

### UNIVERSITE PARIS-SACLAY



# Climate-smart agriculture and its benefits for ecosystems and food security

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Climate-smart agriculture and its benefits for ecosystems and food security



- Quizz time !
- Our food system: driver and victim of climate change
- Caring for the planet and the hungry *and* combating climate change
- How bad and how challenging is climate-smart agriculture ?

bit.ly/38RrvXu

### Our food system:-

driver and victim of climate change

# Our food system: one of the drivers of climate change



Agriculture-related activities are 23% of global greenhouse gas emissions (2019)

AgroParisTech

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# Tomorrow: 50% of emissions to feed ourselves ?



# Climate variability will impact on food production



# Crop yields drop by 2050 under BAU

- > Maize 16%
- ➢ Rice 21%
- > Wheat 42%
- Average 5% per 1°C increase
- > Coffee 50%

# Suitability changes for coffee in East Africa









www.agroparistech.fr

Caring for the planet and the hungry and combating climate change

# Options to balance food security vs. climate Option 1 : change diets and reduce waste



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# 30 to 40% of our food is lost or wasted !



Source: Global Food Losses and Waste, FAO, 2011

### National dietary recommendations (Sweden, 2009)

Food types	Recommendations			
Meat (beef, lamb, pork, chicken)	Eat less, reduce portion size Eat locally produced and grass fed animals			
Fish and shellfish	Choose seafood with sustainable eco- labels From stable fish stocks			
Fruits, vegetables, and leguminoses	Seasonal and locally produced Pesticide free and organic Fiber rich & leguminoses			
Potatoes, cereals	Locally grown – reduce rice intake			
Cooking fat	Choose rape seed and olive oil – reduce palm			
Water	Choose tap water Locally produced/packed			

# Assessing the environmental impact of consumption and production (UNEP, 2010)

"As the global population surges towards a predicted **9.1 billion people by 2050**, western tastes for diets rich in meat and dairy products are unsustainable. (...) Global shift towards a vegan diet is vital to save the world from hunger, fuel poverty and the worst impacts of climate change"



www.agro

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# Safer diets that also impact less on climate



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## A warning though...

# theguardian

home >	world a	development	europe	US	americas	asia	australia	africa
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world sport football opinion culture business lifestyle

### Environmental sustainability

🔒 UK

Veganism is not the key to sustainable development - natural resources are vital

fashion environment tech travel

middle east cities

Lives and livelihoods the world over hinge on livestock, and efforts to reduce our dietary impact can still include some meat, milk and eggs

#### Jimmy Smith

The author is director general of the International Livestock Research Institute

Tonatoy 16 August 2016 07/00 357





#### Most popular



'It's because I had my period': swimmer Fu Yuanhui praised for breaking taboo

= browse all sections



Rio Olympics 2016: athletics, swimming marathon and morelive!



Justin Bieber quits Instagram after feud with Selena Gomez



# Option 2: Reducing agricultural emissions



## Alternate-Wetting-and-Drying (AWD)

#### INTERNATIONAL RICE RESEARCH INSTITUTE



Keep flooded for 1<sup>st</sup> 15 days and at flowering Irrigate when water drops to 15 cm below the surface

30% water

20-50% GHG

Without compromising yield

### **COLOMBIA**

### Storing Carbon deep in the Soil

Tropical forages for degraded pastures

 ✓ 4 to 5 fold increase in animal production

 ✓ Resilience to drought  ✓ 35% increase in soil carbon
 ✓ 75% below 20 cm

CGIAR



Fisher et al. 1994

# Option 3: The '3 in 1' – climate smart agriculture



www.agroparistech.fi

### NIGER



### Bringing back the Sahel's 'underground forest'

# ≻5 million ha of land restored, over 200 million trees re-established

**CCAFS** 



### What if...

### - we spread agroforestry across Africa?



Approximate area suitable for Agroforestry in Africa: ~ 300 Million Ha 140+ Million People below \$1.25 per day

Analysis based on WRI 2013

# What if...

## - we spread agroforestry across Africa?



- +615 Calories per person/day for 140+ Million poor people
- Average yield increase 50%
- Savings of over
  6 Million tons of synthetic fertilizer

# Carbon Sequestration •



2 Gt Co<sub>2</sub>e storage per year corresponds to ~1/3 of Global Direct Ag Emissions

 Significantly higher mitigation potential by further increasing tree density and in humid systems

#### Multiple benefits include:

- Reduced soil erosion
- Additional diversified income from wood products
- Strengthened drought resistance from increased water storage

Agroforestry can be combined with other practices such as water harvesting for additional impact.

RESILIENCE

### CHINA

### Paying for ecosystem services



RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security

AgroParisTech



✓ Sequestered over
 700,000 tonnes of
 carbon

 $\checkmark$ 

**Increased yields** 

 ✓ 2 million ha rehabilitated – reducing erosion

### Agroecology

## 37M ha of land in developing countries

 ✓ 80% increases in yield  ✓ 0.35 tons Carbon ha<sup>-1</sup> yr<sup>-1</sup>

 ✓ Resilience to pest and disease

### Pretty et al. 2006

### Climate-smart coffee-banana systems



RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security







Van Asten et al (2014)

- Microclimate: shading can reduce temperature by >2° Celsius
- Shade biomass increases carbon stock→ CC mitigation
- Shade plants increase revenue and food security for smallholders



Figure 1: The total yield value of intercropped fields was much higher than monocropped coffee or banana in farmer control fields

### Weather-based insurance

 $\checkmark$ 

12 million farmers & 40 different crops insured







Allows farmers to access fertilizer and better seed

 Reduces pressure to bring more land under cultivation ✓ Reduces risks

# How bad is climate smart agriculture ?



#### DON'T BE FOOLED! CIVIL SOCIETY SAYS NO TO "CLIMATE SMART AGRICULTURE" AND URGES DECISION-MAKERS TO SUPPORT AGROECOLOGY

#### SEPTEMBER 2015

We, the undersigned, belong to civil society organizations including social movements, peasants/farmers organizations and faith-based organizations from around the world. We are working to tackle the impacts of climate change that are already disrupting farming and food systems and threatening the food and nutrition security of millions of individuals. As we move towards COP21 in Paris, we welcome a growing

AgroPari

# Should we stop biking because of Monsanto ?

MONSANTO S BEYOND THE ROWS



## MONSANTO ZARATE PLANT HOSTS Community bike ride

# And how challenging ?

Growing food demand keeps increasing emissions despite efforts on per unit emissions reduction



According to the IPCC Special Report on 1.5°C, to limit temperature increases to 1.5°C, **emissions need to halve by 2030** and drop to net zero by 2050 for the best chance of avoiding the worst impacts of climate change. For the business sector, including for the food sector, this translates as reaching net zero emissions from operations, products, and supply chains within this timeframe. (Science Based Targets initiative, 2019)



 « Reaching the Paris Agreement goal will be challenging and require an 'agrarian revolution', where our food system becomes part of a global roadmap for rapid decarbonization. »
 Johan Rockström, EAT Food Forum, State of People and the Planet, 2017



# The rapid decarbonization pathway to reach 1.5°C



Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems

Walter Willer, Johan Racksteim, Bomt Loker, Marco Springmunn, Tim Long, Sonjo Vernwolen, Teru Garnett, David Timan, Fabrice DeClarik, Armande Wood, Maingionell, Michael Guek, Line J Gordon, Jersica Fanza, Carima Hawker, Rami Ziragik Janna Riveru, Wim De Vries, Lindwer Magle Schande, Ashkon Ajsbin, Abhohek Chavihory, Maria Henero, Kima Agustino, Francesco Branca, Anno Lartey, Shenggen Fan, Bostziaz Crane, Eisabarh Fan, Victoria Bigner, Max Trool, Tharess Lindaki, Sadhuir Sagh, Sarah E Comdi, K Seinath Roddy, Sunita Narain, Sarak Nahuru, Ciritarapher JJ, Marcay



# JOIN THE **4%**00 **INITIATIVE**

Soils for food security and climate

Building on solid, scientific documentation and concrete actions on the ground, the "4% Initiative: solis for food security and climate" aims to show that food security and combating climate change are complementary and to ensure that agriculture provides solutions to climate change. This initiative consists of a voluntary action plan under the Lima Paris Agenda for Action (LPAA), backed up by a strong and ambitious research program.

A FRENCH INITIATIVE ALREADY SUPPORTED BY MANY PARTNERS

### A French initiative in the Lima Paris Action Agreement launched at COP21

4p1000 "Soils for food security and climate"

- International research program on soil carbon sequestration
- Multi-stakeholder platform to facilitate partnerships, influence policy and improve supply chains
- Expertise on project monitoring and evaluation
- Digital resource center on carbon in soils

## Why storing Carbon in soils?

### Mitigate climate change

• Attenuate GHG emissions. Organic Carbon can be stored in soils for decades to millenia

Low cost negative emission technology

### Adapt to climate change

• Soil organic matter increases soil water capacity

Decreases sensitivity to erosion

### Contribute to food security & restore degraded soils

- Major role of soil organic matter in soil fertility
- Yields stability

30% world soils severely degraded (FAO - 2015)



## Why 4p1000 or 0.4%?





# **KISS the Ground** L'agriculture régénératrice

Lecture

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Des experts scientifiques et des militants décrivent comment le sol peut être la clé du combat contre le changement climatique et pour la préservation de la planète. Distribution : Woody Harrelson

Genres : Films documentaires, Docus sciences et nature, Documentaires nature et écologie

# Feed the world *and* enhance ecosystems : we are all concerned



# Thank you

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## **References and links**

- CGIAR Program on Climate Change, Agriculture and Food Security (CCAFS)
  - ccafs.cgiar.org
- UNEP International Resource Panel
  - www.unep.org/resourcepanel/
- Global Alliance for Climate Smart Agriculture (GACSA)
  - www.fao.org/gacsa/en/
- WBCSD Scaling Positive Agriculture Project
  - https://www.wbcsd.org/Programs/Food-and-Nature/Food-Land-Use/Scaling-Positive-Agriculture
- French Initiative 4P1000
  - <u>4p1000.org/</u>

