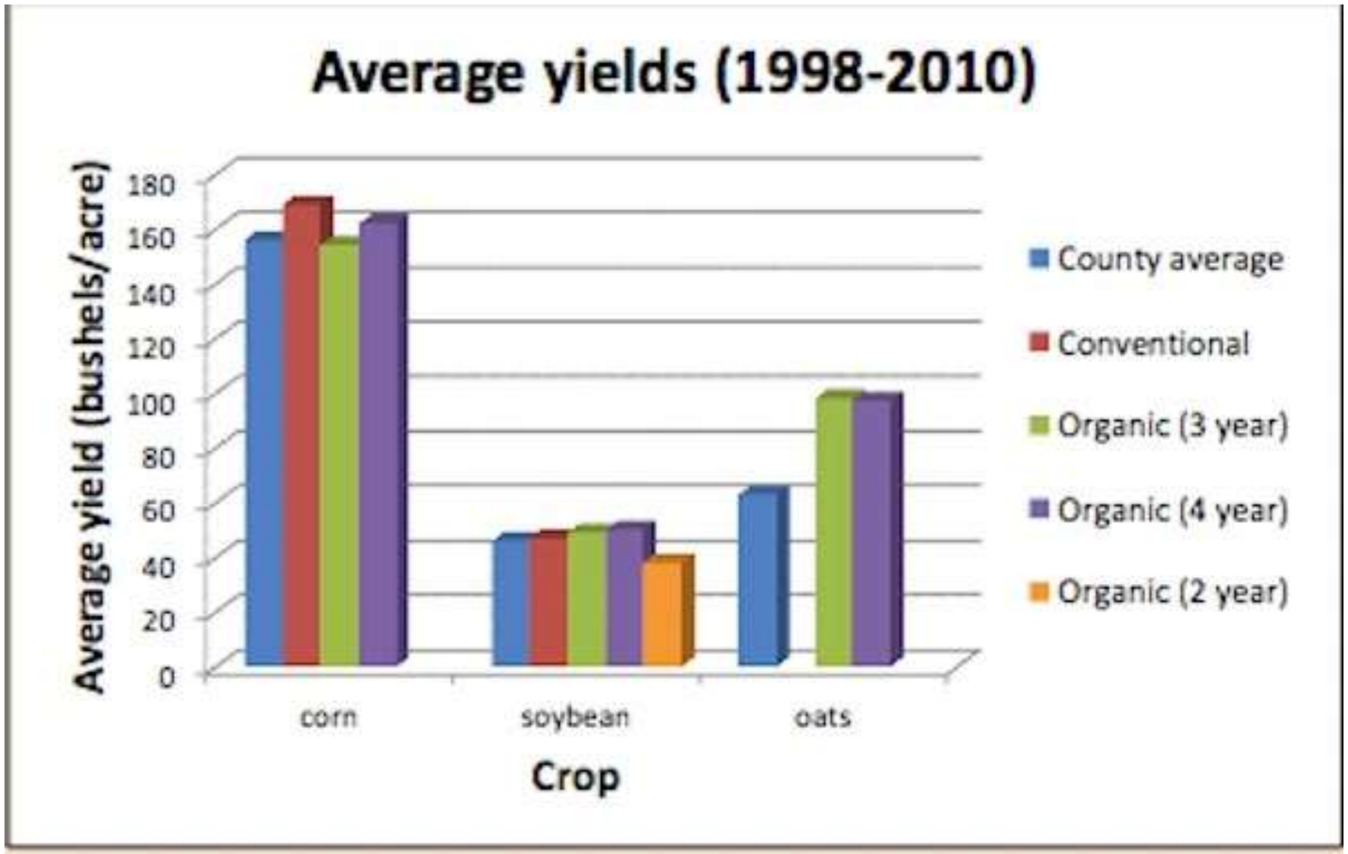
- je nach Fruchtfamilie

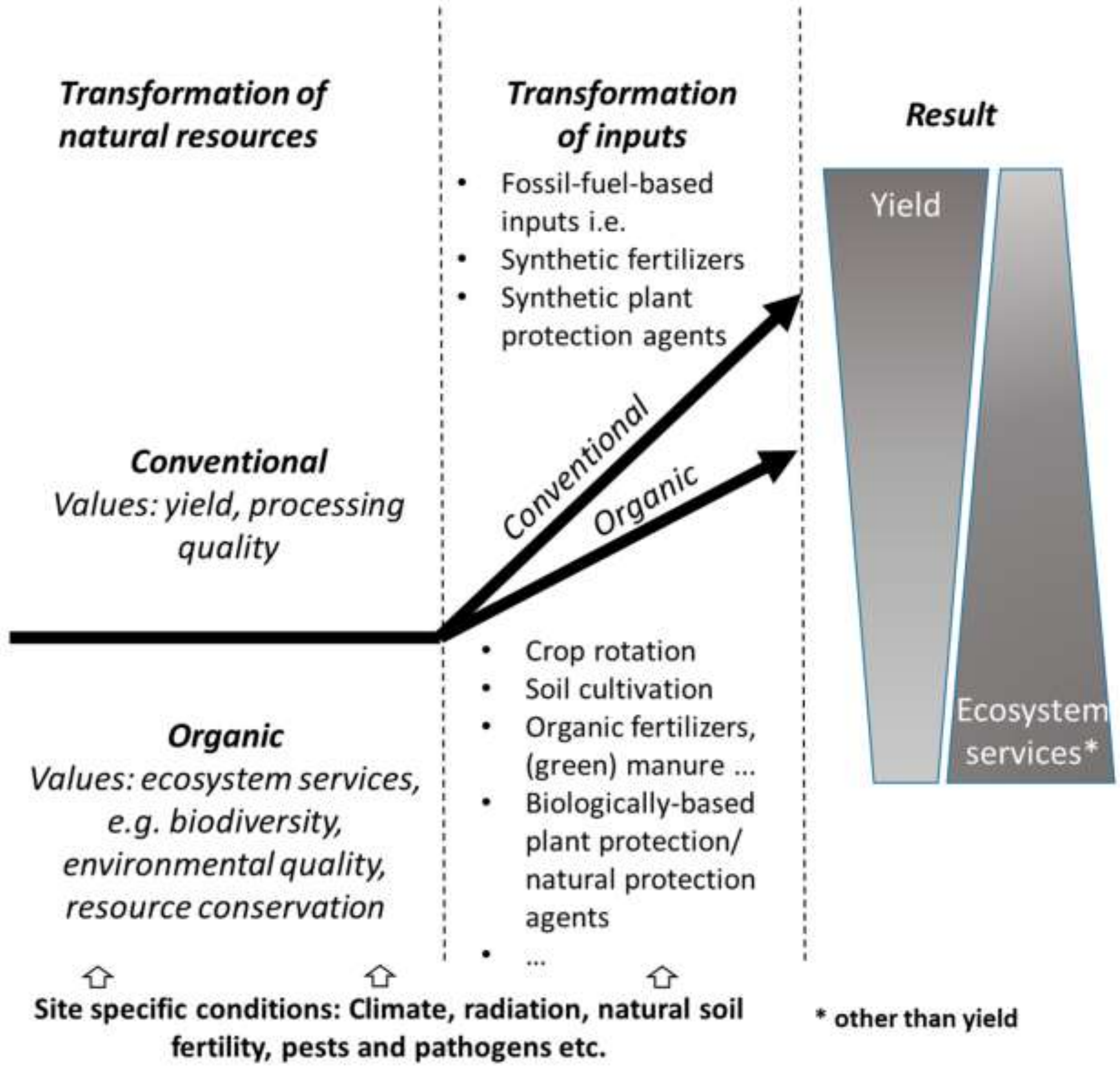
- je nach Region

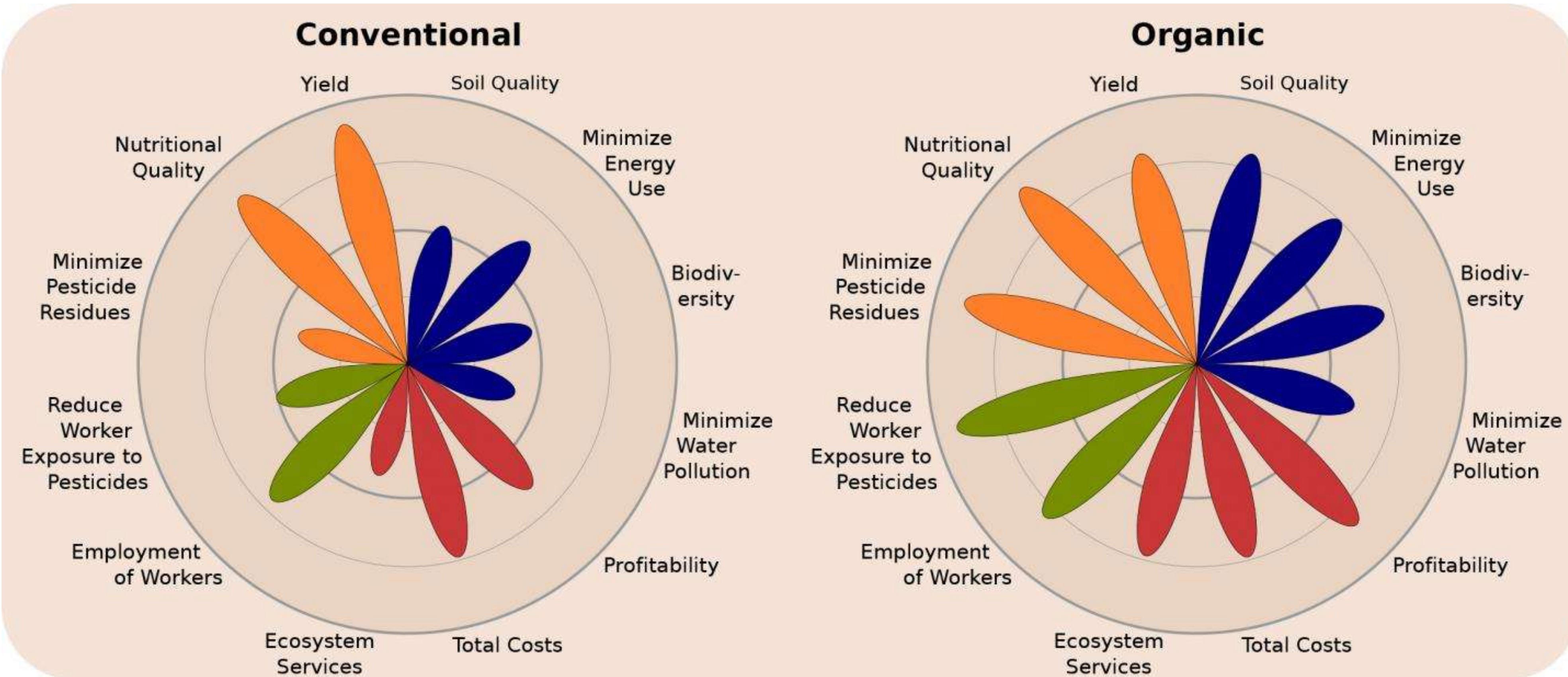
[de Ponti et al., 2012]

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.


Average yields (1998-2010)
Average yield (bushels/acre)
180
160
140
120
100
80
60
40
20
0
corn
soybean
oats
Crop
County average
Conventional
Organic (3 year)
Organic (4 year)
Organic (2 year)

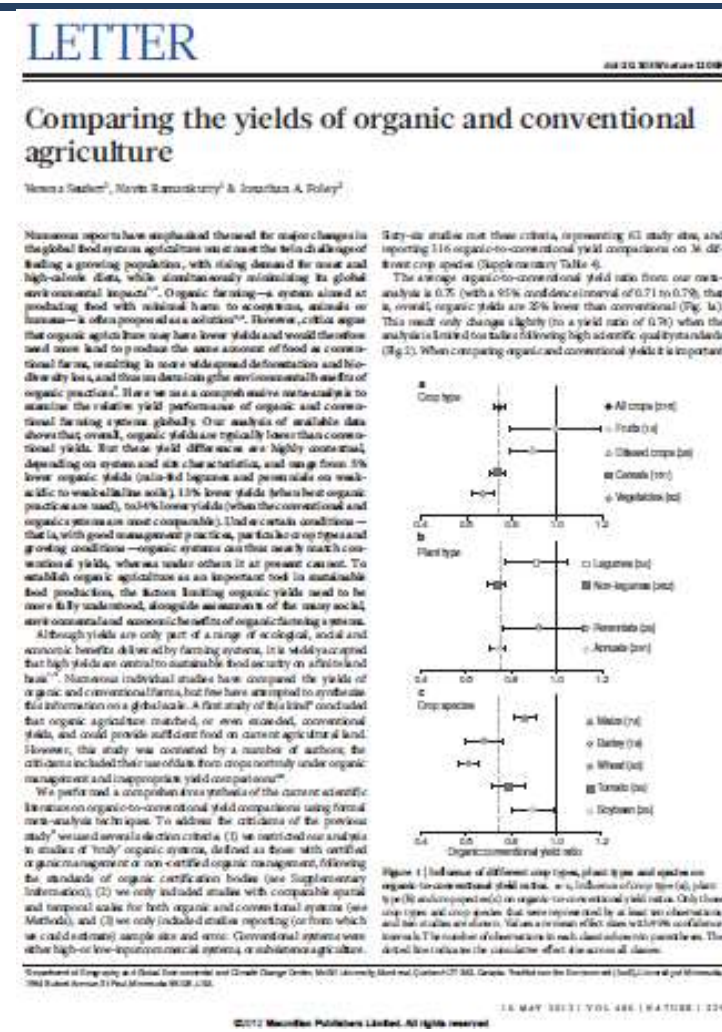

Transformation of natural resources
Transformation of inputs
Result
• Fossil-fuel-based inputs i.e.
• Synthetic fertilizers
• Synthetic plant protection agents
Yield
Conventional
Organic
Conventional
Values: yield, processing quality
• Crop rotation
• Soil cultivation
• Organic fertilizers, (green) manure ...
• Biologically-based plant protection/ natural protection agents
• ...
Ecosystem services*
Organic
Values: ecosystem services, e.g. biodiversity, environmental quality, resource conservation
Site specific conditions: Climate, radiation, natural soil fertility, pests and pathogens etc.
* other than yield


Conventional
Yield
Soil Quality
Minimize Energy Use
Biodiv-ersity
Minimize Water Pollution
Profitability
Total Costs
Ecosystem Services
Employment of Workers
Reduce Worker Exposure to Pesticides
Minimize Pesticide Residues
Nutritional Quality
Organic
Yield
Soil Quality
Minimize Energy Use
Biodiv-ersity
Minimize Water Pollution
Profitability
Total Costs
Ecosystem Services
Employment of Workers
Reduce Worker Exposure to Pesticides
Minimize Pesticide Residues
Nutritional Quality

Comparing the yields of organic and conventional agriculture

- <u>Meta-Analyse</u>
- <u>Kriterien festgelegt</u>
- <u>66 Studien</u>

[Seufert et al., 2012]


LETTER

Comparing the yields of organic and conventional agriculture

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

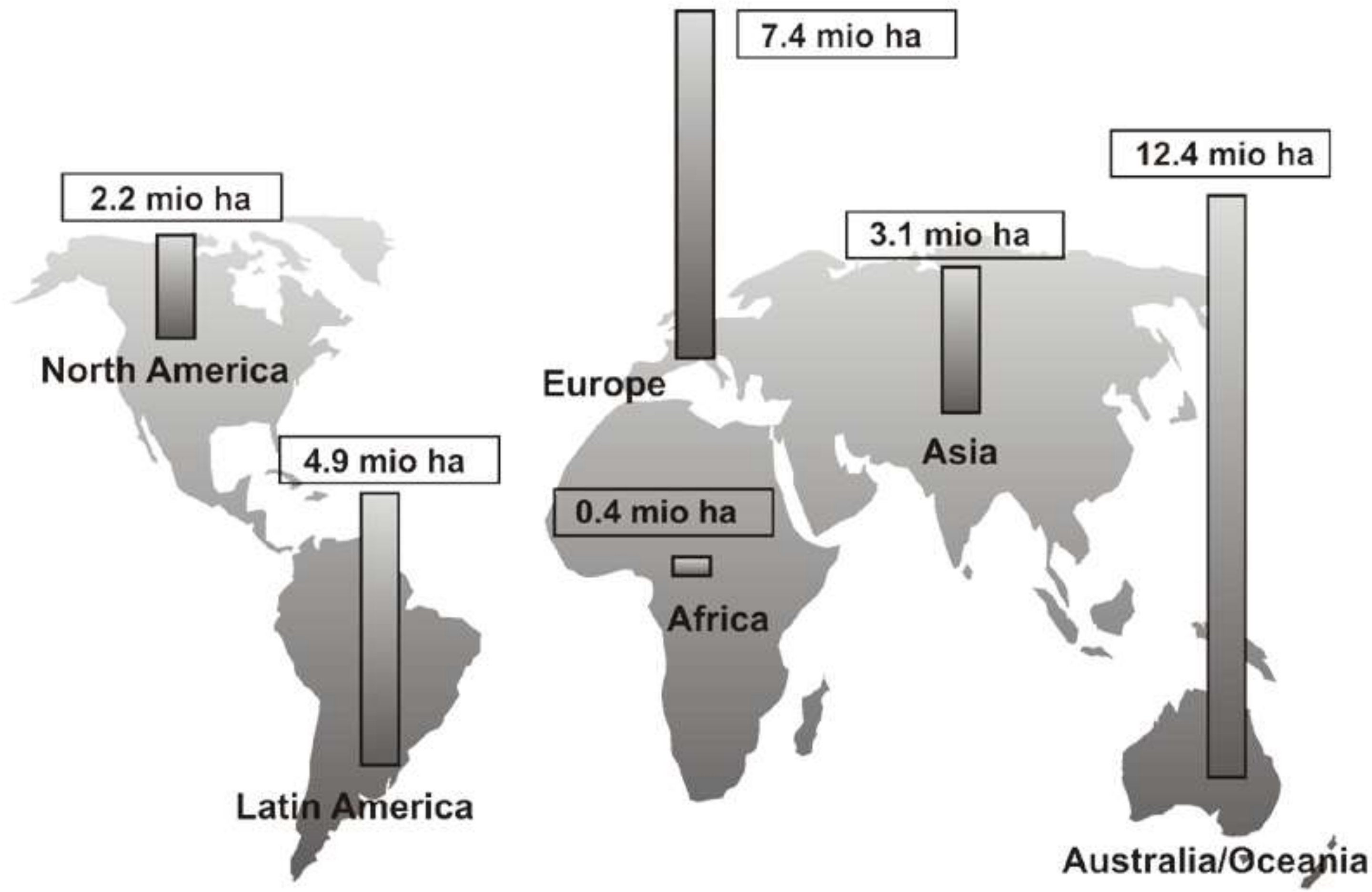
Standardabweichung: 33,8 – 60%

Erträge variieren

- je nach Frucht
- je nach Region

[Brückler et al., 2018]

Biolandbau weltweit: 30,4 Mill. ha



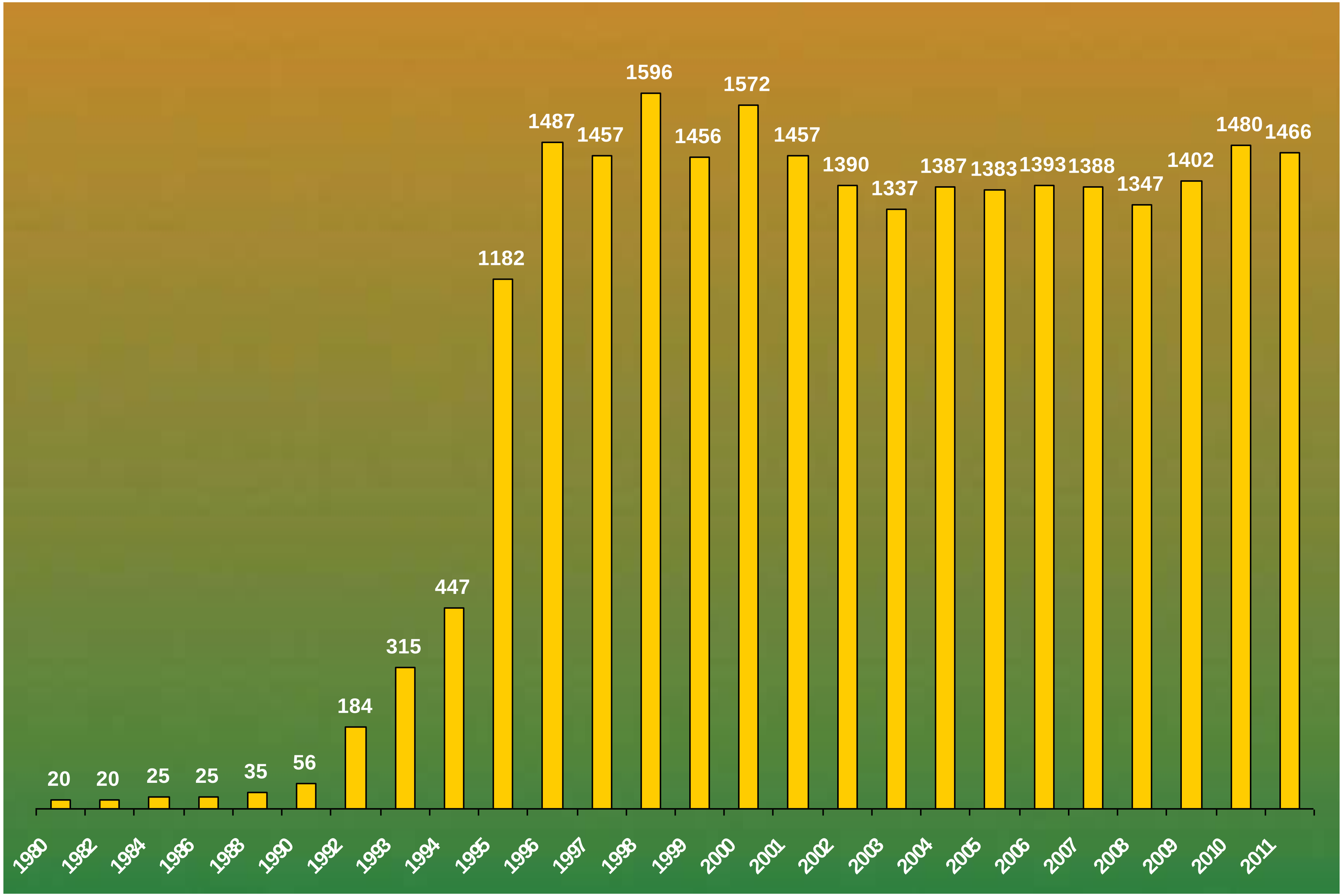
© SOEL, Source: FiBL Survey 2008

BIO AUSTRIA

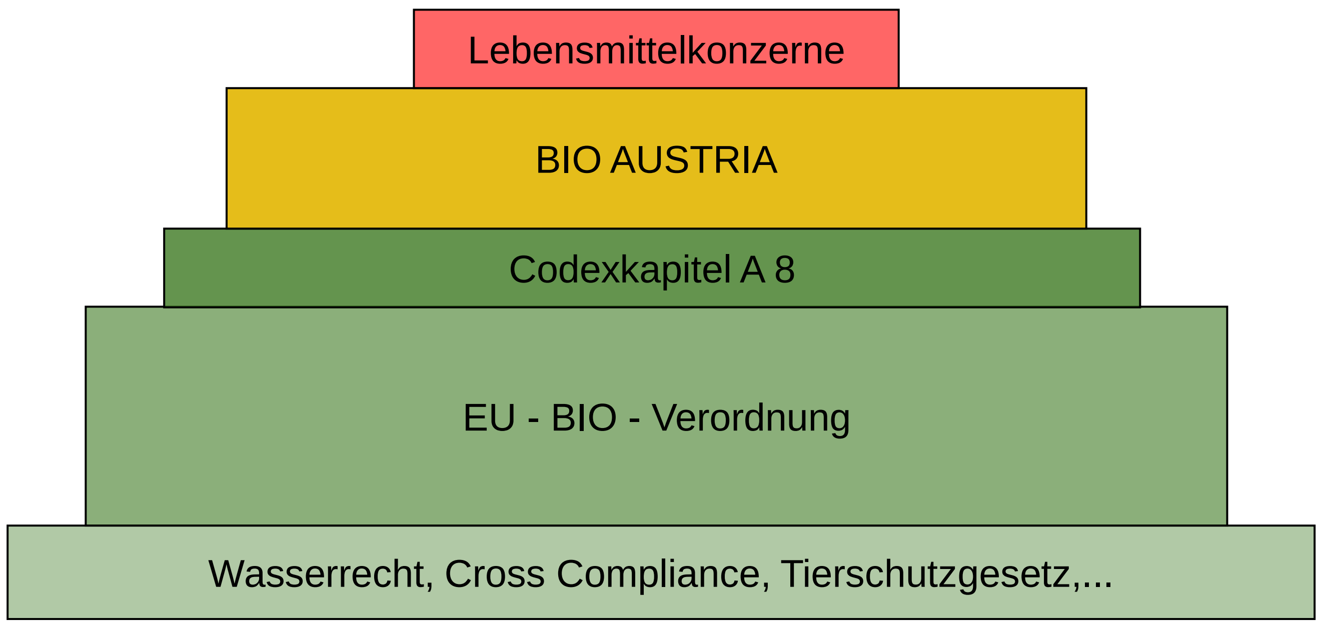
- gemeinnütziger Verein
- Eigentum der Bauern
- Jeder soll sich einbringen!
- Österreichweit aktiv
- Heimisches Bio-Netzwerk
- den Werten verpflichtet…

Bio in Kärnten

knapp 12 % aller Landwirte in Kärnten sind **Biobauern**



Rechtliche Grundlagen; gelebte Praxis



There are two main types:

Family Based

- Small farms
- Workers made up of immediate and sometimes extended family members
- All produce goes to the family
- All the income gained goes back into the farm
- Sustainability is practiced avidly
- Processes that reduce manpower, money and taxed utilities are used

Community Based

- Somewhat larger establishments
- Farmers gather a small community that all live on a farm or plot of land
- Most of the produce is used by the community, some is sold
- More time to spend on perfecting sustainable practices
- Many minds bring many oppinions to the table

Methods of Farming

- Part of subsistence farming is using the littlest space to produce the most
- Different methods are used to acquire such a goal
- These beds a tiered garden beds
  - They utilize a hilled area that would otherwise be difficult to farm
  - Water uses gravity to travel between garden beds

Benefits of Subsistence Farms

- A sustainable source of food
- A place to practice sustainable methods of growing, gathering foods and using natural resources
- Good for the soil and local ecosystems
- Very affordable as long as the work is put in

Methods Cont.

- Intercropping
  - Maximizes variation and use of space
  - Plants work together to provide each other with nutrients and distribute water between levels
  - Creates a medley of dead material to revitalize the soil

CSAs provide income for the farm that can be used for more seed and starts

It also provides an alternative food option for locals

Farmers markets are another source of income and gives the local community healthy food and jobs

Farmers markets can also be a place for local arts and crafts

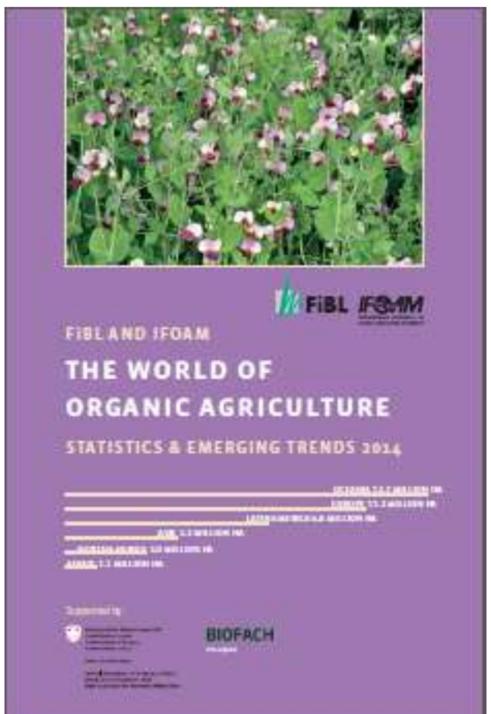
Summary

- With all these forms and methods of farming, such practices could be a medium for the next generation of sustainable living.
- Not only is the work visibly satisfying but it brings people together and nurtures ideas.
- It is a great way to conserve our planet and live fully.

Organic Agriculture 2014: Key Indicators and Leading Countries

Indicator	World	Leading countries
Countries with data on certified organic agriculture[1]	2012: 164 countries	
Organic agricultural land	2012: 37.5 million hectares (1999: 11 million hectares)	Australia (12 mio. hectares, 2009) Argentina (3.6 mio. hectares) US (2.2 mio. hectares, 2011)
Share of total agricultural land	2012: 0.87 %[2]	Falkland Islands (Malvinas) (36.3 %) Liechtenstein (29.6 %) Austria (19.7 %)
Further, non-agricultural organic areas (mainly wild collection)	2012: 31 million hectares (2011: 32.5 million hectares; 2010: 43 million hectares)	Finland (7 million hectares) Zambia (6.1 million hectares; 2009) India (4.7 million hectares)
Producers	2012: 1.9 million producers (2011: 1.8 million producers; 2010: 1.6 million producers)	India (600'000), Uganda (189'610), Mexico (169'707)
Organic market size	2012: 63.8 billion US dollars (approx. 50 billion euros) (1999: 15.2 billion US dollars) Source: Organic Monitor	US (22.6 billion euros), Germany (7 billion euros) France (4 billion euros)
Per capita consumption	2012: 9.08 US dollars[3]	Switzerland (189.1 euros), Denmark (158.6 euros) Luxemburg (143 euros)
Number of countries with organic regulations 2012	2012: 88 countries (2011: 86 countries)	
Number of IFOAM affiliates	2013: 732 affiliates from 114 countries	Germany: 85 affiliates; India: 44 affiliates; United States: 37 affiliates; China: 34 affiliates

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



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/

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/

Neue Wirtschaftsformen

Community Supported Agriculture
CSA

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.

Was ist
Solidarische Landwirtschaft?

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

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.

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

Was stellt der Hof zur Verfügung?

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

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.

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

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

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

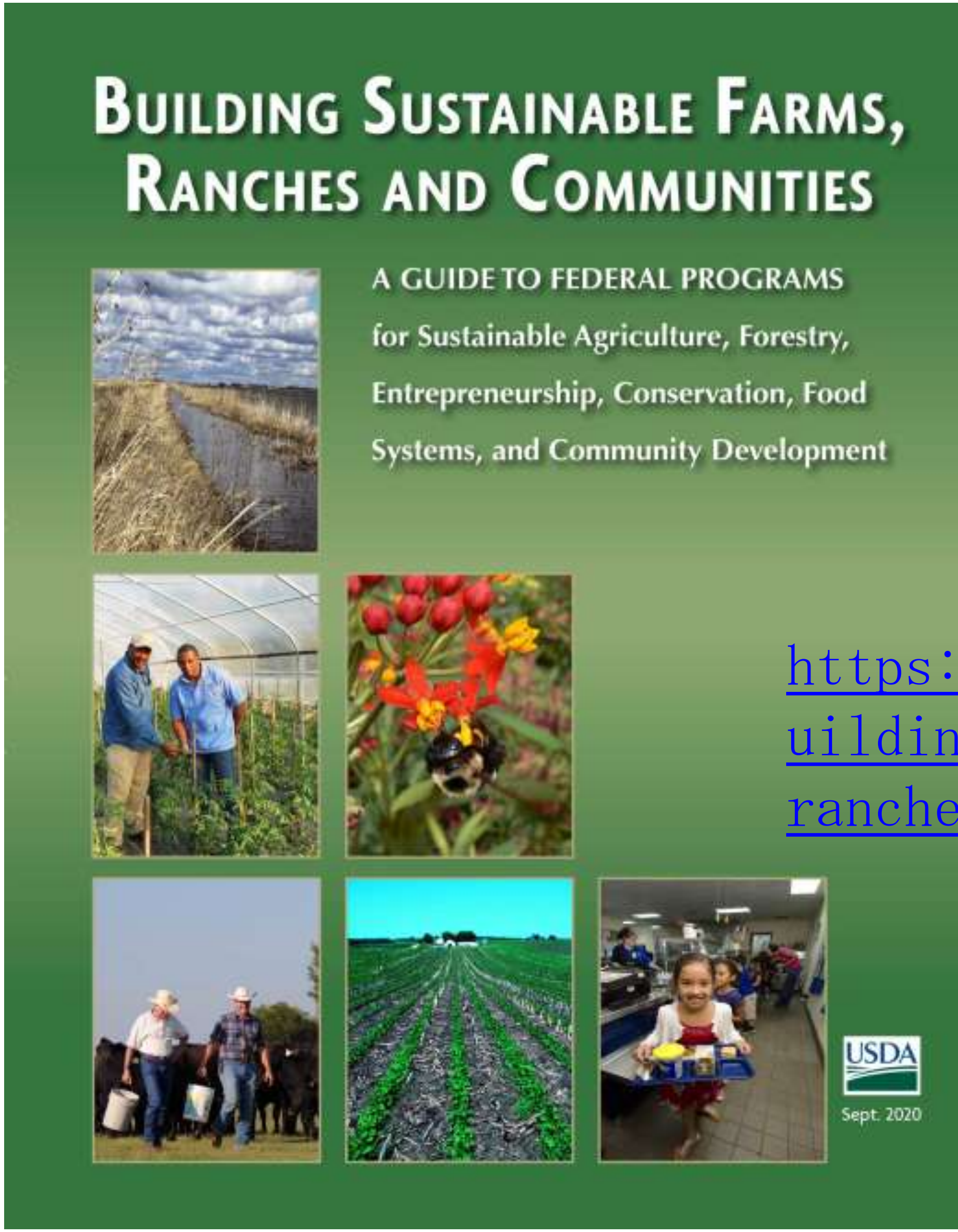
- Mitgliedschaft für ein Jahr/Saison erzeugt ökonomische Sicherheit für den Hof.
- Mitglieder identifizieren sich mit „ihrem“ Hof.

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

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



SARE Sustainable Agriculture Research and Education

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


Ökologische Landwirtschaft &
fairtrade in
Entwicklungsländern

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

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

Verschiedene nicht-zertifizierte Bewirtschaftungsweisen

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

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

Entwicklung des öko-Landbaus in Entwicklungsländern

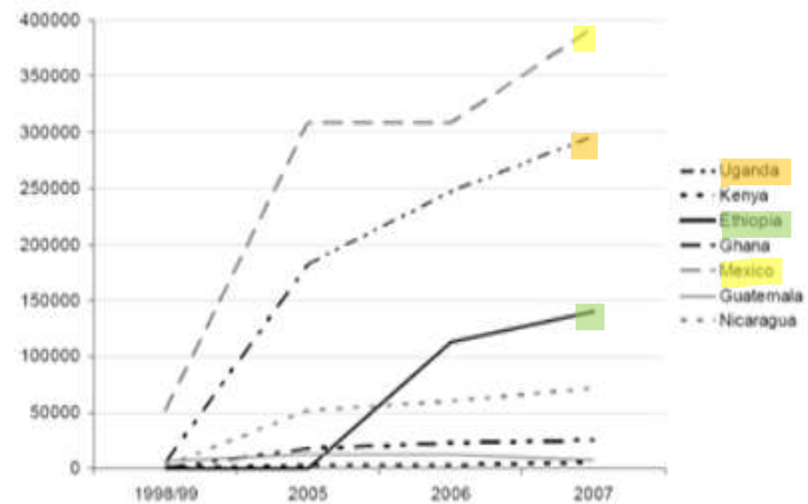


Abbildung Entwicklung der zertifizierten Biofläche ausgewählter Entwicklungsländer von 1998 bis 2007 (Willer und Yussefi, 2000; Willer und Kilcher, 2009)

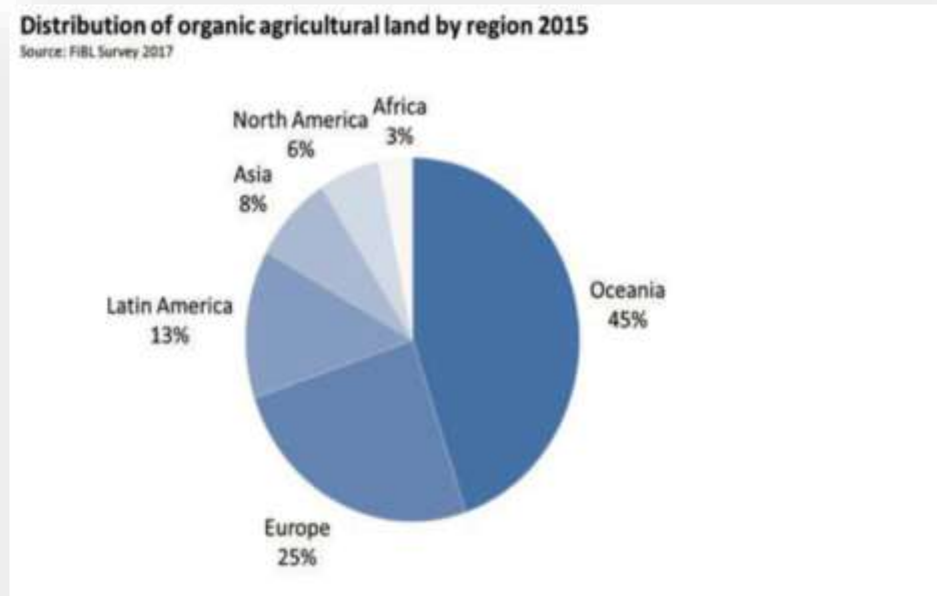


Figure 1: World: Distribution of organic agricultural land by region 2015

Source: FiBL survey 2017, based on information from the private sector, certifiers, and governments. For detailed data sources see annex, page 316

Ökologische Landwirtschaft

- Verminderte Ertragsschwankungen

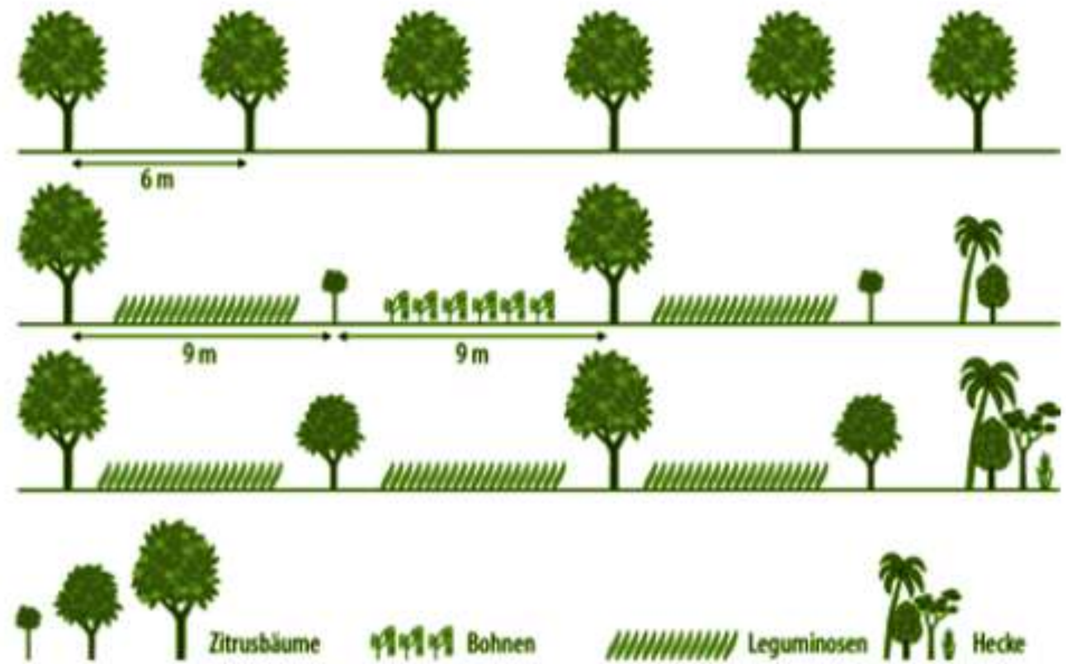
  - langfristige Ernährungssicherheit
- Geschlossene Nährstoffkreisläufe & effiziente Nutzung lokaler Ressourcen
- Biobauern produzieren mehr

  -Bio-Kokos-Kooperative in Kuba
- Marktzugang und Mehrwert mittels zertifizierter Bio- Produkte
- Selbstbewusstsein und Eigenständigkeit

- **Diversität**

  - Agroforst-Systeme
  - Intercropping
  - Rotation

Abbildung: Überführung einer Zitrusplantage in ein Intercropping-System (Grafik: Lukas Kilcher, FiBL 2005)



Wege zur Ernährungssicherheit durch ökologische Landwirtschaft

Zertifizierte ökologische Landwirtschaft:

- Fokus auf exportorientierte Produkte
- Premiumpreise
- erhöhtes Einkommen
- Abhängig von Weltmarktpreisen und Exporteuren

Nicht-zertifizierte ökologische Landwirtschaft:

- Fokus auf Subsistenzprodukte
- Lokaler Markt
- keine Premium Preise
- Geringe Einkommenserhöhung

Probleme und Herausforderungen

- Exportorientierung

  - Konkurrenz um Anbaufläche, Arbeitszeit und Investition
  →Entwicklung eines lokalen Markt
- Zertifizierung als Hürde für Kleinbauern

  - Hohe Kosten
  - Einhaltung von Richtlinien
  - Unterschiedliche Leistungen der ICS
  → Authentizität der Richtlinien und Definitionen

- Forschungsdefizite

Herausforderungen

- Stärkung des Wissenssystems (Bildung, Beratung, Dokumentation)
- Entwicklung einer Bauernschule für die Umschulung einer Region
- Stärkung bestehender Bio Bauern
- Entwicklung eines nationalen Zertifizierungssystems

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

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

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

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

Fairtrade labels

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

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

Darf so etwas bio sein?

- Naturschutzverbände zweifeln z.B. beim Ananas-, Soja oder Zuckerrohranbau

- „bio“= ökologische Produktionsmethoden

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

Low input sustainable agriculture (LISA)