

PRINSIP-PRINSIP PERTANIAN ORGANIK



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Bahasan pagi ini

- Latar belakang
- Prinsip dan tujuan pertanian organik
 - Pendekatan sistem
 - Tujuan Keberlanjutan
 - Prinsip Pertanian Organik
- Sistem Pertanian Organik Lainnya
- Perbedaan pertanian organik dari sistem pertanian lain



Latar Belakang


- Trend konsumen terhadap pangan organik
- Semakin banyak petani dan pengusaha beralih ke pangan “organik” dan mengklaim produknya sebagai “organik”
- Benarkah yang diklaim mereka?
- Bagaimana konsumen dan produsen yang benar-benar menerapkan sistem pertanian organik dilindungi?



Apakah Pertanian Organik?



PANGAN ORGANIK



Pangan yang berasal dari sebuah sistem pertanian organik yang menerapkan praktek-praktek manajemen yang bertujuan untuk memelihara ekosistem untuk mencapai produktivitas yang berkelanjutan, dan melakukan pengendalian gulma, hama dan penyakit, melalui berbagai cara seperti daur ulang residu tumbuhan dan ternak, seleksi dan pergiliran tanaman, manajemen pengairan, pengolahan lahan dan penanaman serta penggunaan bahan hayati (SNI No. 01-6729- 2002)



PERTANIAN ORGANIK

Suatu sistem produksi yang mengabaikan atau meminimalkan penggunaan pupuk sintetis, pestisida, bahan-bahan mempercepat pertumbuhan dan bahan aditif lainnya. Untuk memaksimalkan tingkat kemungkinan produksi, sistem pertanian organik mempercayakan pada rotasi pemanenan, hasil residu, pupuk kandang, pupuk hijau, sampah dari pertanian organik dan memperhatikan aspek-aspek biologi pengontrolan hama untuk mempertahankan produktivitas tanah dan limbah serta mendukung nutrisi tumbuhan dan mengontrol serangga, tumbuhan liar dan hama lainnya. (USDA)



Prinsip dan Tujuan Pertanian Organik

- Pendekatan Sistem
 - Tujuan Keberlanjutan
 - Prinsip Pertanian Organik
- 

Pendekatan sistem: ekosistem alam sebagai model

Ekosistem Hutan Alam



Ekosistem Lahan Organik



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Ekosistem Hutan Alam

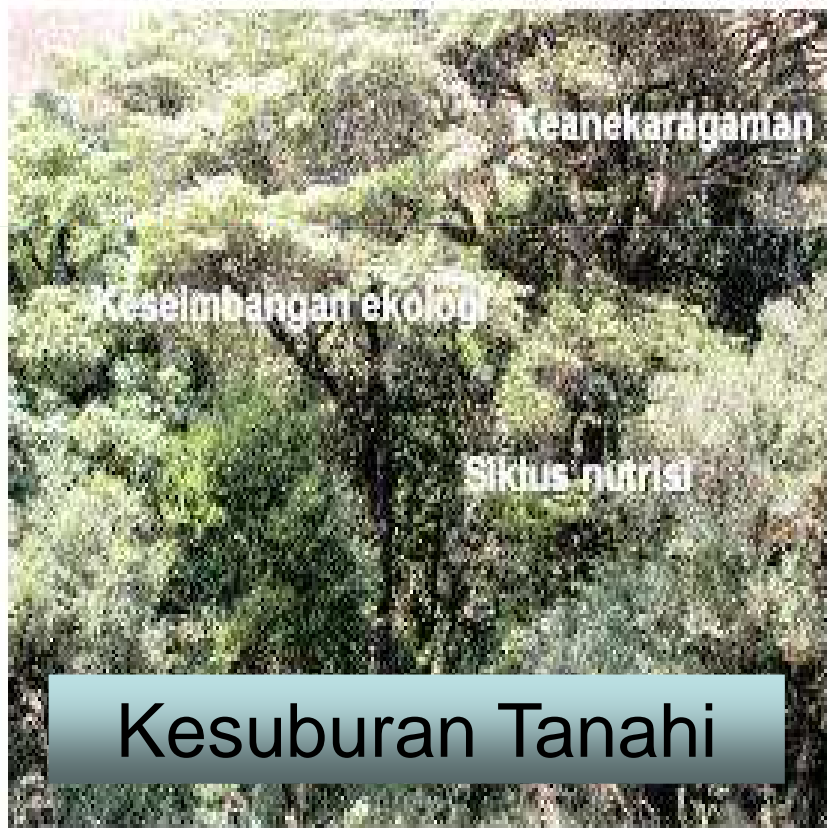


Ekosistem Lahan Organik



Pendekatan sistem: ekosistem alam sebagai model

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Ekosistem Lahan Organik





Diskusi

- *Lakukan identifikasi prinsip-prinsip ekosistem alam yang manakah yang terdapat dalam ekosistem pertanian tradisional atau organik?*
- *Apakah signifikansinya bagi petani?*
- *Elemen apakah yang dapat disertakan untuk memperbaiki lahan?*

Pendekatan sistem: ekosistem alam sebagai model

Ekosistem Hutan Alam



Ekosistem Lahan Organik



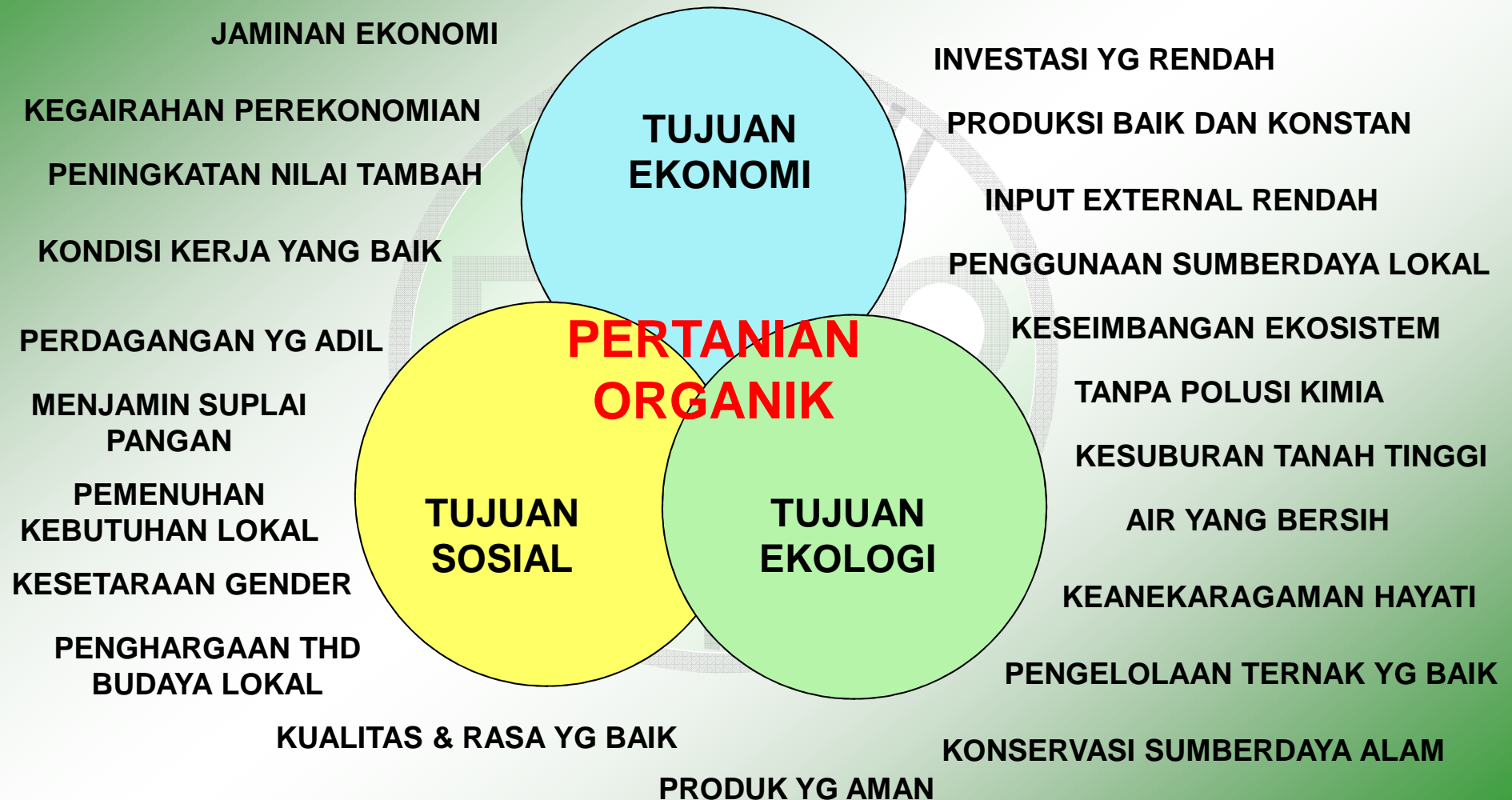
KEMBALI KE ALAM?



Diskusi

- *Kenapa anda tertarik dengan pertanian organik*
- *Apa yang anda harapkan dari pertanian organik?*

TUJUAN KEBERLANJUTAN PERTANIAN ORGANIK



Principles of Organic Agriculture

On a general level:

- Improve and maintain the natural landscape and agro-ecosystem
- Avoid over-exploitation and pollution of natural resources
- Minimize consumption of non-renewable energy and resources
- Produce sufficient quantities of nutritious wholesome and high quality food
- Provide adequate returns, within a safe, secure and healthy working environment
- Acknowledge indigenous knowledge and traditional farming systems

On a practical level:

- Maintain and increase the long-term fertility of the soil
- Enhance biological cycles within the farm, especially nutrient cycles
- Provide nitrogen supply by intensive use of nitrogen fixing plants
- Biological plant protection based on prevention instead of curing
- Diversity of crop varieties and animal species, appropriate to the local conditions
- Animal husbandry appropriate to the needs of the animals
- Ban on synthetic chemical fertilisers, plant protection, hormones and growth regulators
- Prohibition of Genetic Engineering and its products
- Ban on synthetic or harmful methods, processing aids and ingredients in food processing

Prinsip utama pertanian organik

- **Prinsip Kesehatan**

- Pertanian Organik harus mempertahankan dan meningkatkan kesuburan tanah, kesehatan tanaman, hewan, dan manusia sebagai sesuatu yang utuh dan tak dapat dibagi

- **Prinsip Ekologi**

- Pertanian organik harus berdasarkan kepada siklus dan sistem ekologi yang hidup, bekerja dengannya, melampauinya dan membantu mempertahankannya

- **Prinsip Keadilan**

- Pertanian organik harus dibangun berdasarkan hubungan yang memastikan adanya kejujuran dan keadilan dengan lingkungan umum dan peluang kehidupan

- **Prinsip Perlindungan/Kepedulian**

- Pertanian Organik harus dikelola dalam cara yang penuh kehati-hatian dan bertanggungjawab untuk melindungi kesehatan dan kesejahteraan generasi dan lingkungan sekarang dan masa datang

Principle of health

Organic Agriculture should sustain and enhance the health of soil, plant, animal and human as one and indivisible.

- This principle is the foundation of organic agriculture. It states that the health of all living systems and organisms, from the smallest in the soil to human beings, are mutually dependent. Even though they are separate entities, they belong together and form larger entities. It builds on the shared origin of the words “whole” and “health” and stresses the integrity of living systems as a whole.
- The role of organic agriculture whether in farming, processing, distribution or consumption is to sustain and enhance the process of health at all stages and levels.

Ecological principle

Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.

- This principle roots organic agriculture within living ecological systems.
- It stresses that production is to be based on ecological processes instead of external inputs.
- Nourishment and well-being is achieved through the ecology of the specific production environment. For example, in the case of crops this is the living soil; for animals it is the farm ecosystem: for fish and marine organisms, the aquatic environment.
- Production, through farming or wild harvesting, should not be exploitative.

Principle of fairness

Organic Agriculture should be built upon relationships that ensure fairness with regard to the common environment and life opportunities.

- This principle deals with human relations and relations between humans and other living beings.
- It stresses that organic agriculture should maintain and conduct these relationships in a manner that ensures fairness: a concept that includes the characteristics of equity, respect, justice and stewardship.

Principle of care

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

- This principle primarily stresses the approach of organic agriculture to strategic and day-to-day management. Precaution and responsibility is called for, not risk assessment which is a narrow notion based on a narrow scientific or economic appraisal. By contrast care: precaution and responsibility encompass evidence and perspectives that can be scientific but can also be outside of the realm of science, have a moral content and a relevance to non-experts.
- This principle should govern management, development and technology choices in organic agriculture. Such a precautionary approach to decision-making will recognize that, even when the best scientific knowledge is used, there is often a lack of knowledge with regard to future consequences and to the plurality of values and preferences of those who might be affected.



Sistem pertanian organik lainnya

- Biodynamic
- Permaculture
- Nature-farming
- Organic by Neglect
- Traditional farming?

Sistem pertanian organik lainnya

Bio-dynamic agriculture

Cosmic rhythms:

- ⇨ timing the activities of tillage, sowing and harvesting

Vitality:

- ⇨ quality, not only quantity

Biodynamic preparations:

- ⇨ specific preparations applied in diluted form

The Farm Organism:

- ⇨ the right number of animals



R. Steiner

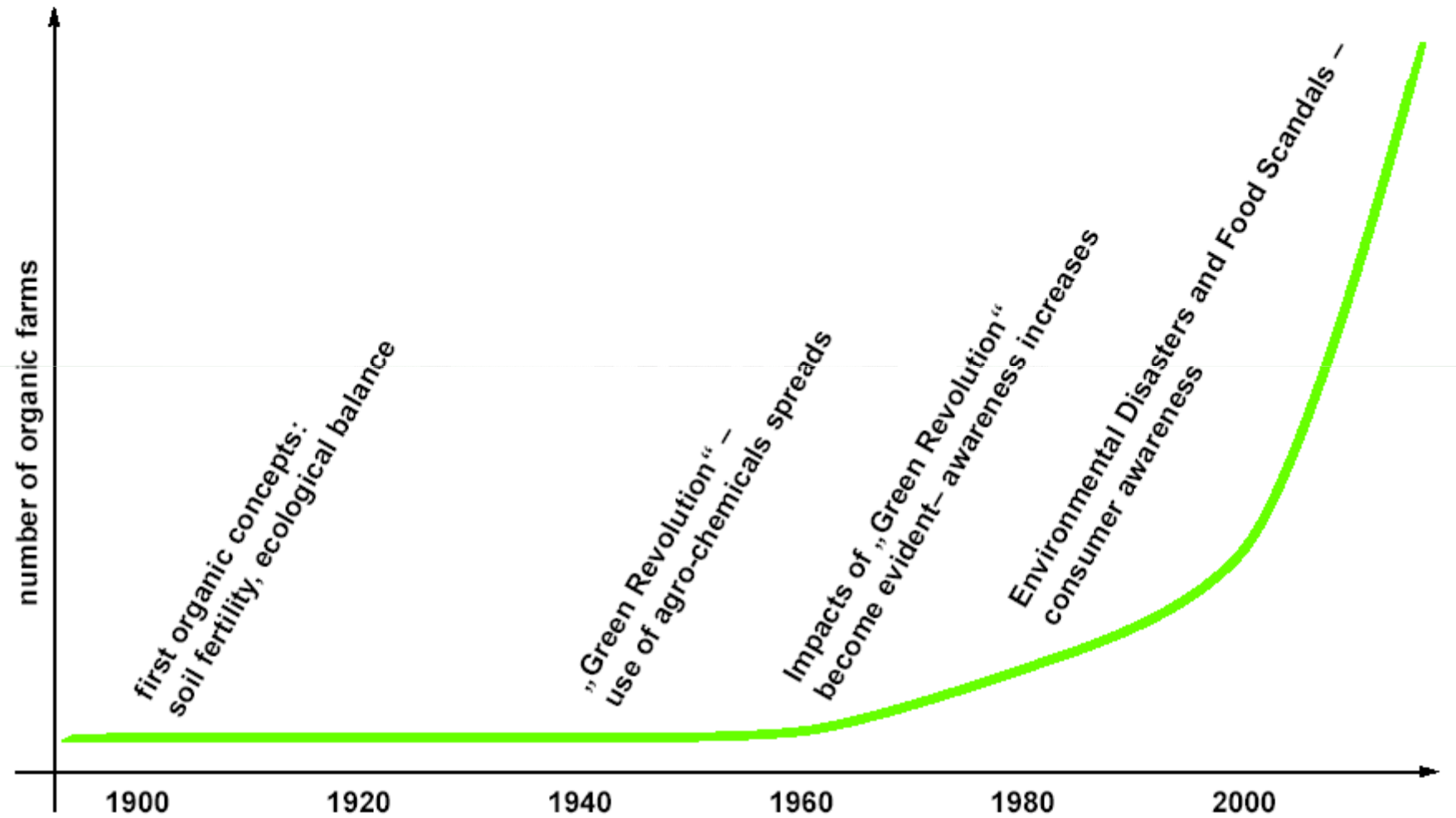
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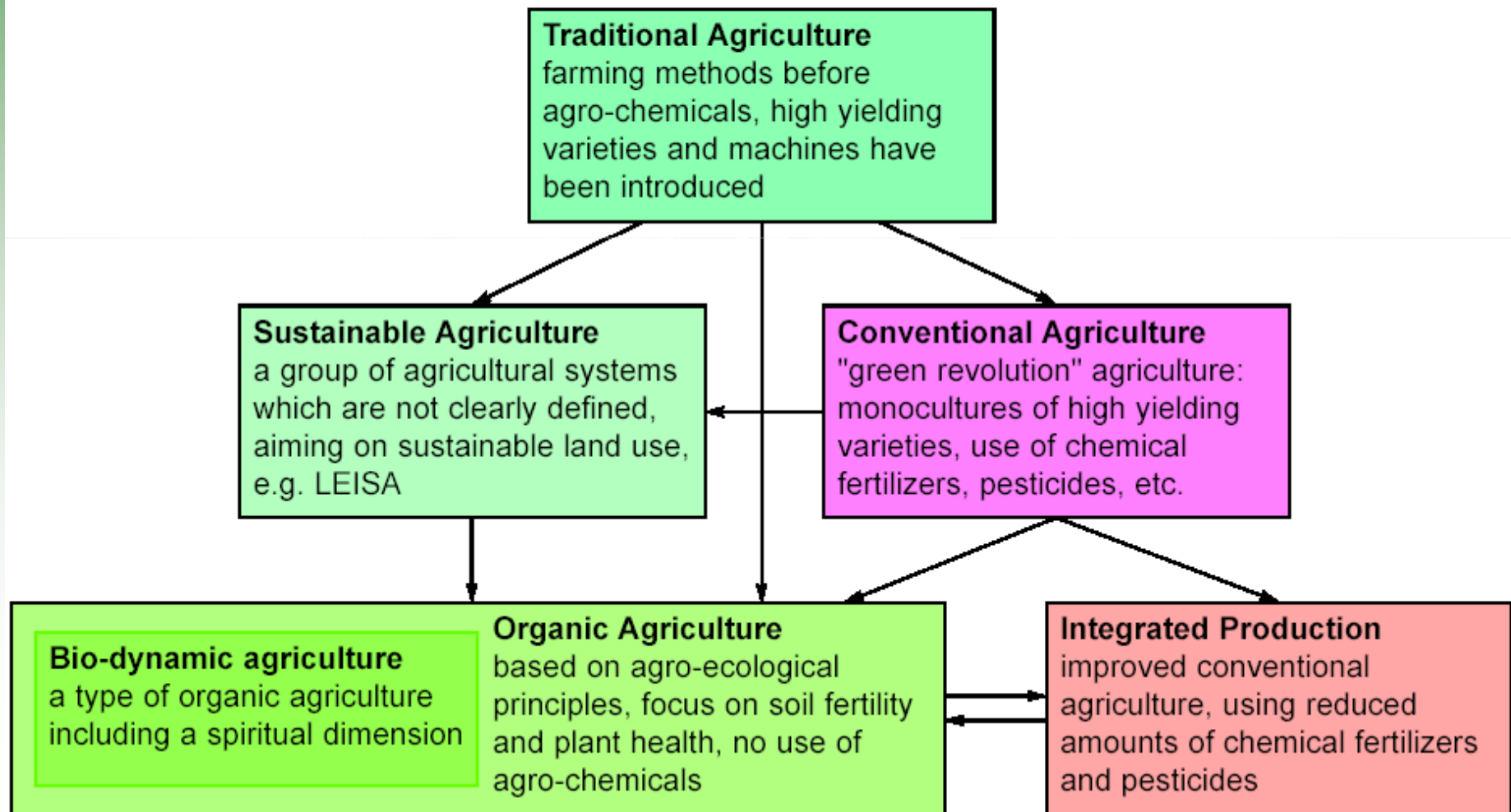
Perbedaan Pertanian Organik dari Sistem Pertanian Lainnya

- Pertanian Berkelanjutan
- Pertanian Tradisional
- Pertanian Terpadu
- Pertanian Konvensional

The Organic Idea



Perbedaan Pertanian Organik dari Sistem Pertanian Lainnya



Pertanian Berkelanjutan

- *An integrated system of plant and animal production practices having a site-specific application that will over the long-term - (1) satisfy human food and fiber needs; (2) enhance environmental quality and the natural resource base upon which the economy depends, (3) make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls, (4) sustain the economic viability of farm operations, and (5) enhance the quality of life for farmers and society as a whole.*

Sistem Pertanian Terpadu

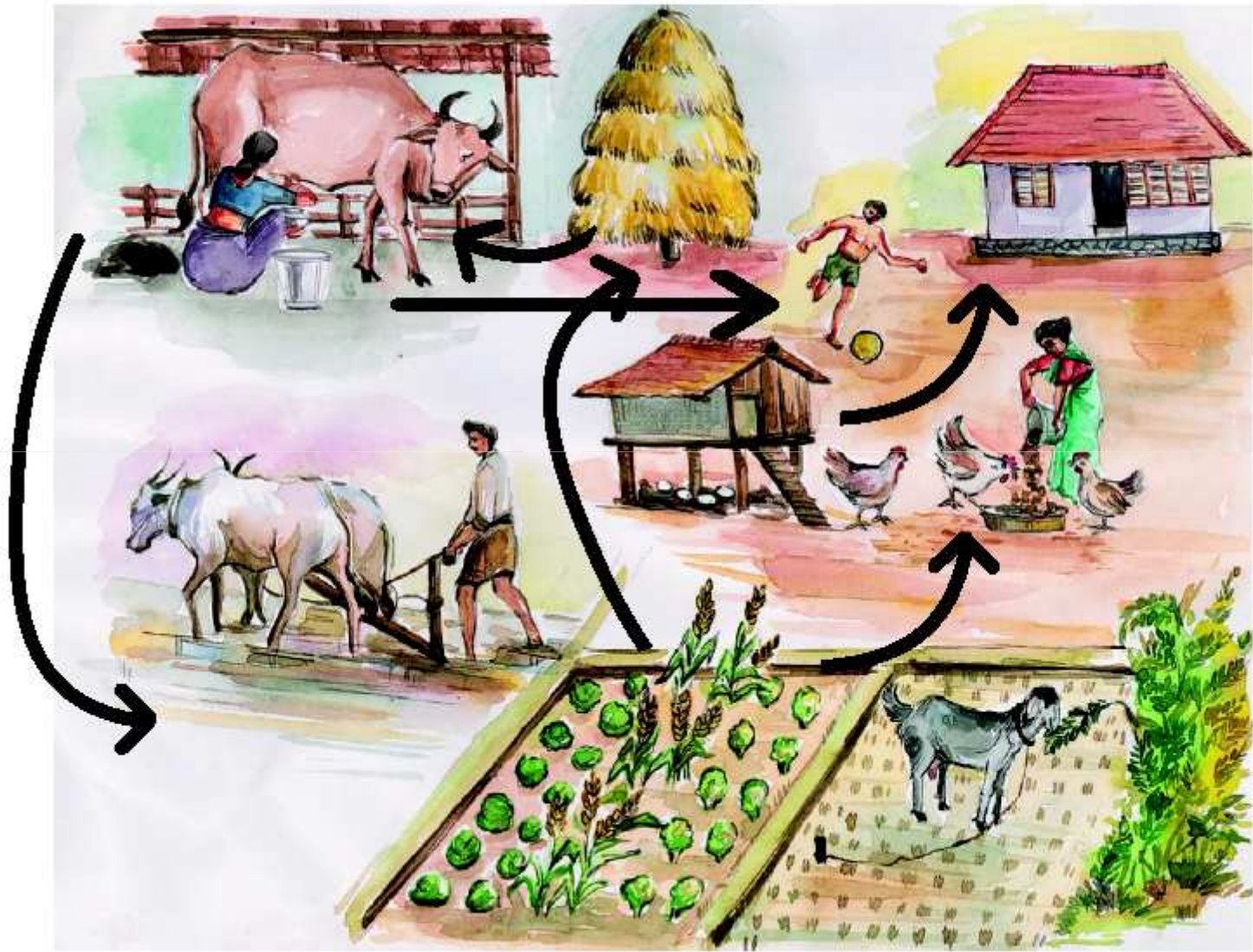
- Sistem Pertanian Terpadu (*integrated farming system*) adalah satu sistem yang menggunakan ulang dan mendaurulang, menggunakan tanaman dan hewan sebagai mitra, menciptakan suatu ekosistem yang “tailor-made”, meniru cara alam bekerja.
- Satu praktek budidaya aneka tanaman/aneka kultur yang beragam dimana "micro output" dari satu budidaya menjadi input kultur lainnya, sehingga meningkatkan kesuburan tanah dengan tindakan alami menyeimbangkan semua unsur hara organik yang pada akhirnya membuka jalan untuk pertanian organik ramah lingkungan dan berkelanjutan

Konsep Sistem Pertanian Terpadu



Sumber: RiauPulp, 2005

Integrating animals in the farm





Diskusi

- *Apakah pertanian organik sustainable?*
- *Sebutkan unsur-unsur yang dapat mendukung bahwa pertanian organik sustainable?*
- *Apa yang harus dicapai untuk mencapai sustainable*
- *Apakah pertanian tradisional organik dan sustainable? Lakukan identifikasi terhadap sistem tradisional menggunakan tabel berikut!*

Ceklist Untuk Mengidentifikasi Apakah Pertanian Tradisional Organik?

Checklist: How organic are traditional systems?		
Standard Requirement	The local traditional system	check
No synthetic fertilizers		
Nutrient supply based on recycling of organic material		
No burning of biomass		
No clearing of natural forests		
Measures to improve soil fertility		
Prevention of soil erosion		
No synthetic pesticides		
Preventive methods to improve plant health		
Crop diversity		
Maintenance of biodiversity		
Sustainable use of water		
Animal friendly keeping and shed systems		
Sufficient free move of farm animals		
No mutilations of farm animals		
Animal fodder from organic farm		
No use of preventive antibiotics and growth promoters		
Socially just		



Apakah Pertanian Tradisional Organik?

Is Traditional Farming Organic?

What traditional and organic farming have in common

- No use of chemical fertilizers, insecticides, fungicides, herbicides, growth promoters etc.
- No use of genetically engineered plants and animals
- Use of animal manures

Organic methods which can be found in traditional farming

- Closed nutrient cycles, low external inputs
- Recycling of biomass through mulching or composting
- Mixed cropping and/or crop rotations
- Sustainable management of resources: soil, energy, water
- Maintenance of soil fertility, prevention of soil erosion
- Animal friendly husbandry practices

What is specific to organic farming

- Use of microbial preparations for pest management
- Release or efficient attraction of beneficial insects
- Use of high yielding, but disease resistant breeds of crops and animals
- Introduction of efficient green manures, cover crops and nitrogen fixing trees
- Use of improved tools for soil cultivation, weeding, sawing etc.
- Application of improved compost methods and bio fertilizers

Comparison of Integrated Production (IP) and Organic Agriculture

Criteria	Integrated Production	Organic Agriculture
Chemical insecticides, fungicides and herbicides	permitted, with certain restrictions	not permitted
Chemical fertilisers	permitted, with limitations on maximum application	not permitted
Use of GMO	permitted	not permitted
Treated seed material	permitted	no chemical treatment
Animal friendly keeping	some regulations	strict regulations
Fodder purchase	no limitations	defined limits
Use of growth promoters	permitted	not permitted
Animal breeding	high performance, embryo transfer permitted	life performance, no embryo transfer
Animal health	preventive use of chemo-therapeutic medicine permitted	no preventive use of chemo-therapeutic medicine

The «Green Revolution» – was it green?

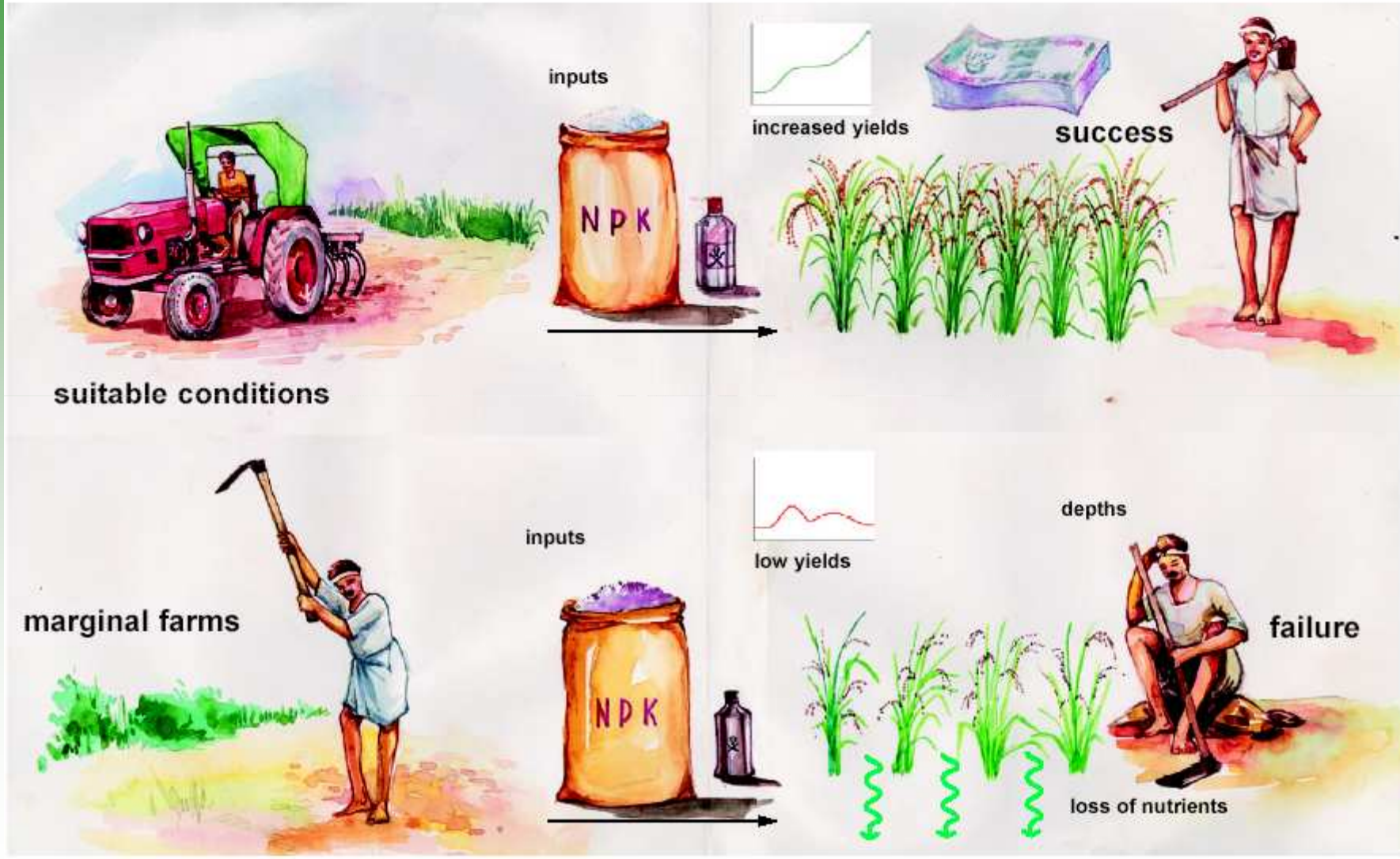
The technology package:

- Monocropping
- High yielding varieties
- Mechanisation
- Herbicides
- Pesticides
- Chemical fertilizers

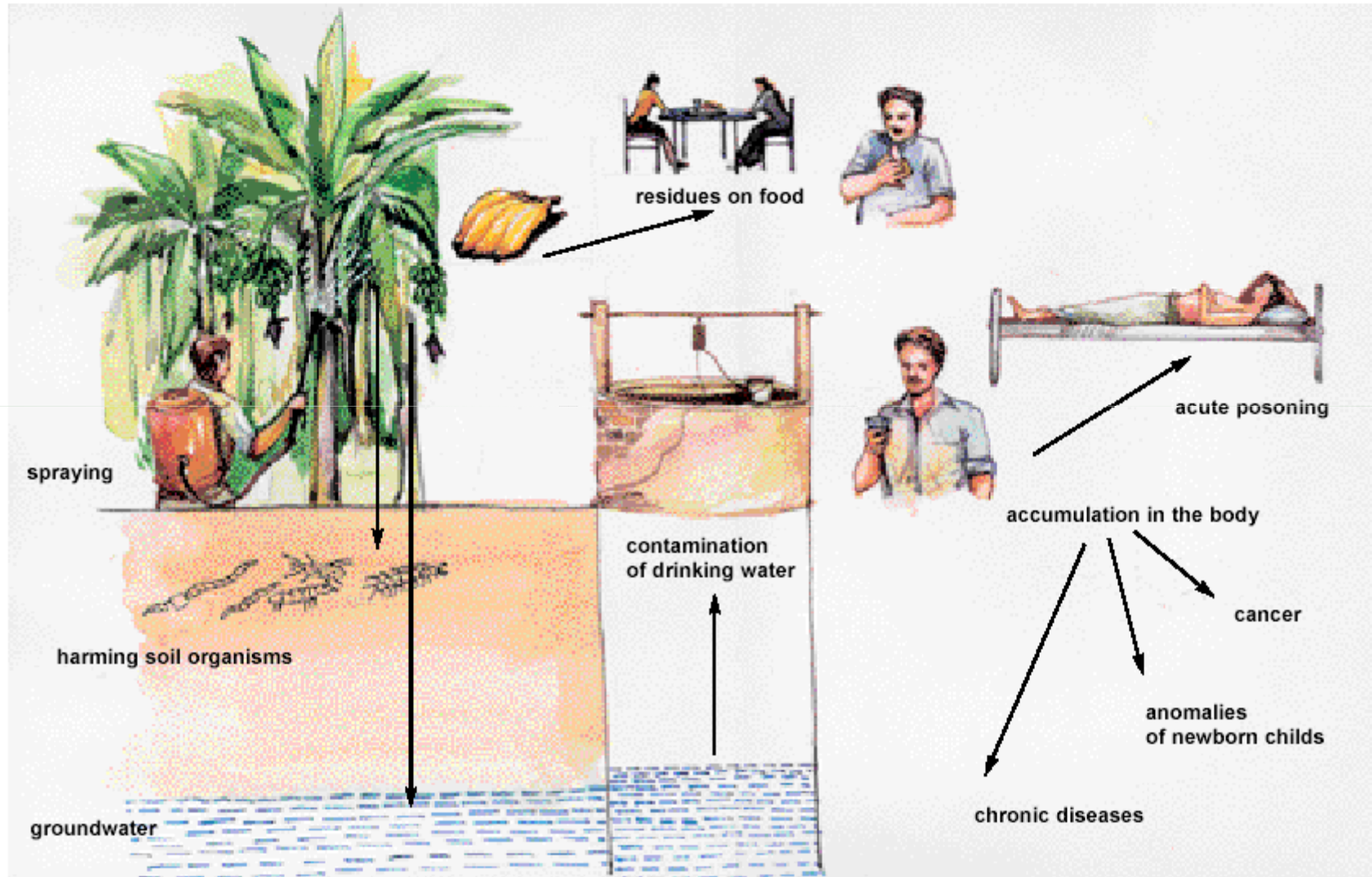


- The environmental impact:*
- Soil erosion, salinisation
 - Water pollution and overexploitation
 - Loss of biodiversity, dull landscapes
 - Pesticide residues and antibiotics in food

Success and Shortcomings of the Green Revolution



Pesticides – „Plant Medicine“ or Poison?



Manfaat Pertanian Organik

- Konservasi tanah dan pemeliharaan kesuburan tanah soil
- Mengurangi polusi air (air tanah, sungai, danau)
- Perlindungan binatang liar (burung, kodok, serangga, dsb)
- Meningkatkan keragaman hayati, landscape yang lebih beragam
- Perlakuan hewan ternak yang lebih baik
- Mengurangi penggunaan input eksternal dan energi yang tidak terbarukan
- Mengurangi residu pestisida dalam makanan
- Tidak terdapat hormone dan antibiotic dalam produk hewani
- Mutu produk yang lebih baik (rasa, sifat-sifat penyimpanan)

Bahan Bacaan

- IFOAM Training Manual for Organic Agriculture in the Tropics Theory, Transparencies, Didactic Approach. October 2002.
- Codex GUIDELINES FOR THE PRODUCTION, PROCESSING, LABELLING AND MARKETING OF ORGANICALLY PRODUCED FOODS¹ (GL 32 – 1999, Rev. 1 – 2001)
- BRITISH COLUMBIA CERTIFIED ORGANIC PRODUCTION OPERATION POLICIES AND MANAGEMENT STANDARDS VERSION 5 BOOK 2. Certified Organic Management Standards
- IFOAM Basic Standards for Organic Production and Processing, 2002.
- IFOAM. 2005. Prinsip-prinsip Pertanian Organik

TERIMA KASIH



Overview on Organic Production in 2000



Source: SOEL Statistics

Organic manures – an overview



Algae and other aquatic vegetal matter

The value of organic manures

Chemical fertilizers



- Contain selected nutrients and may lead to deficiencies.
- Decrease the content of soil organic matter.
- Disturb soil organisms.
- Are easily leached.
- Are expensive.
- Need a lot of energy to be produced.
- Frequently do not show the expected success.



Organic manures

- Offer all the nutrients the plant needs.
- Increase the content of soil organic matter.
- Feed the soil organisms.
- Bear little risk of leaching of nutrients.
- Are cheap or free of cost.
- Are in many cases wastes.
- Continuously release nutrients over a long period of time.

Appropriate Treatment of Farmyard Manure

- Protect from sun and rain.

- Protect from wind.

- Mix with straw.

- Avoid water logging.



- Build a dam to avoid in- and outflow.

- Compress if dry.

- Insure solid underground.

- Water if necessary.

Commercial organic manures

Manure	Fertilisation effect	Availability of nitrogen	Origin	Comments
Guano	N, P	●●●	Dried droppings of seabirds	P content higher than the plants' demand
Hoof and horn meal	N, P	●●●	Slaughterhouse waste	The finer it is grinded, the faster N is available
Algae	Minerals			Depending on their origin they may contain heavy metals
Oil cakes	N, P	●(●)	By-products of the oil production	Examples: castor cake, neem cake, peanut cake, rapeseed cake
Hair, wool, feathers	N	●●(●)		
Agro-industrial by-products	N, P, K	●●		By-products from brewery, distillery, textile processing, husks and peels, food processing The ratio of the nutrients depends on the product

Mineral Fertilizers allowed in organic farming – a basic overview

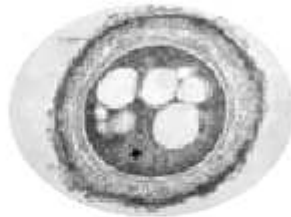
Fertilizer	Origin	Characteristics	Application
Plant Ashes	Burned organic material	<ul style="list-style-type: none"> • Mineral composition similar to plants • Easy uptake of the minerals • Wood ashes rich in K and Ca 	<ul style="list-style-type: none"> • To compost (best) • Around the base of the plants
Lime	Ground limestone, algae	<ul style="list-style-type: none"> • Buffers low pH (content of Ca and Mg secondary) • Algae: rich in trace elements 	<ul style="list-style-type: none"> • Every two to three years when soil-pH is low (avoid excessive use: reduction of availability of P, more deficiencies of micro-nutrients)
Stone Powder	Pulverised rock	<ul style="list-style-type: none"> • Trace elements (depending on the composition of the source) • The finer the grinding the better the adsorbance. 	<ul style="list-style-type: none"> • To farmyard manure (reduces volatilisation of N and encourages the rotting process)
Rock Phosphate	Pulverised rock containing P	<ul style="list-style-type: none"> • Easily adsorbed to soil-minerals • Weakly adsorbed to organic matter • Slow reaction 	<ul style="list-style-type: none"> • To compost • Not to reddish soils (irreversible adsorption)

Some of the active ingredients found in microbial fertilizers



Rhizobium

- A bacterium.
- Lives in soil, around and inside of the roots of legumes.
- Forms a symbiosis with leguminous plants.
- Fixes atmospheric nitrogen.



Azotobacter

- A bacterium.
- Lives free in the soil.
- Can fix nitrogen.



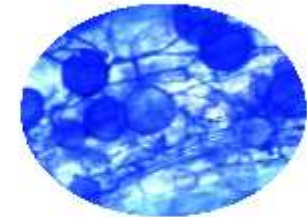
Azospirillum

- A bacterium.
- Lives in soil.
- Is able to live on its own in soil, or in close associations with plant roots.
- *A. brasilense* is able to fix nitrogen.



Pseudomonas

- A diverse group of bacteria.
- Can use a wide range of compounds that plants give off when their roots leak or die.
- Various functions: e.g. solubilizing phosphorus and making it available.



Mycorrhiza

- A fungus-root symbiosis.
- Lives with the roots of nearly all plants.
- Lives in the root and extends itself into the soil.
- Helps the plant by gathering water and nutrients.
- Improves soil structure.

How to prepare your own biofertilizer

**A Bolivian
recipe for
1500 kg
of Bocashi**
*(to be adapted
to the local
conditions)*



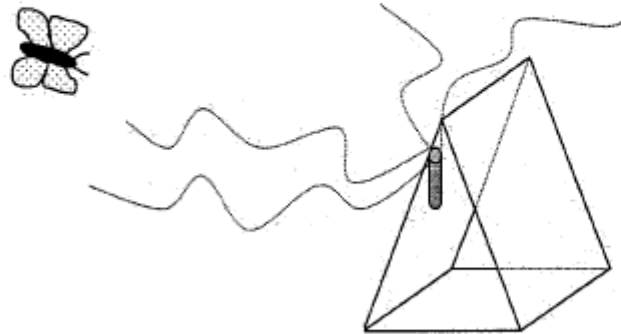
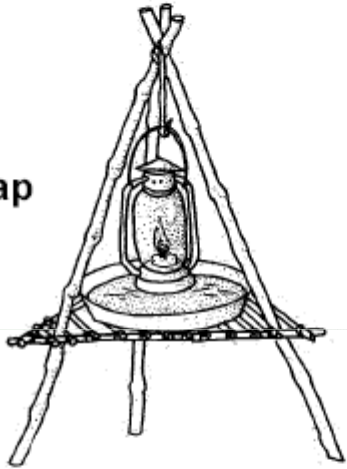
- 400 kg of animal dung
(cattle, chicken, rabbit, sheep, goat)
- 400 kg straw from oats, wheat, rice or rye
- 400 kg of soil from the place,
without stones and clumps
- 120 kg of charcoal in small pieces
- 20 kg of bran, concentrate for cattle or flour
- 1 kg of lime (in zones with acid soils)
- Some kg of yeast, fermented maize
or already prepared Bocashi
- 1 litre of sugar cane molasses
- 225 litres of water

Preventive crop protection measures

- 1) **Adapted and resistant varieties**
- 2) **Clean seeds and planting material**
- 3) **Suitable cropping systems**
- 4) **Balanced nutrient management**
- 5) **Input of organic matter**
- 6) **Appropriate soil cultivation**
- 7) **Good water management**
- 8) **Promote natural enemies**
- 9) **Optimal planting time**
- 10) **Sanitation measures**

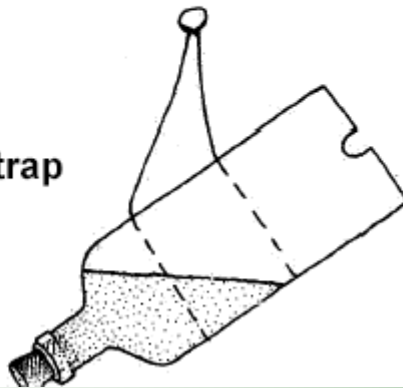
Mechanical control methods: Traps

Light trap



Sex-pheromone traps
attract male insects

Pit trap



Source: «Natural Crop Protection in the Tropics» Gabi Stoll.

Prevention instead of curing

I get more pests each year!
Where do they come from?
What shall I do?



I have few pest problems
on my organic farm because
my plants are strong enough
to defend themselves!



Natural Enemies: friend of the farmer



Predators

- Spiders, beetles
- Feed on different insect species

Parasitoids

- Wasps, flies
- Larvae develop in or on the host



Pathogens

- Fungi, bacteria, viruses
- Develop under humid, dark conditions

Nematodes

- Small worms
- Attack plants and insects



Conserve and enhance natural enemies



- Provide fodder and habitat
- Do not spray
- Do not burn
- Increase plant diversity

Releasing natural enemies

Releasing beneficial insects

Cards with trichogramma eggs:

against tomato fruitborer



Using antagonistic microbes

Bacteria: Bacillus thuringensis

against caterpillars, beetles, mosquito etc.

Viruses: NPV

against caterpillar

Fungi: Beauveria bassiana

against corn borers, whitefly, thrips etc.

Nematodes: Steinernema carpocapsae

against cutworms

