Biomimicry: an innovative tool for sustainable solutions in agri-food

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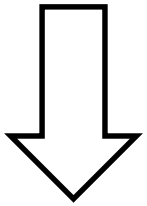
Content

- Introduction: What is biomimicry?
- Biomimicry applications in agrifood:
  - ✓ Natural forms
  - ✓ Processes
  - ✓ Ecosystems
- Ambition and goals of the ”Lectoraat Biomimicry”

Biomimicry = Biomimetics

Greek: **βιος (bios) + μιμησις (mīmēsis)**



English: **Life/Nature + imitation**

- **Why** do we need to imitate nature?
- **How** do we have to imitate nature?
- **What** do we have to imitate?

Biomimicry definition

“biomimicry is learning from and then emulating natural forms, processes, and ecosystem to create more sustainable design”

Biomimicry definition

*"biomimicry is learning **from** and then emulating natural forms, processes, and ecosystem to create more sustainable design"*

from ≠ about

⇩

Nature as mentor and NOT as something to exploit

"3.8 billion of years of research and development have made animals, plants and microbes consummate engineers"

Biomimicry definition

"biomimicry is learning from and then emulating ***natural forms, processes, and ecosystem*** *to create more sustainable design"*

Forms

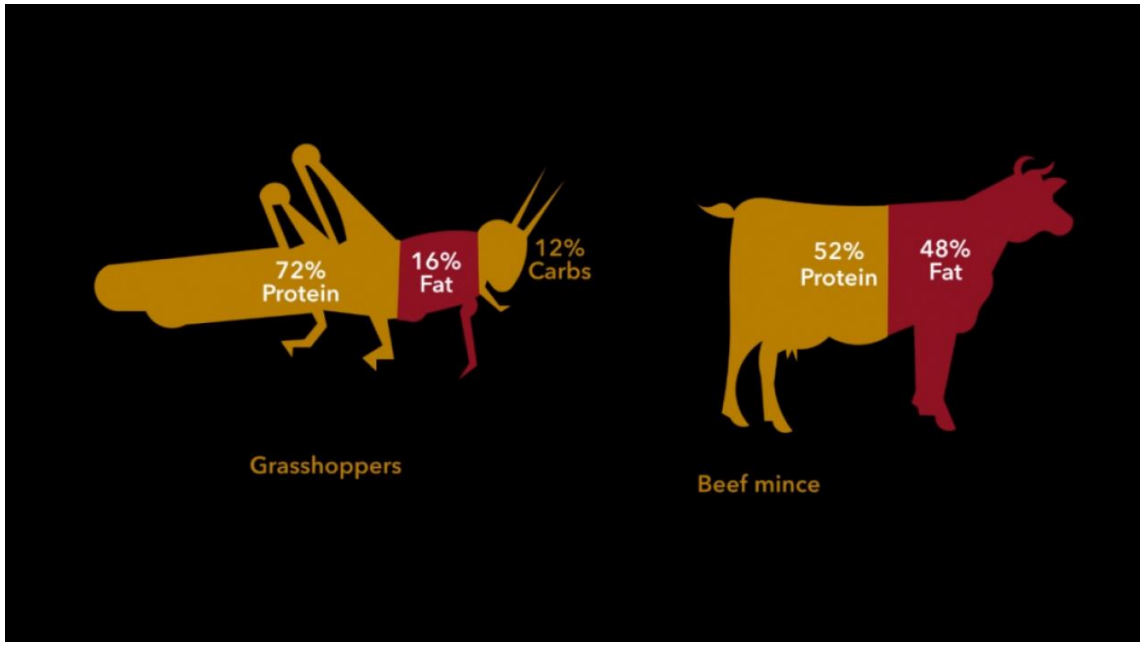
Processes

Ecosystems

Biomimicry definition

*"biomimicry is learning from and then emulating natural forms, processes, and ecosystem to create **more sustainable design**"*

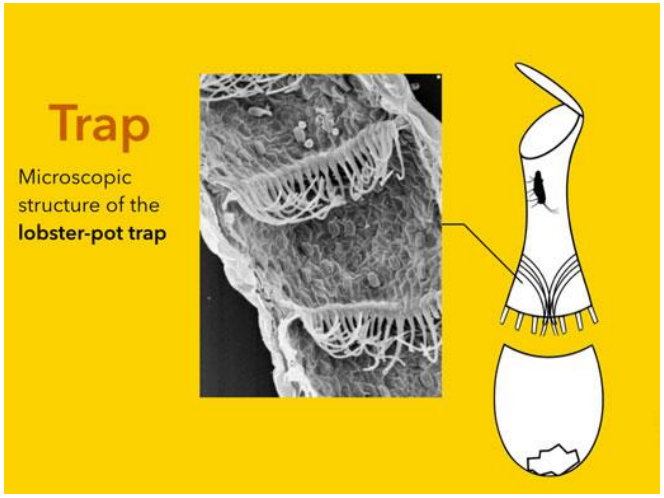
Examples in agrifood: forms



Edible insects may be a possible solution to global food crisis

- Valuable source of proteins
- Do not need much space
- Lower levels of greenhouses gases

Examples in agrifood: forms



JUBE

Insect-capturing device

- Beautifully crafted
- Fully made of organic/natural materials

Examples in agrifood: processes

Monoculture:

Massive use of fertilizers both organic and synthetic

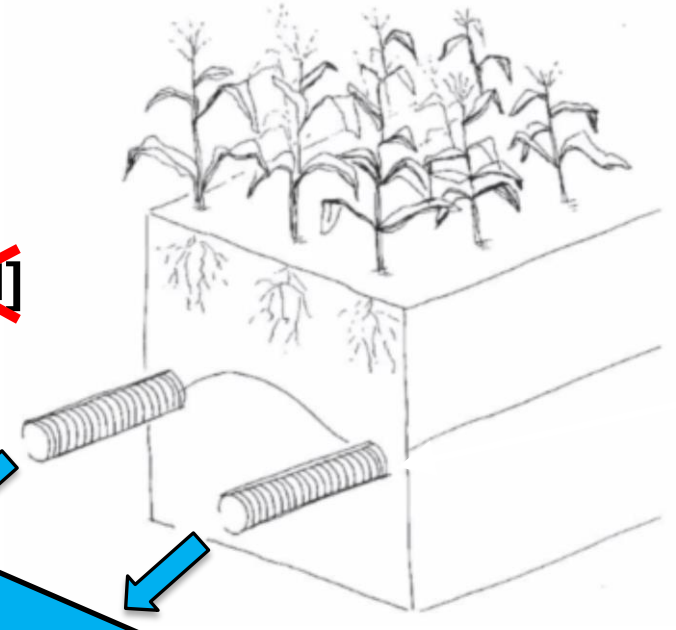
[NPK]

Eutrophication

Examples in agrifood: processes

Bio-inspiration	Relationships between soil microbes and plant roots		Earthworms	Tiny intestinal villi
Functions			Filter nutrients [NPK]	Slow down water flow
Materials	Plants roots	Organic fabric layer	Biochar	Wood-plastic composite pipe

Examples in agrifood: processes



[N P H]

Waterways

Filtration system

Eutrophication

Examples in agrifood: ecosystems

Annual crops

Industrial-like model

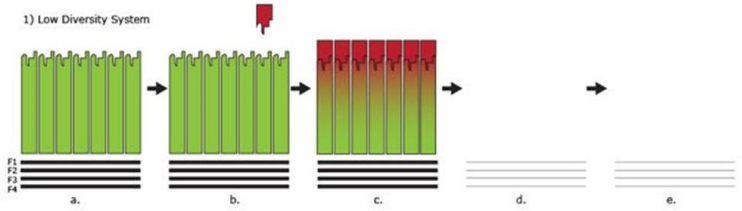
Maximize instead of optimize

- amounts of soil carbon loss (which ends up in the atmosphere as CO2),
- soil erosion,
- nutrient leakage,
- changes in soil organisms
- Extensive use of herbicides and pesticides

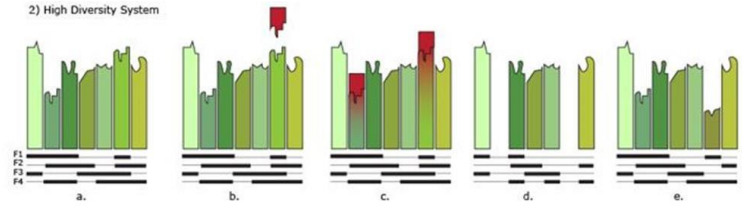
More sustainable agricultural models must be devised and adopted

Examples in agrifood: ecosystems

An **ecosystem** is a biological community of interacting organisms and their physical environment



Low diversity
High productivity in short term **BUT** very sensitive to fluctuation in conditions



High diversity
Less productivity in short term **BUT** stable and resilient to fluctuation in conditions

Examples in agrifood: ecosystems

Model transition

Monoculture

Permaculture

How can we manage and/or harvest permaculture based fields in a cost effective way?

Examples in agrifood: ecosystems

Bio-inspiration

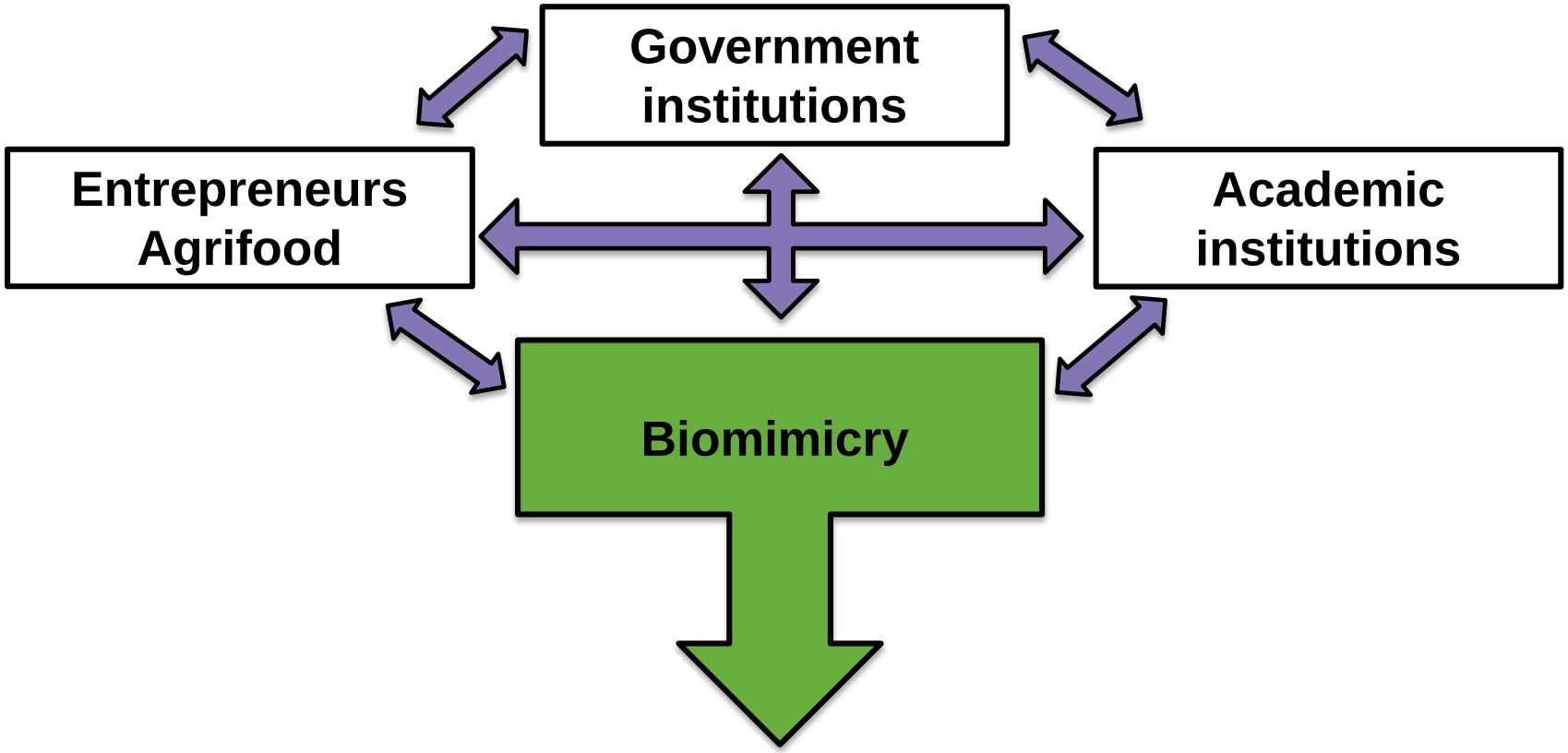
Swarms of ant-like robots

Advantages:

- Pointwise operations
- Light weight
- Crop weight even distributed

No soil sinking!

Lectoraat Biomimicry ambition



More sustainable solutions

Please challenge us!!!