

Winter Course Program for Practical Agriculture Sciences Towards Regional Sustainability

Affiliations:



12th – 18th December 2014

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BIORESOURCES and UTILIZATION RELATED TO SUSTAINABLE AGRICULTURE



Sustainable agriculture is the act of farming using principles of **ecology**, the study of relationships between organisms and their environment.

One of the **Challenges** to Sustainable Agriculture is:

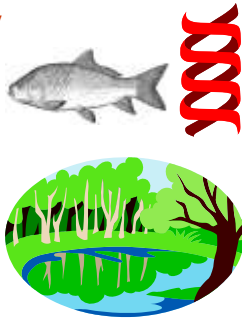


Unsustainable use of natural production factors such as soil, **biological diversity** and water.



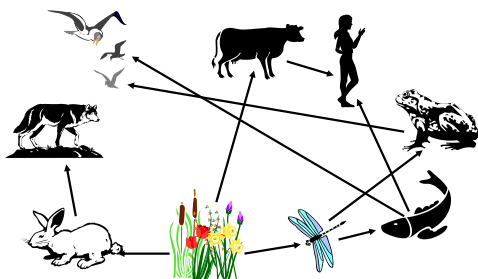
Biodiversity

- The term "biodiversity" is a contraction of the phrase "biological diversity".
- Biodiversity means the richness and variety of life - of genes, species and ecosystems.



Biodiversity

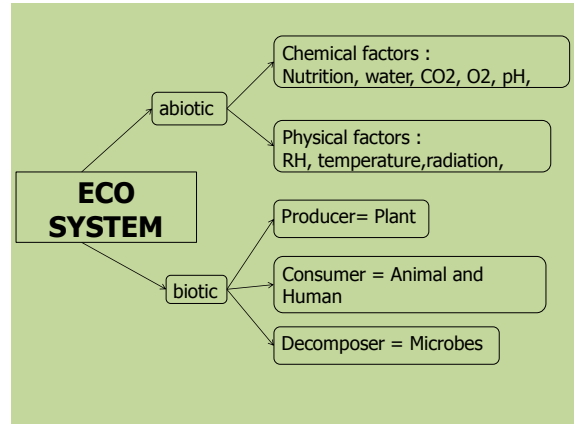
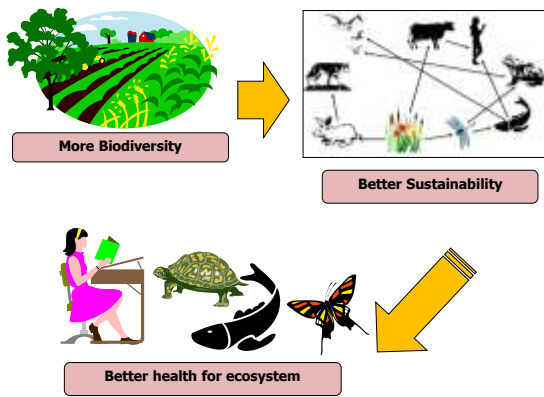
- Biodiversity maintains the health of the earth and its people.
- It provides us with food and medicine and contributes to our economy..
- The greater the variety of species, the healthier the biosphere.



The more links in a food web, the more stable the system.

Biodiversity and Sustainability

- The biodiversity of an ecosystem contributes to the sustainability of that ecosystem.
- Higher/more biodiversity = more sustainable
- High biodiversity in an ecosystem means that there is a great variety of genes and species in that ecosystem.
- A great variety of genes and species means that the ecosystem is better to carry out natural processes in the face of external stress.
- Thus, the ecosystem is more sustainable.



Tsukuba Botanical Garden



Collection, conservation, and learning center of various plant species and research conservation of plant biodiversity

Collection



The **BIGGEST ORCHID** in the **WORLD**



PLANT CONDITION IN WINTER-TSUKUBA BOTANICAL GARDEN



EVERGREEN PLANTS



DECIDUOUS PLANTS

Winter Plant

- Cuprecaceae, Poaceae, Agavaceae, & Crassulacea
- Narrow leaf, Thick Leaf, Waxy coating of cutin
- Small stomata & fewer stomata >>> **Reduces water loss.**



Conservation



LEARNING CENTER....

Pitcher plant



Entomophagous plant...

Plant that leaves are adapted to a pitcher/catcher shape which traps insects and secretes a liquid that digests them



Greenhouse Technology Of Tsukuba Botanical Garden



ANIMALS BIO-DIVERSITY



The Background

- Livestock play important roles in the production of food and for other purposes.
- The diversified use of livestock on average contributes to between 10% and 50% of the gross domestic product (GDP) of countries in the tropical developing world.
- About 70% of the world's rural poor depend on livestock for their livelihood (FAO, 2005a).

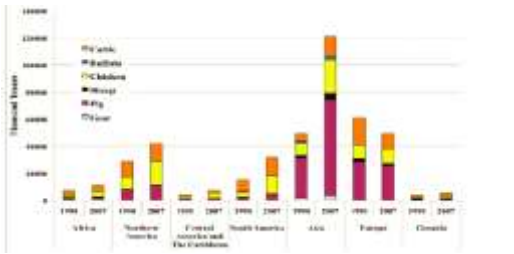


Figure 2. Total world meat production by region in 1990 and 2007. Source: FAO (2009).

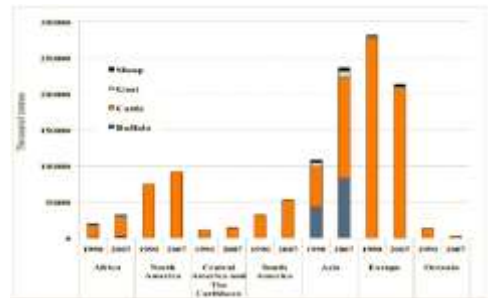


Figure 3. Total world milk production by region in 1990 and 2007. Source: FAO (2009).

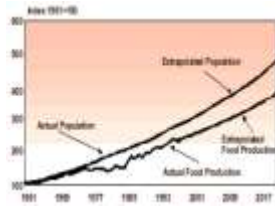
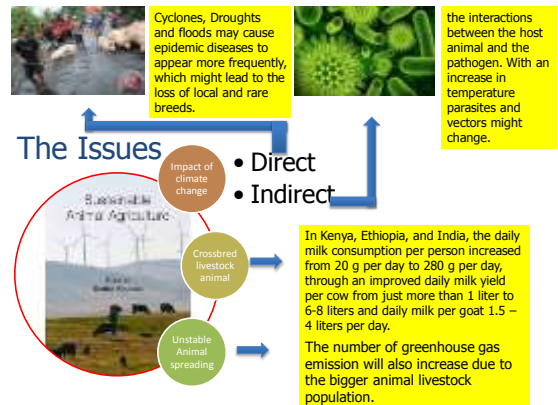


Figure 1: Trends in human population growth and food production in sub-Saharan Africa. Source: CGIAR (1999).

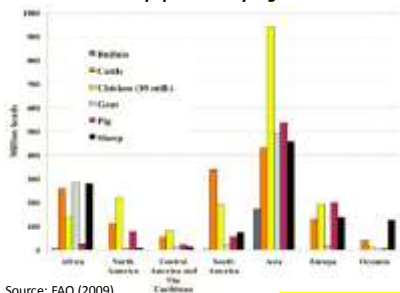


Table 1. Per capita daily supply of animal products in calories and gram protein for 1990 and 2003. Source: FAO (2002; 2009)

	1990		2003	
	Calories	Protein (g)	Calories	Protein (g)
Developed world	458	35	477	47
Developing world	274	13	340	21
Sub-Saharan Africa	161	11	180	12



World livestock populations by regions in 2007



Source: FAO (2009).




51% of all green gas emission comes from the livestock production (FAO,2006)TA

MICROBES BIODIVERSITY

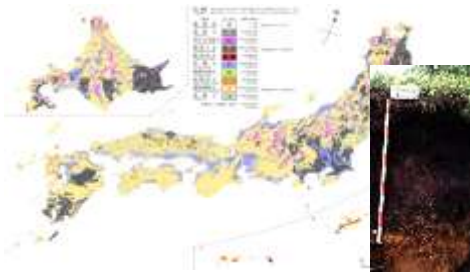




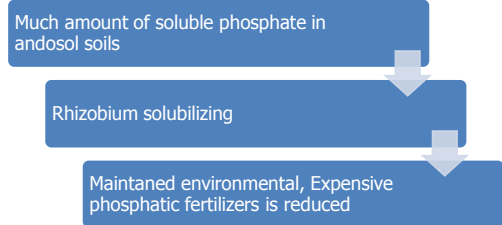
3 Roles of PGPR

-  Inhibits of harmful microbes
-  Decomposition of soil organic mater
-  Produces of plants hormones

Japanese Soil Distribution



The Largest kind of soil in Japan is Anodosol, which is has problem with Phosphorus fixation



PSB :Phosphorus (P) solubilizing bacteria

(Ex: *Rhizobium*)

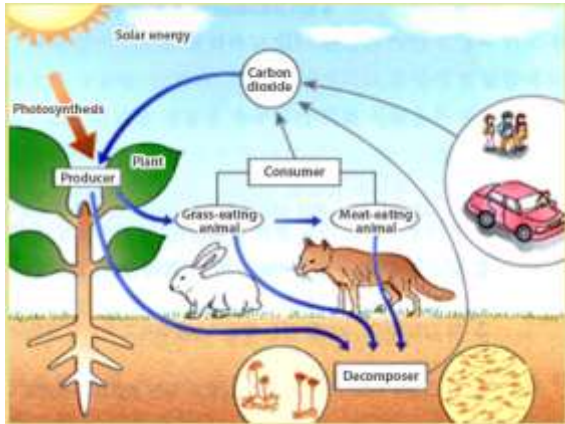
PSB secrete different types of organic acids (e.g., carboxylic acid) thus lowering the pH in the rhizosphere and consequently release the bound forms of phosphate like Ca₃ (PO₄)₂ in the calcareous soils.

PGPR	Crop parameters
<i>Myrtillocypris obsoleta</i>	Direct growth promotion of cereals and legumes
<i>Frankliniella pallida</i>	Early development of cereals seedlings, growth stimulation of tomato plant
<i>Acetivibrio burlinensis</i> and <i>A. ruber</i>	Growth of wheat and maize plants
<i>P. fluorescens</i>	Growth of pearl millet, increase in growth, leaf nutrient contents and yield of maize (Musa)
<i>Acetivibrio</i> and <i>A. inguiformis</i> spp.	Growth and productivity of cereals
<i>P. fluorescens</i> , <i>Bacillus pumilus</i> , and <i>Mycolococcus pilosus</i>	Enhance uptake of N, P and K by maize crop
<i>Frankliniella</i> , <i>Acetivibrio</i> and <i>A. inguiformis</i> spp.	Stimulate growth and yield of chick peas (<i>Cicer arietinum</i>)
<i>A. inguiformis</i> and <i>Frankliniella</i> spp.	Improves the yield and phosphorus uptake in wheat
<i>P. putida</i> , <i>P. fluorescens</i> , <i>A. inguiformis</i> and <i>A. inguiformis</i>	Improves seed germination, seedling growth and yield of maize
<i>P. putida</i> , <i>P. fluorescens</i> , <i>P. fluorescens</i> , <i>P. putida</i> , <i>A. inguiformis</i> , <i>A. inguiformis</i>	Improves seed germination, growth parameters of maize seedling to germination and also grain yield of field grown maize

PGPR and their effect on growth parameters/yields of crop/fruit plants.



CONCLUSION



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