



# Federal University of Viçosa

## Soil Science Department

Center for Alternative Technologies of Zona da Mata  
Brazilian Association for Agroecology



**Agroecology as a science, a movement and a practice: can it feed the world?**

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# Introduction

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1. Is agroecology a movement, a practice or a science?
2. Is it possible to feed the world using the agroecological approach in agriculture?
3. What is the best: intensifying agriculture to have more area for nature conservation or to have a more extensive agriculture integrated with nature?
4. Share of our experiences (agroforestry systems), in the Zona da Mata of Minas Gerais, Brazil.
5. Leave for the discussion: how can we scale up the agroecological experiences around the world?

1. Is agroecology a movement, a practice or a science?

## 1.1. Is agroecology a movement?

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- ✓ In Brazil, in the end of 70's and 80's agroecology started as alternative agriculture.
- ✓ Alternative agriculture as a response to the environmental and social problems created by the Green Revolution technologies applied to agriculture.
- ✓ Main actors:
  - a) agronomists (linked to the Federation of the Agronomist Associations and the Federation of the Students of Agronomy, still very active);

b) NGOs and farmer organizations (supported by the Liberation Theology – Grassroot Eclesial Comunities – CEBs, linked mainly to the Catholic Church).

- linked to the left wing parties – especially the Labor Party (1982).

✓ 2002. Foundation of the ANA - National Articulation of Agroecology (<http://www.agroecologia.org.br>) – network especially among NGOs, social movements, but also scientists.

## Meetings

- ✓ 1989. The IV (and last) Alternative Agriculture Conference – around 4000 people (students, agronomists, farmers etc).
- ✓ 2002. 1<sup>st</sup> National Meeting of Agroecology. Around 1000 people (mainly farmers and technicians, but also scientists).
- ✓ 2006. 2<sup>nd</sup> National Meeting of Agroecology. Almost 2000 people (mainly farmers and technicians, but also scientists).



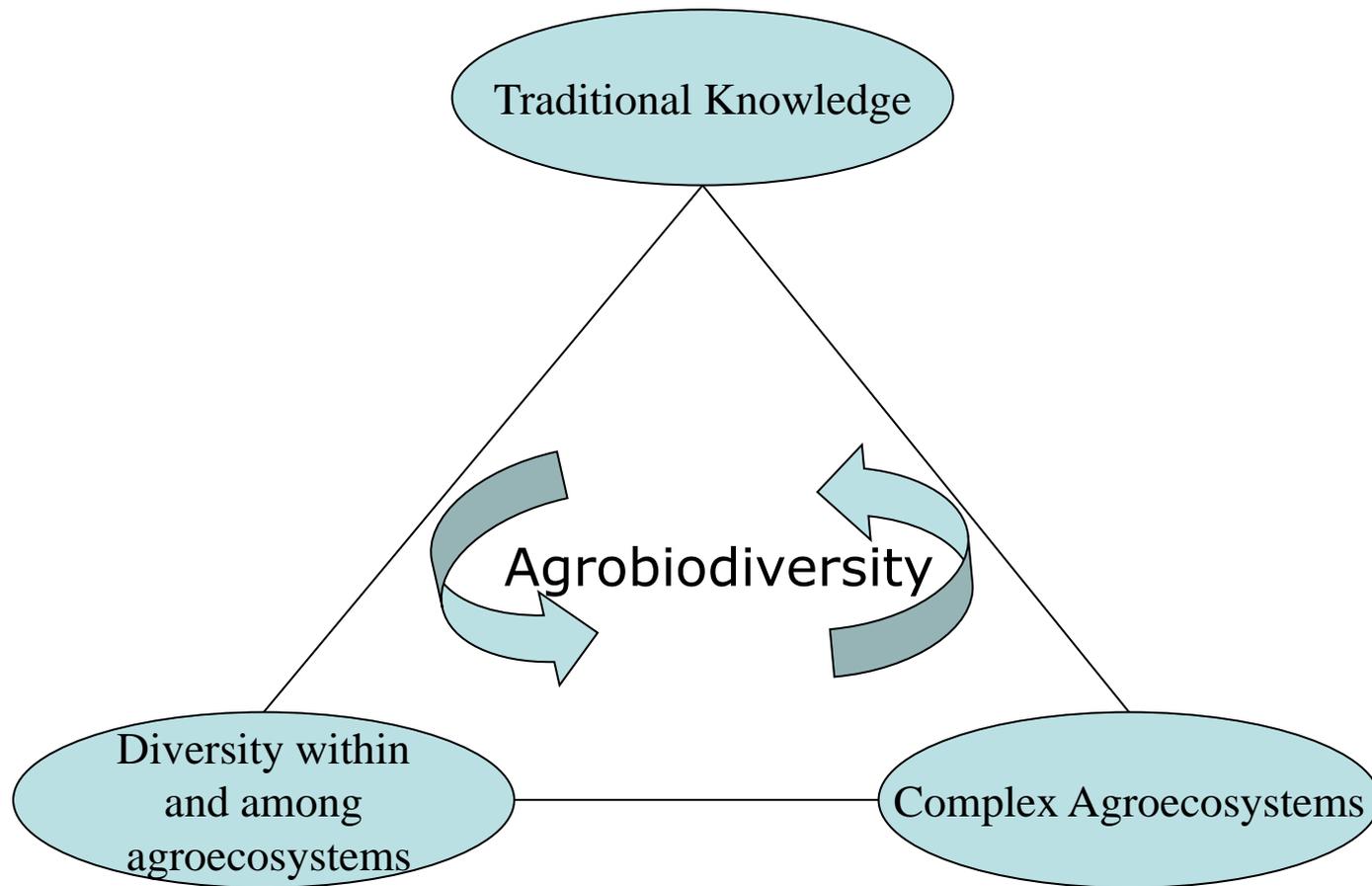
- In 2012, ANA and ABA (Brazilian Association of Agroecology – more linked to the scientists) in agreement with the Ministries of Environment and Rural Development will present a proposal for the National Program for Agroecology.

**This shows that Agroecology is a movement in Brasil!**

## 1.2. Is agroecology a practice?

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- ✓ To manage biodiversity and to develop complex agroecosystems we need farmer s knowledge



- ✓ Agroecology does not have a package (as does the industrial agriculture).
- ✓ Agroecology is highly knowledge-intensive while high-tech typically accounts for only a small portion of its recipes (IAASTD)
- ✓ We need the farmer's experience to observe, to take decisions, to give inputs.
- ✓ For agroecology:
  - Participatory approach is essential.
  - The on-farm experiments are very important.
  - To respect and to value farmer's knowledge is imperative!  
(This is very important to raise farmer's self esteem)

# In Brasil agroecology is developed with the farmers!

Agroecologia em Rede

<http://www.agroecologiaemrede.org.br/mapeo/index.php?c=1&f=consult...>



[www.agroecologiaemrede.org.br](http://www.agroecologiaemrede.org.br): 709 experiences are registered.

✓ We have much more! In Zona da Mata we registered, so far, 21 experiences. We have more than one hundred!



Santa Fé Farm: our slogan is agroecology!

It is a practice!

## 1.3. Is agroecology a science?

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- ✓ Agroecology is shortly defined as the science that studies the agroecosystems.
- ✓ The ecological principles that apply to the natural ecosystems (symbiosis, competition, nutrient cycling etc) also apply to the agroecosystems.
- ✓ Contrary to the natural ecosystems, the agroecosystems are influenced by economy and cultural and social factors. For instance, land tenure, market, prices and history are all very important.

- Consumers are also included. Nowadays, the definition of agroecology is towards a larger focus on the entire food system, defined as a global network of food production, distribution and consumption (Gliessman, 2007).
- However, agroecology does not study only food systems, but also the production of energy, wood and fibers.
- Moreover, there are boundaries among agroecosystems and among agroecosystems and the natural ecosystems.

- ✓ Thus, agroecology is a science to study agriculture, but .... Agriculture that must be ecologically sound, socially and culturally responsible, and economically viable.
- ✓ Therefore, agroecology requires a multidisciplinary (or transdisciplinary) approach.

- ✓ 2004. On the scientific side, the Brazilian Association of Agroecology (ABA) was created (<http://www.aba-agroecologia.org.br>)
- ✓ ANA and ABA work together, but ABA is more connected to science and ANA to the social movements.
- ✓ December 2011. The 7<sup>th</sup> National Conference of Agroecology was organized by ABA. More than 2000 people attended, mainly students and scientists, but also farmers and technicians
- ✓ More than 1000 papers were presented (<http://www.aba-agroecologia.org.br> – cadernos de agroecologia).

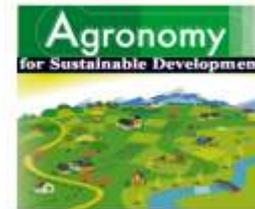
- ✓ In 2006, Agroecology was officially recognized as a science by EMBRAPA - the Brazilian Agricultural Research Corporation. The referential benchmark for agroecology was published (<http://www.embrapa.br/publicacoes>)
- ✓ Recently, several technical, undergraduate and graduate courses on agroecology were created in several universities, theses have been developed, papers published...

**Thus, agroecology is a science!**

- ✓ Therefore, in Brasil, agroecology is a movement, a practice and a science.
- ✓ This is supported by **Wezel et al., 2009. Agron. Sustain. Dev. (available on line).**

Agron. Sustain. Dev. (2009)  
© INRA, EDP Sciences, 2009  
DOI: 10.1051/agro/2009004

Available online at:  
[www.agronomy-journal.org](http://www.agronomy-journal.org)



Review article

## **Agroecology as a science, a movement and a practice. A review**

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(Accepted 29 January 2009)

In my opinion, this is what makes agroecology so wonderful.  
Agroecology is not an emotionless and pseudo-neutral science

**2. Is it possible to feed the world using the agroecological approach in agriculture?**

IAASTD (International Assessment of Agricultural Knowledge, Science and Technology for Development) involved 400 scientists around the world to help answering this question.

**IAASTD Co-sponsors: FAO, UNEP, UNESCO, UNDP, WB, WHO, GEF**

Agriculture at a cross road (2009) – 606 pages:

<http://www.agassessment.org>

**Greenpeace: summary of the main findings of the IAASTD, (64 pages) - Agriculture at a cross road: food for survival.**

A reverse question: Is it possible to feed the world with the industrialised agriculture?

“Industrialisation of agriculture with its monocultural approach, neglect of the ecological and social multifunctionality of agriculture, and commodification of food on a global level will not only fail to guarantee the survival of 9 billion people on this planet, expected for 2050. It is about to destroy the basis of our food supply and threatens the web of life upon which we all depend.” (Summary by Greenpeace , based on IAASTD report).

The IAASTD also argued that we must change from industrial to agro-ecological methods and that we need to have an approach to food production that is multi-functional.

**You cannot solve the problem with the same kind of thinking that created the problem**

***Albert Einstein***

- ✓ De Schutter, 2010 – special rapporteur, for the United Nations, on the right to food also helped to answer the question

United Nations

A/HRC/16/49



**General Assembly**

Distr.: General  
20 December 2010

Original: English

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**Human Rights Council**

**Sixteenth session**

Agenda item 3

**Promotion and protection of all human rights, civil,  
political, economic, social and cultural rights,  
including the right to development**

**Report submitted by the Special Rapporteur on the right to  
food, Olivier De Schutter**

Drawing on an extensive review of the scientific literature published in the last five years, the Special Rapporteur identifies

“**agroecology** as a mode of agricultural development which not only shows strong conceptual connections with the right to food, but has proven results for fast progress in the concretization of this human right for many vulnerable groups in various countries and environments. And it strongly contributes to the broader economic development”.

3. What is the best: intensifying agriculture to have more area for nature conservation or to have a more extensive agriculture integrated with nature?



Fragments surrounded by a monocultural agriculture matrix.  
This is the reality of the Atlantic Forest – hotspot of biodiversity.  
What to do?

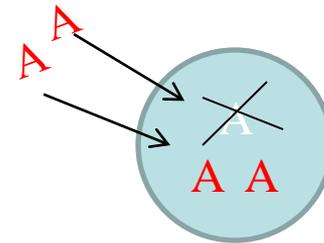
- ✓ To answer the question, Perfecto et al. 2009 (Nature's Matrix: Linking Agriculture, Conservation and Food Sovereignty) can help us.

### 3.1. Fragments as Islands

- There is more biodiversity in larger islands and in islands more close to the mainland. Why?

- ❑ More microhabitats, thus provide more niches for the species to fill
- ❑ Theory of Island Biogeography: the population of organisms are always dispersing. Each area is receiving migrants at any time.

If,  
Extinction is a natural process.



The number of species in one island will increase, if **immigration** is higher than extinction,

The question is: if the fragments are like island, is the agricultural matrix around the fragments like an ocean that impedes migration?



**If you consider the agricultural matrix as an ocean – you argue for the intensification. However, you will fail. Why?**

3.2. The argument in favor of intensification<sup>1</sup> as a way to increasing yields and conserving wildlife is based on two assumptions:

- ✓ First, agricultural intensification leads to land sparing;
- ✓ Second, biodiversity declines with increasing yields.

<sup>1</sup>intensification considered as agroecosystems that are heavily dependent on agrochemicals, tillage and monoculture.

First argument. Land sparing (**this is not supported by data** – article of faith).

Why?

✓ Intensification does not take place in a social-political vacuum.

“Regions that experience agriculture intensification also experience increased economic activity, high demands for products and services, immigration, road constructions, **and as consequence, in many cases: deforestation**” (Perfecto et al., 2009)

## Second argument: biodiversity declines with increasing yields

- ✓ It is true for industrial agriculture systems, especially following the green revolution technologies.
- ✓ But not necessarily for agroecological ecosystems, intensely managed and intense in knowledge.
- ✓ It is possible to have highly productive agroecological farming systems and at the same time to maintain and promote biodiversity.

Agricultural fields do not need to be like an ocean.

## What matters?

- ✓ A high quality agricultural matrix around the fragments that permits an easy migration from fragment to fragment.
- ✓ Thus, even if the species can not persist in the matrix, species will frequently move through the matrix, maintaining the functioning of the metapopulation dynamics.

In the Atlantic Forest we have from two to four dry months. In these months the food production in the forest is low.



**Bats (?) feeding on the passion fruit!**



**Maracanas (endangered species)  
feeding on the left over corn**

Supported by:

Goulart et al. (2011), **Frugivory by five bird species in agroforest home gardens of Pontal do Paranapanema , Brazil.** *Agroforestry Systems*: 82 (3) 239-246

- ✓ Four out of five bird species used forest habitats more frequently than agroforestry systems. However, feeding activity was higher in agroforestry systems than in forests.
- ✓ The number of food taxa were 19 in secondary forest and 28 in agroforestry systems.
- ✓ Agroforestry systems are important as a resource-rich environment for frugivorous birds. This richness is related to the ability of these environments to support species during the dry season, as well as to the amount and variety of fleshy fruits found in these habitats.



**Até quando vamos engolir isso?**



**AGROTÓXICO  
MATA**

CAMPANHA PERMANENTE CONTRA  
OS AGROTÓXICOS E PELA VIDA

**It is also good for human beings**

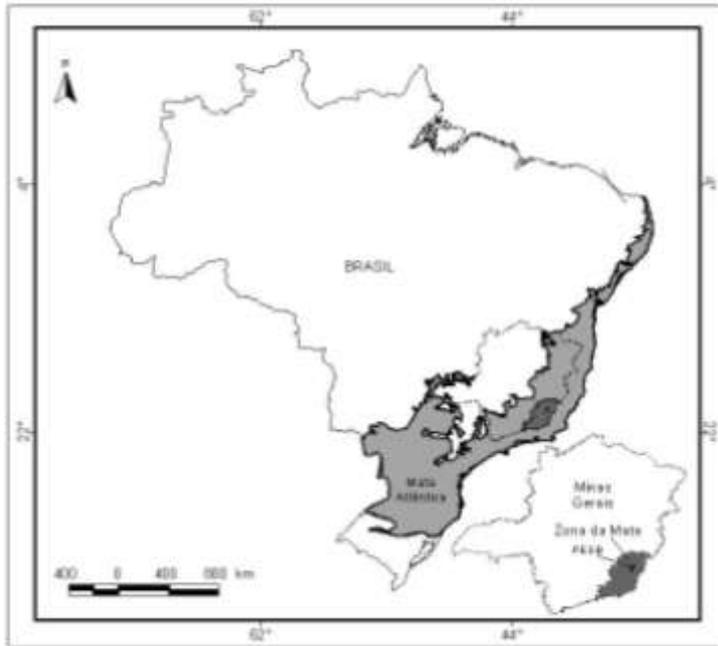
- ✓ Better quality of food.
- ✓ Better work environment for the farmers.



**Via Campesina campaign against the use of pesticides in Brasil: we consume around 5 litres of pesticides per year per person**

## **4. Our experience**

# Atlantic Rainforest Biome: **Hotspot of biodiversity**



The Atlantic Forest ranks among the top **five of the 25 richest and most threatened** reservoirs of plant and animal life on Earth (so-called **biodiversity hotspots**) (Myers et al. 2000).

- Nowadays: around 7% of it remains.
- **One of the reasons: agriculture**



forest fragments...

pastures

forest fragments...

Coffee



✓ Main land use: full-sun coffee and pasture in monoculture.  
Managed mainly by family farmers.

**Following the agroecological principles, CTA-ZM in partnership with UFV and small farmers organizations in Zona da Mata developed agroforestry systems, using a participatory approach.**

# Agroforestry Systems

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- ✓ 1993 - a Participatory Rural Appraisal (PRA) process was undertaken in Araponga (municipality of Zona da Mata).
- ✓ One of the biggest problems pointed out by the farmers was the **loss of soil quality** – “enfraqecimento das terras”.

✓ The farmers prioritized land use problems and selected a committee called “terra forte” (strong land) composed of farmers, staff of the NGO and the Soil Department/UFV to present some land conservation proposals to overcome the problem.



✓ **The committee suggested several practices.**

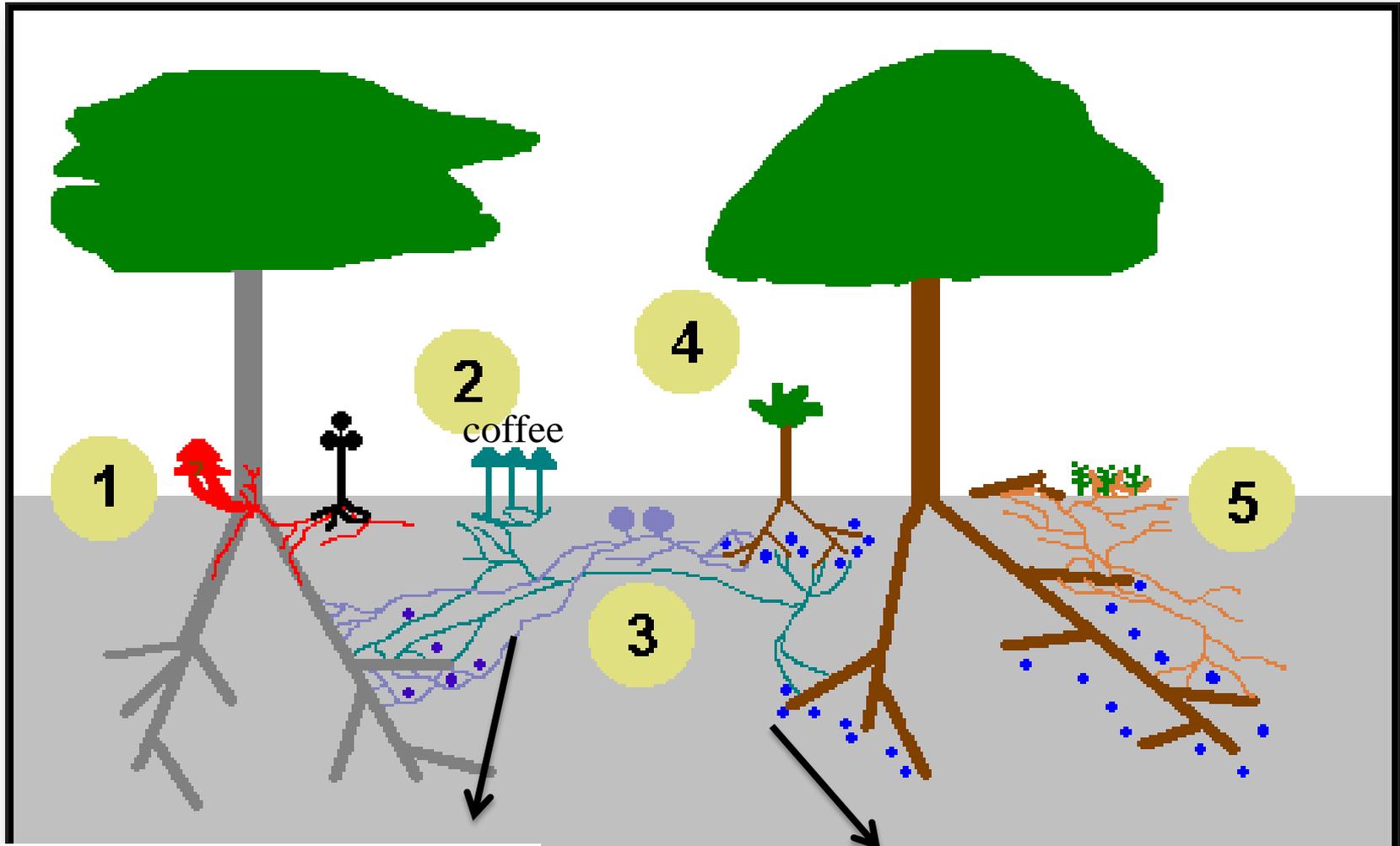
**- Most of them common to the farmers:**

**Ex.: green manure; management of the spontaneous vegetation;**

**- One not common to the farmers: agroforestry systems**

# Why are trees so important?

- Better use of the environment: above and below ground



Increase mycorrhizal network in deeper layer of the soil

Some trees are leguminosae: rhizobium symbiosis

# Why are trees so important?

- Attract more associated biodiversity: birds, bees etc.



Associated biodiversity is responsible for many ecosystem services

- ✓ In the green revolution type of agriculture, the ecosystem services (nutrient cycling, pest controls, soil structure etc.) were replaced by chemical fertilizers, tillage and pesticides.
- ✓ You can decide to be dependent on the biodiversity or on the industries that produce the chemicals.
- ✓ The replacement of the environmental services by chemicals is key to understand why agriculture, instead of benefiting, harms the biodiversity.

# **Agroforestry in Zona da Mata started in 1994**

- ✓ **Around 30 experiences, in 11 municipalities;**
- ✓ **Each experience 1000 m<sup>2</sup>;**

From 2003 to 2005, CTA, farmers and the Soil Department systematized the experience with the agroforestry systems, using a participatory approach (Sousa et al, 2010: Agrof. Syst. 80, 1-16).

- Farmers were visited and interviewed and we organized several meetings with the farmers



**Meeting at CTA**



**Meeting at the University**

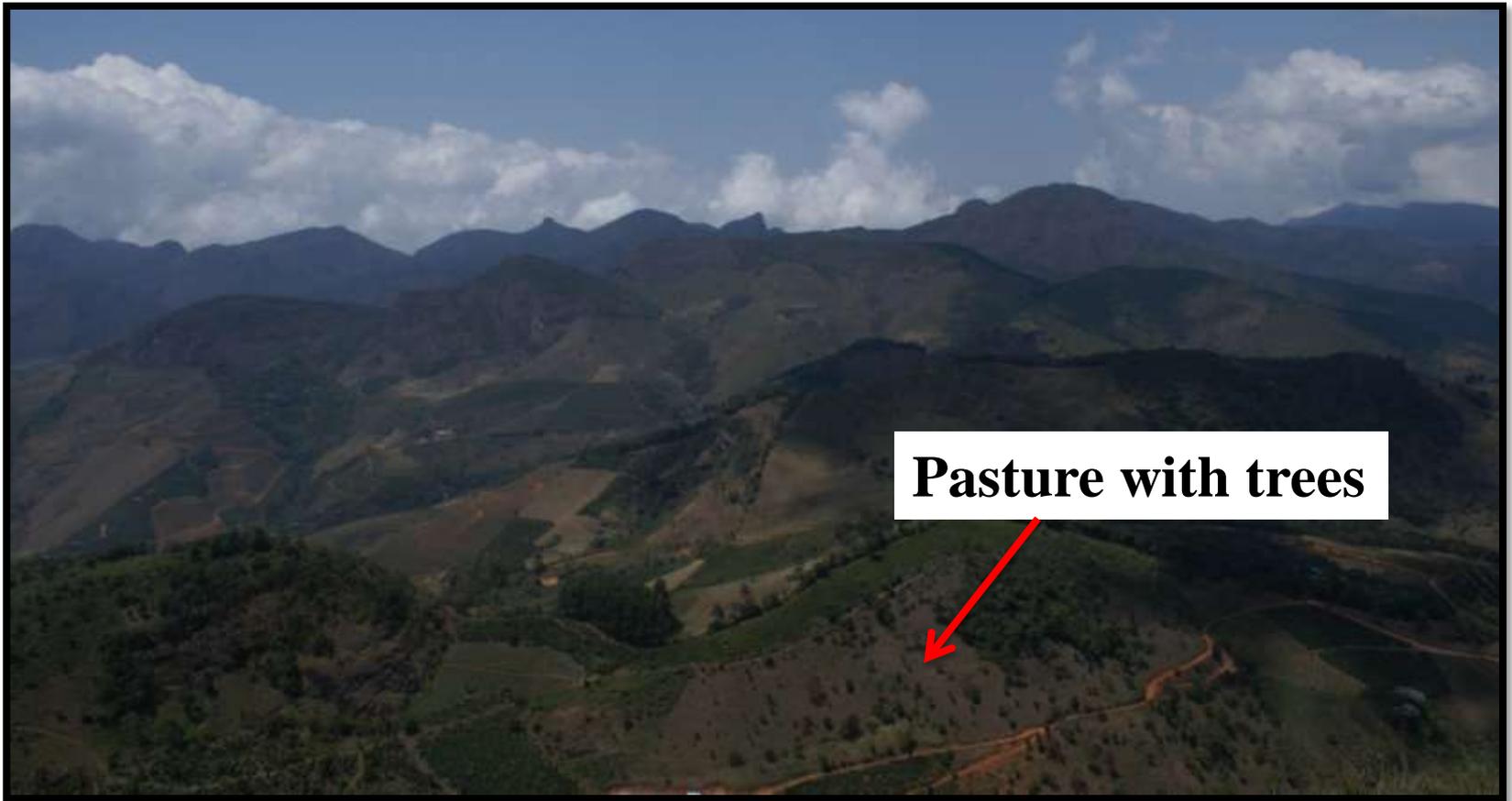


**Interview**



**Meeting in the community**

During the systematization, we concentrated on agroforestry coffee systems. **We are studying pasture systems now!**





## Agroforestry systems

Definition resulting from this process:

- A diversified tree stratum;
- **A bush stratum** (coffee and others);
- A herbaceous stratum, (leguminosae, spontaneous vegetation, edible plants etc).



# Some results



**Degraded land**



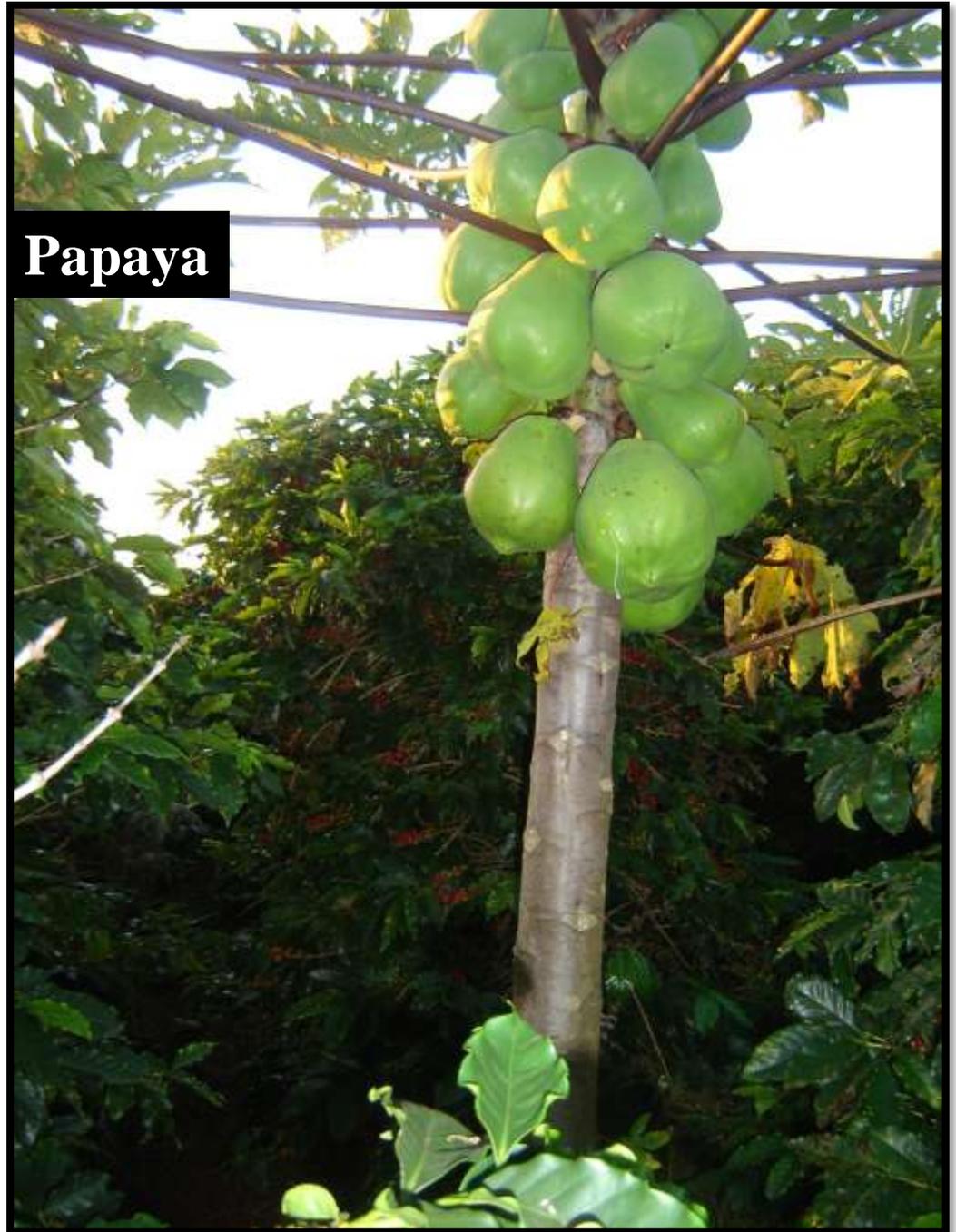
**The same land 15 years later**



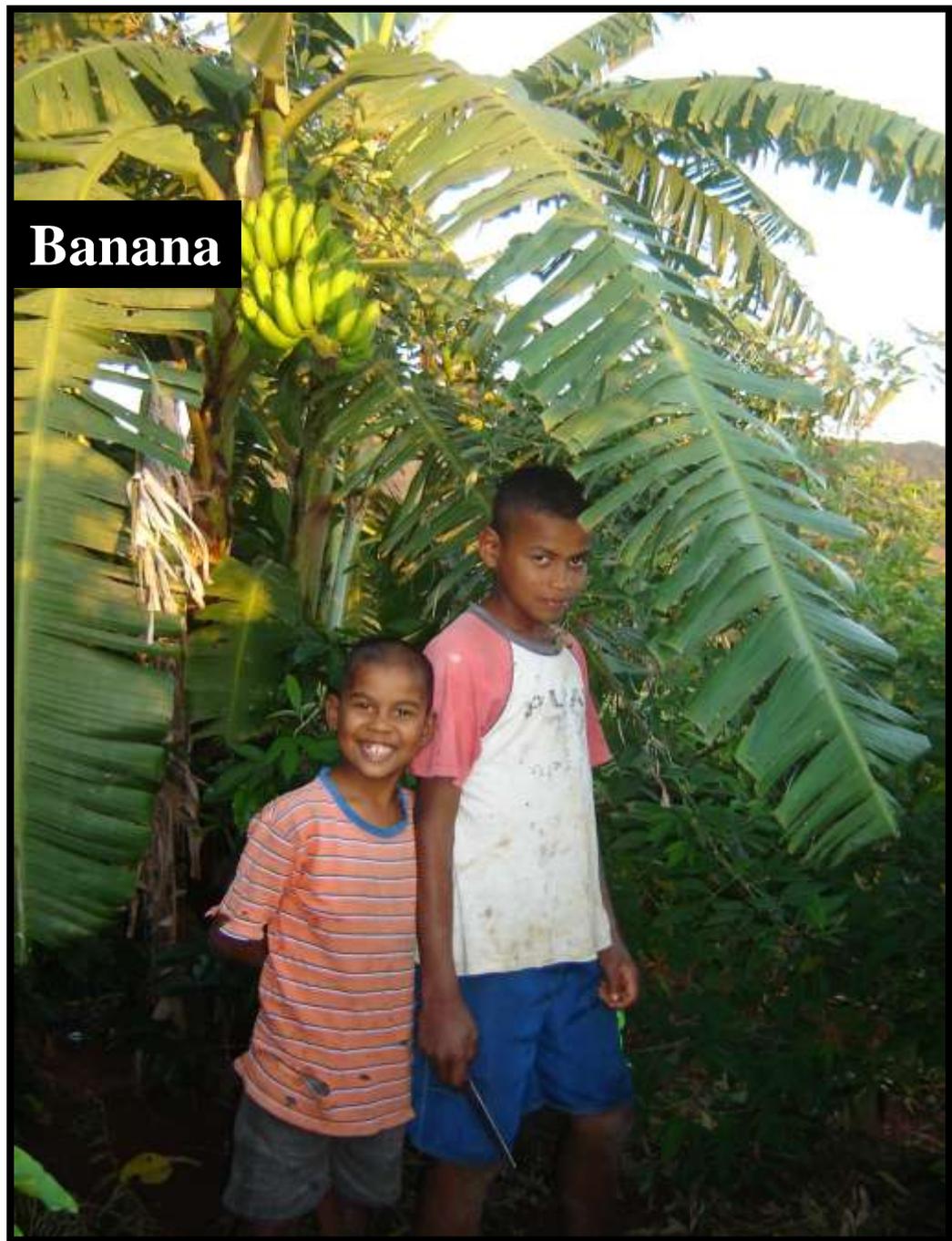
**Another view**

**Diversification of the  
production**

**Papaya**



**Banana**



**For the family!**

**For the animals...**

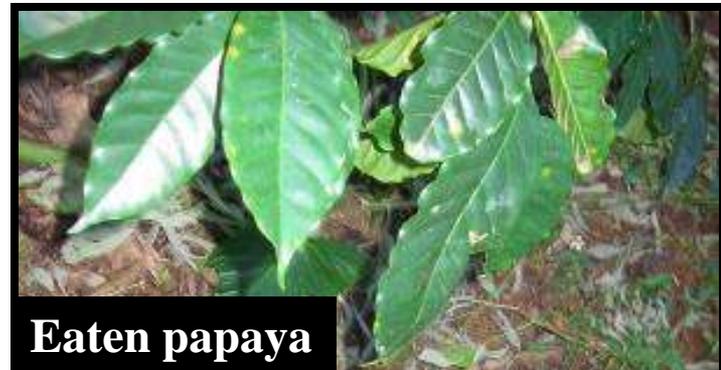


**Avocado**



**Eaten avocado**

**For the wild animals...**



**Eaten papaya**



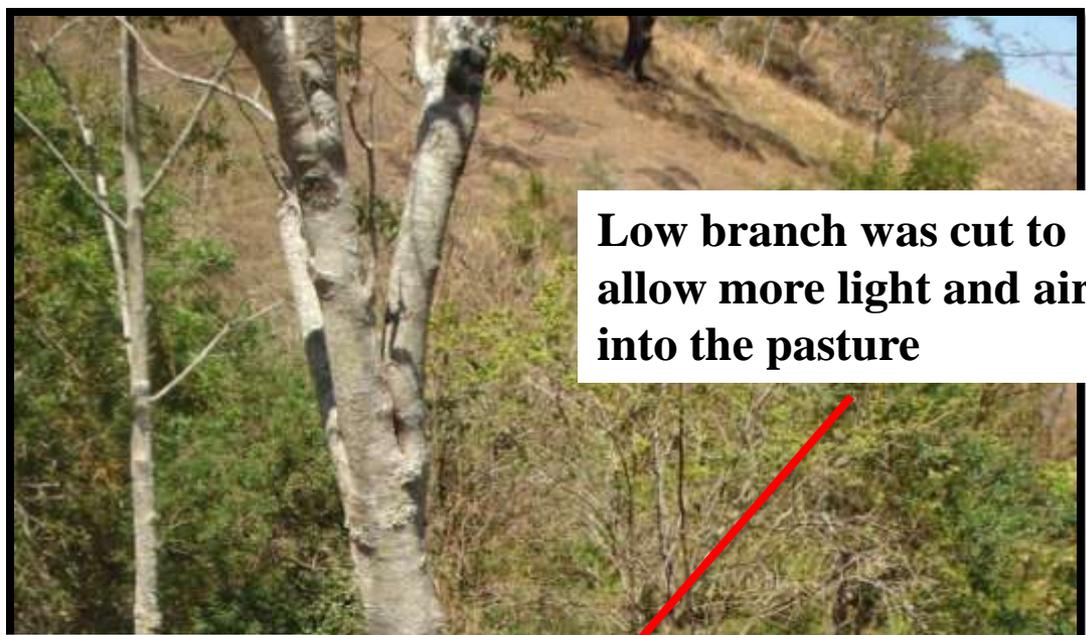
Gijs – from Otherwise , in the past



**And also for Dutch guys, if they are there in the correct season...**

Water





**Low branch was cut to allow more light and air into the pasture**



**Wood: due to the management: fire wood, small constructions, fences...**



**More associated biodiversity**



**Coffee plant**

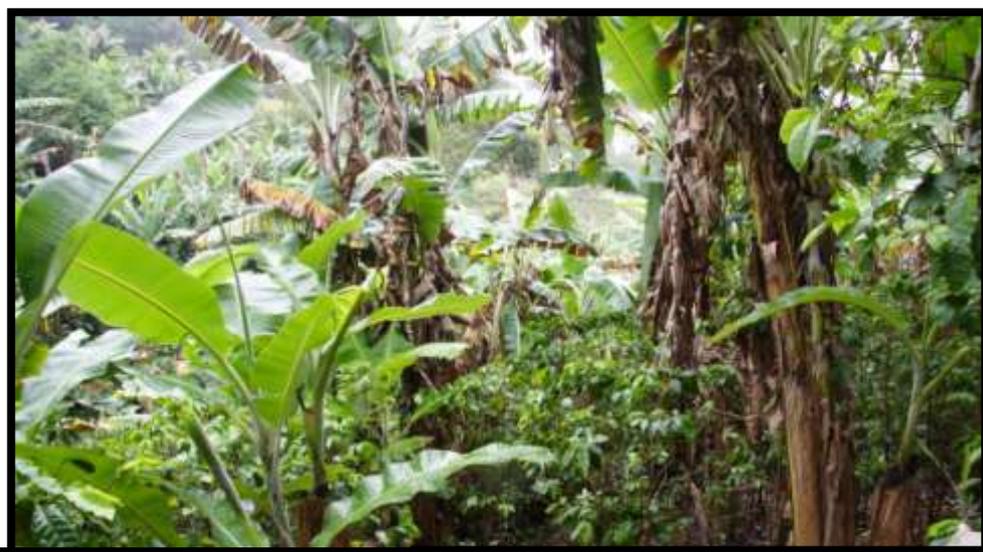
**More products for the market**



**1000 avocado plants**  
**300 boxes: US\$ 600,00**

**180 boxes  
of banana/month**

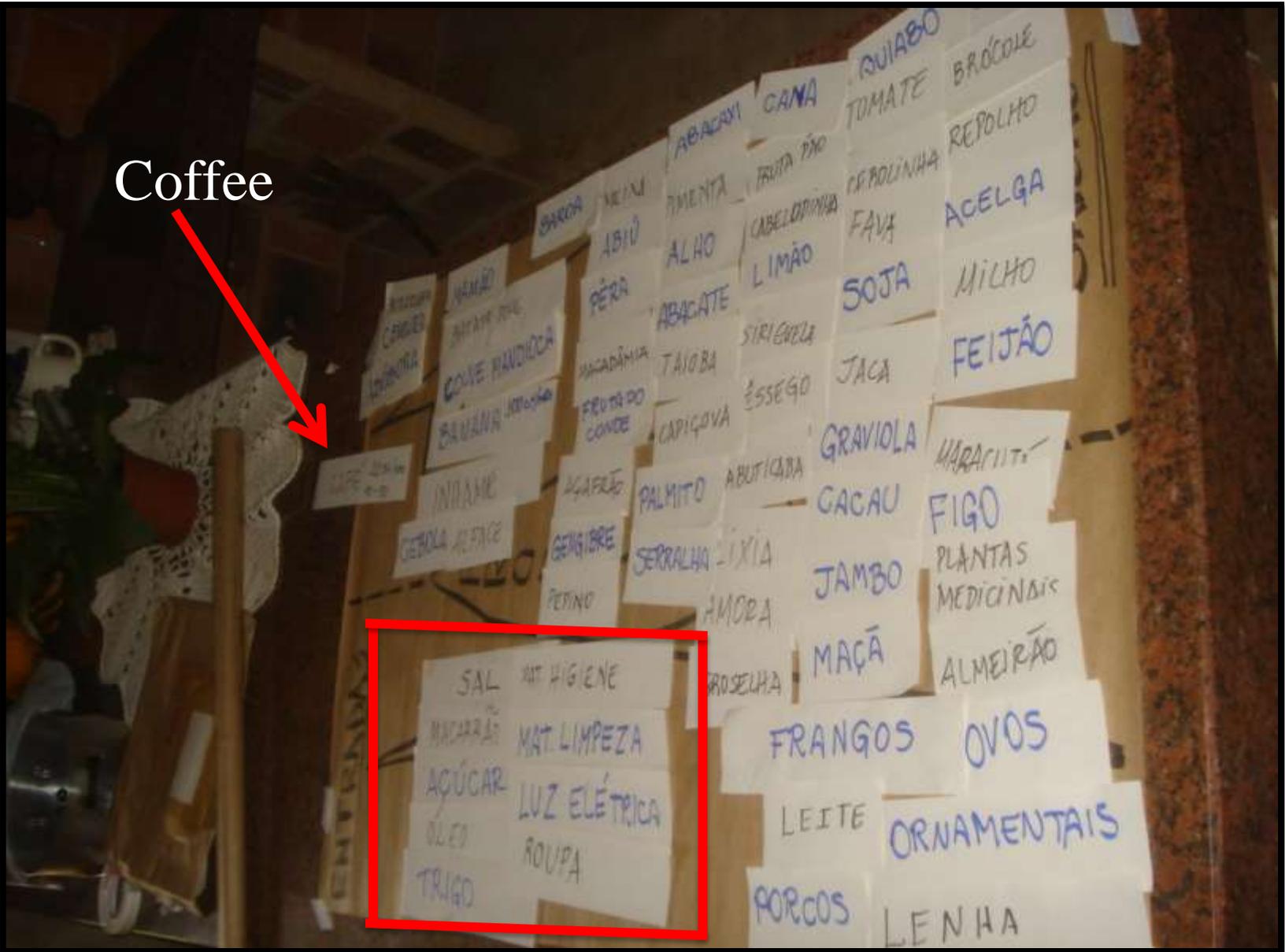
**US\$ 360,00**



Coffee



SAL MAT HIGIENE  
MACARRÃO MAT LIMPEZA  
AÇÚCAR LUZ ELÉTRICA  
ÓLEO ROUPA  
TRIGO



ABACAXI CANA QUIABO  
TOMATE BRÓCOLE  
FRUTA FRIA  
CERVOLETA REPOLHO  
ALHO CABELINHA FAVA ACELGA  
LIMÃO SOJA MILHO  
ABACATE SIRIGUELA JACA FEIJÃO  
TAIOBA  
FRUTO DO CONDE  
CARIÇOVA  
ESSEGO  
MACADÂMIA  
JACARÉ  
ABUTICABA  
PALMITO  
SERRALHA LIXIA  
AMORA  
PETINHO  
ROSELHA  
MAÇÃ  
FRANGOS OVOS  
LEITE ORNAMENTAIS  
PORCOS LENHA

Breakfast



Photo: Jaap Meijering

Almost all food is produced at the farm

Lunch



Photo: Jaap Meijering

Food security and sovereignty



Healthy and nice environment for the family!



Healthy child: the best indicator of life quality!

And coffee...

*Solanum argenteum*

The idea is to search for a local optimum rather than single purpose maximum results (IAASTD)

Coffee...

Since the beginning these **COMPLEX** systems have been studied,  
nowadays more intensely.



## Pollinization



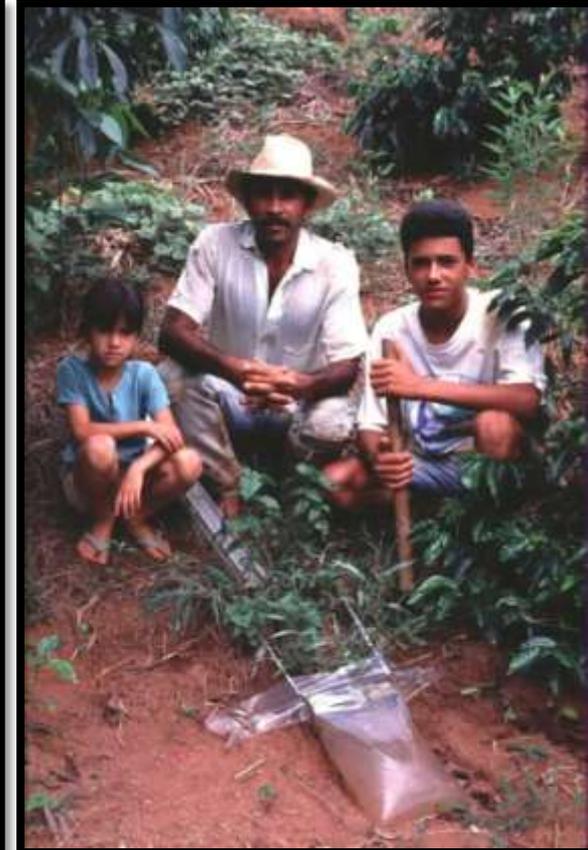
## Floristic studies



## Nutrient cycling

## Erosion

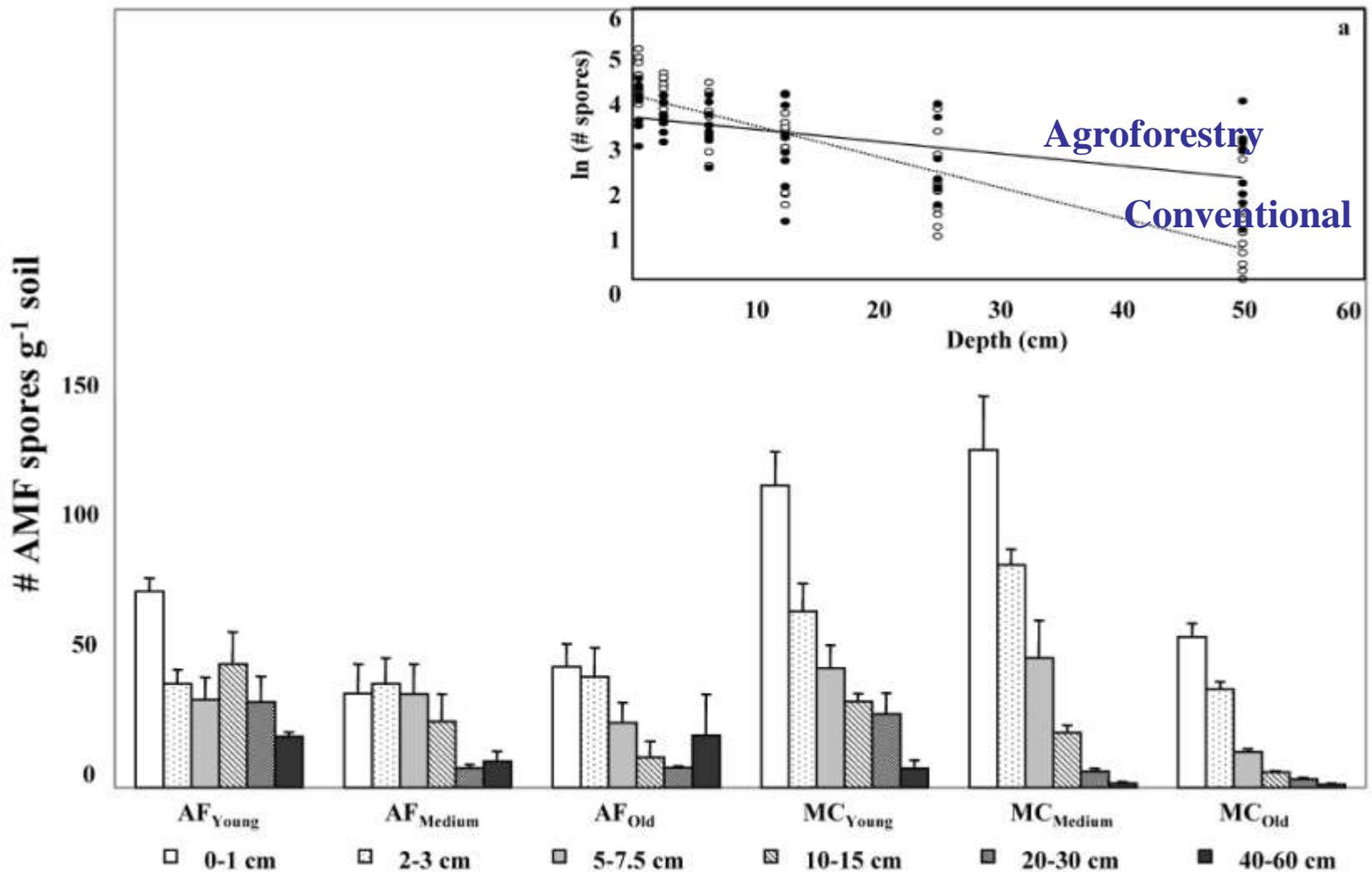
## Soil quality



## Sampling *S. macranthera* roots for mycorrhizal studies



(sampling material for Loes Mertens, to screen for mycorrhiza)



**Mycorrhizal spores at different soil depths under agroforestry (AF) and monocultural coffee systems (MC). The agricultural systems were 5 years old (Young), 15-20 years old (Medium) and 20-24 years old (Old) (Cardoso et al. 2003).**

We do our best to study the systems together with the family farmers and their organizations!





CAFE COM CIENCIA  
2007

Departamento de Genética - UFPA  
Laboratório de Evolução - UFPA  
Instituto de Biologia - UFPA  
Centro Tecnológico Alameda, Caixa de Correio  
Instituto de Engenharia, Faculdade de Arquitetura  
Instituto de Tecnologia, Escola de Engenharia

01/01/2005









There are several experiences as ours in Zona da Mata... The question is:

## 5. How can we scale up the agroecological experiences around the world?

Scale up: understood as having **more farmers producing in agroecological ways,**

Which means:

Less land intensely managed with pesticides and fertilizers and  
**More land intensely managed with knowledge and biodiversity!**

What we want is to go “From Islands of Success to Seas of Change!”

**From Islands of Success to Seas of Change  
Initiative for Scaling Inclusive Agri-Food Markets**



<http://www.seasofchangeinitiative.net/>

A conference that will take place in The Netherlands, April, 2012

- ✓ De Schutter (2011), the special UN rapporteur, argues that the scaling up of these experiences is the main challenge today.
- ✓ The IAASTD: We know the solutions. **We have the power to change.** What are we waiting for?

## 1) The empire of the agribusiness and food industries

IAASTD ([summary by Greenpeace](#)):

“The summaries were adopted, negotiated line by line, and the overall assessment approved by 58 out of 61 participating governments. Three governments (USA, Canada and Australia) welcomed the assessment, but felt unable to fully endorse its conclusions. In a last-minute move before the final plenary, representatives of Syngenta and CropLife International. The association of global agrochemical companies, withdrew from the process after years of active participation and contribution. Among the most contentious issues at stake was the role of global trade, of genetic engineering, and of intellectual property rights, as well as the overall assessment of industrial agriculture as compared to small-scale farming”. **Who has the power????**

## 2) Consumers

What do you eat? Where do you buy your food? What do you do to change the situation?

Do you know this place?





### 3) Farmers

According to Keshavarz (2010, in: *Sociology, Organic Farming, Climate Change and Soil Science*):

The decision about whether take advice about conservation (I could say agroecology) are affected by three dimensions

- The personality of the farmer.
- The advisory structure
- The policy environment facing farmers

#### 4. Public Policies. De Schutter (2010) - special rapporteur, for the United Nations advises:

Appropriate public policies can create an enabling environment for such sustainable modes of production. These policies should prioritize:

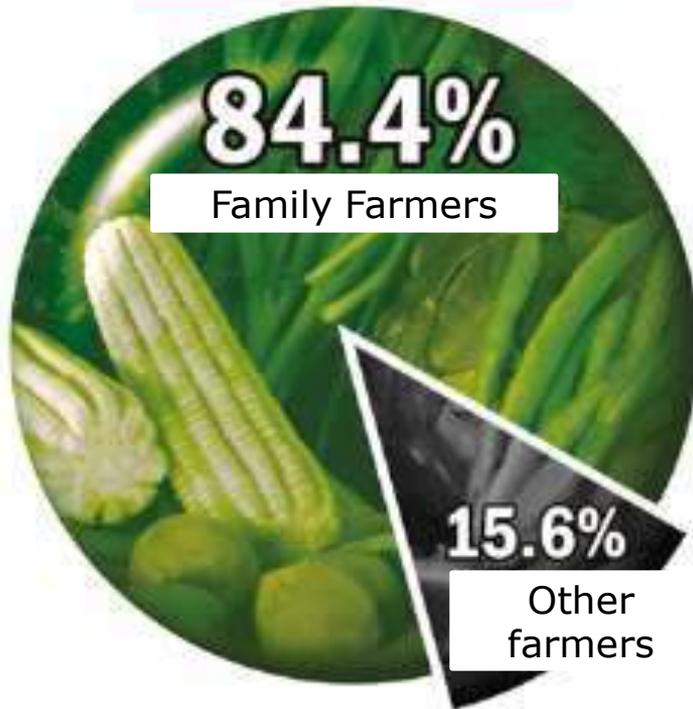
- ✓ obtaining goods for public spending rather than solely providing input subsidies;
- ✓ investing in knowledge by reinvesting in agricultural research and extension services;
- ✓ investing in forms of **social organization** that encourage partnerships, including farmer field schools and farmers movements innovation networks;
- ✓ investing in agricultural research and extension systems;
- ✓ empowering women;
- ✓ and creating a macro-economic enabling environment, including connecting sustainable farms to fair markets.

Simple steps in the right direction (Greenpeace's summary based on the IAASTD report):

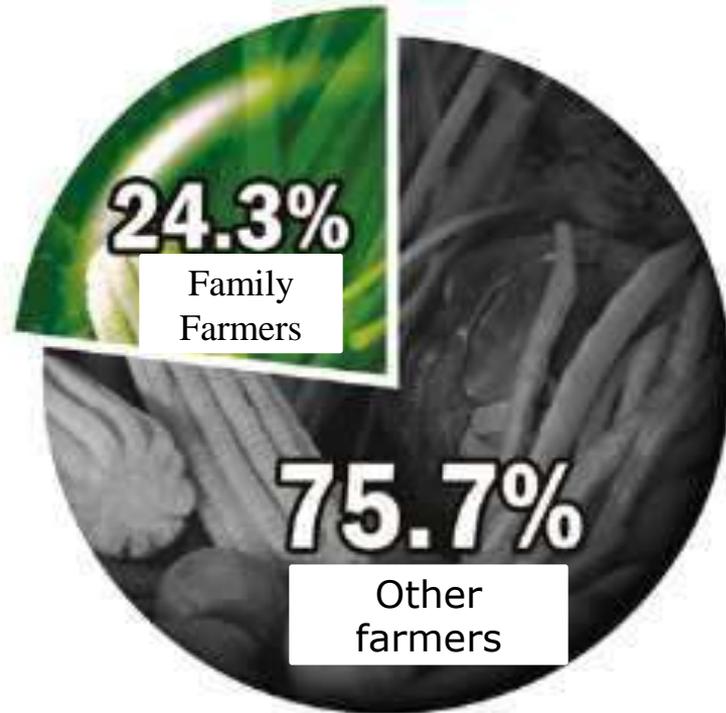
1. Food First.
2. Women make the difference.
3. Smallholders are the key to sustainable food security. Produce most of the food humanity consumes.

# Family Agriculture x Industrial Agriculture in Brazil

Total of farms: 4367902



Total Area



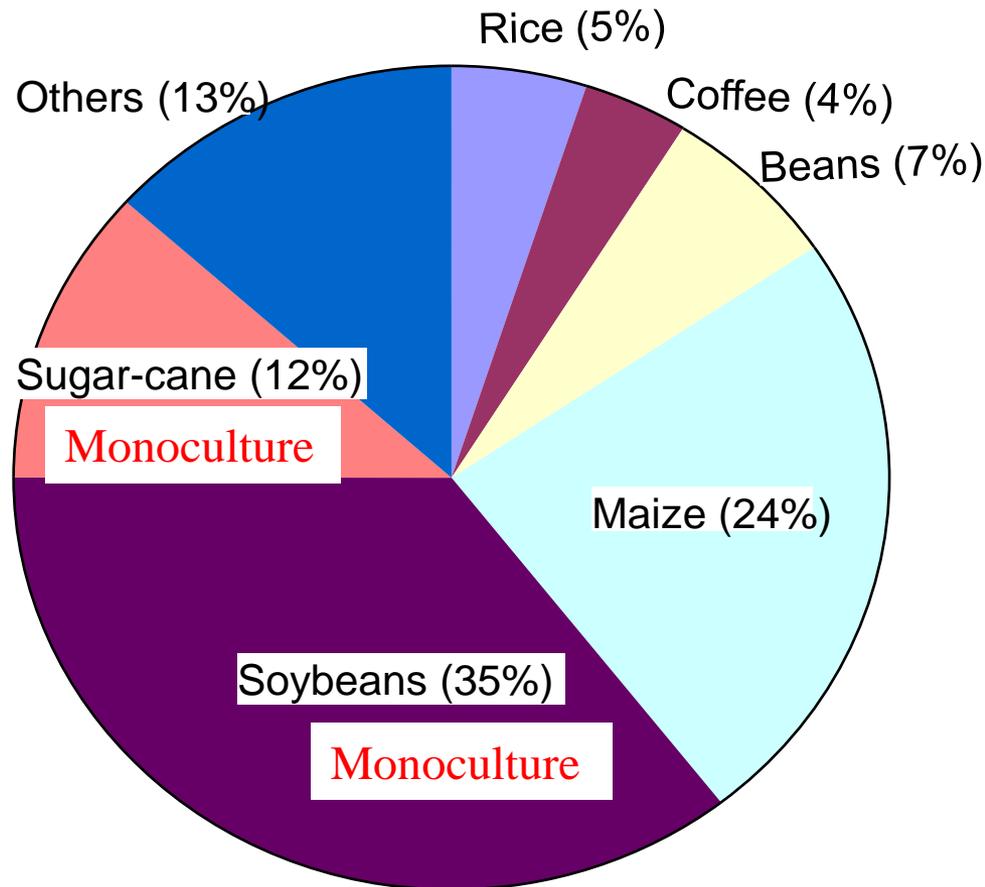
**Receive only 25% of the credits**

# Family Agriculture produces 70% of the food that reach the Brazilian's tables!



## 4. Replace monocultures with diversity.

### Cultivated area - BRAZIL



5. Design agricultural policies that support and enhance the multiple ecological functions of agriculture.
6. Escape the pesticide treadmill!
7. Minimize fossil fuel dependency.
8. Grow and produce food as close as possible to those who eat it.
9. Reduce and optimize meat, eggs and milk production and consumption.
10. Reduce waste of food and other agricultural products at every step of production, processing and distribution.

11. Rethink and improve how bioenergy is produced and utilized.

12. More trees!

13. Adapt global trade to the major challenges.

14. Share the knowledge needed for survival

✓ investing in forms of social organization that encourage partnerships, including farmer field schools and farmers movements innovation networks (De Schutter, 2010);

## Conclusions:

**YES,**

- ✓ Agroecology is a science, a movement and a practice.
- ✓ It is possible to feed the world using the agroecological approach.
- ✓ It is better to have agriculture that is more friendly to nature than to intensify agriculture using pesticides, monocultures, GMOs and tillage.
- ✓ We have several islands of good experiences, as the one in Zona da Mata.
- ✓ To have seas of change depends also on you!

Thank you!  
Obrigada!

“The world will be sustainable only when people start talking about sustainability of the soul” Vilma Machado