World Agroforestry Centre & food security

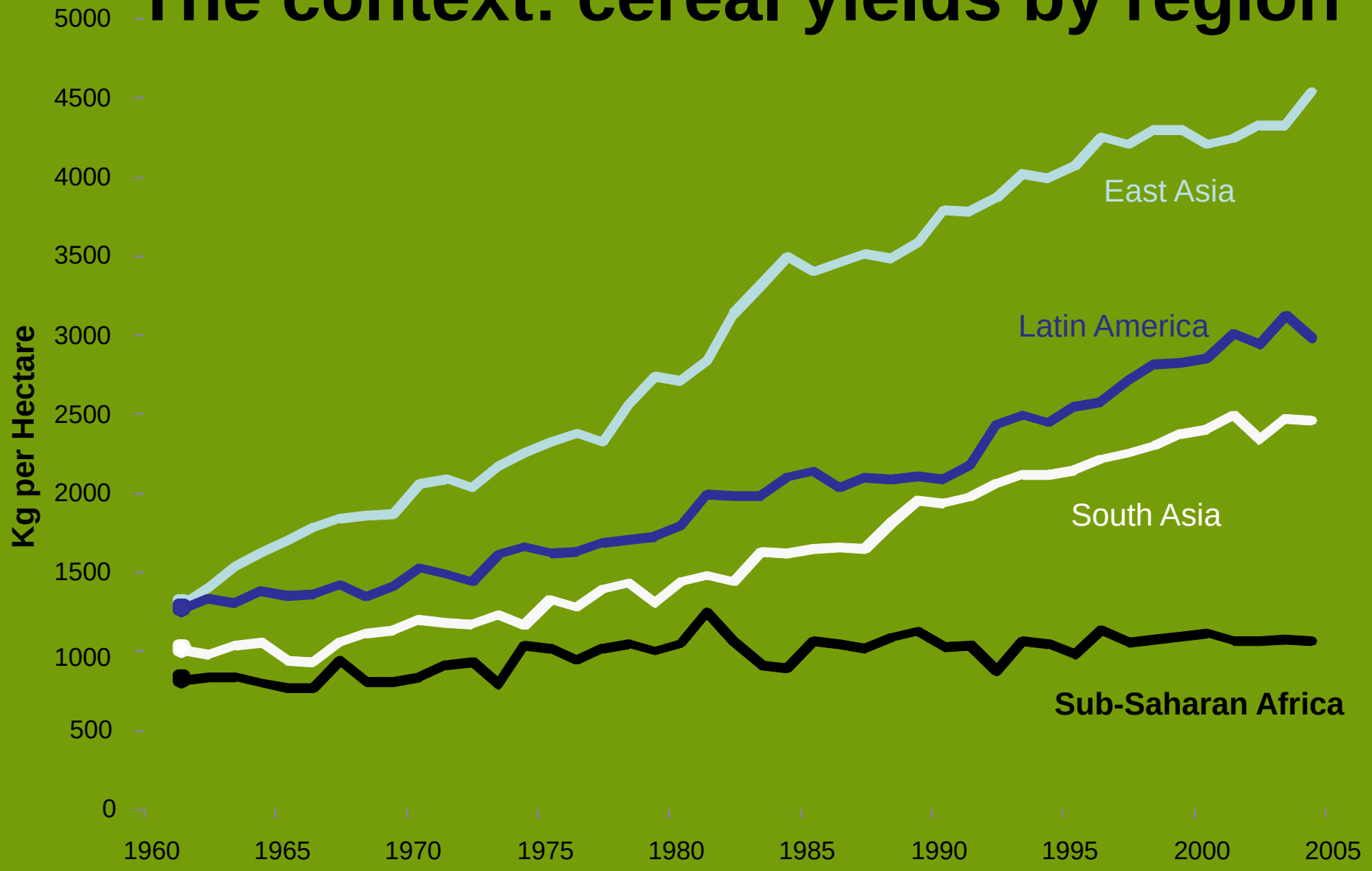
World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

Why agroforestry?

The core problem: by 2050, we need to…

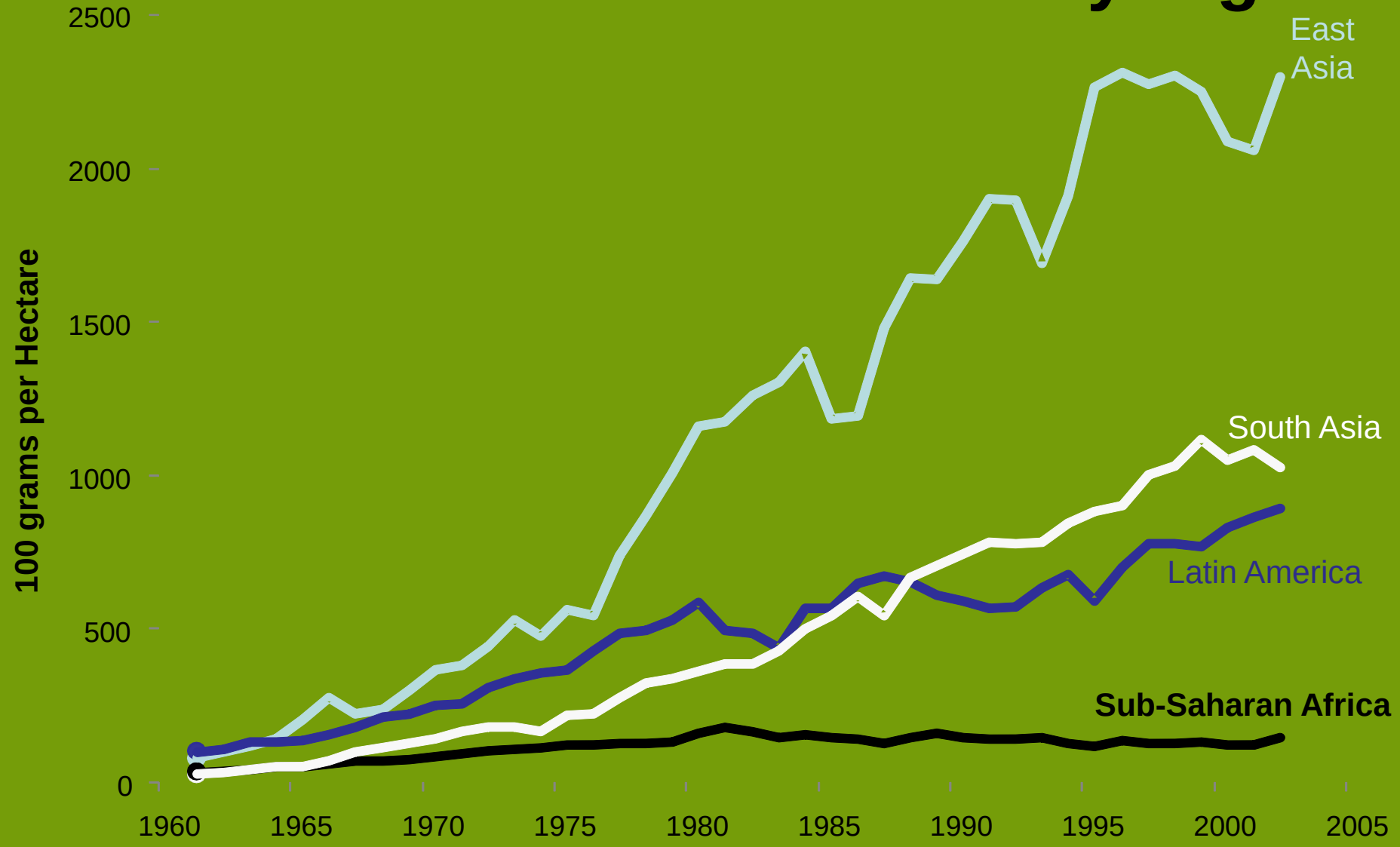
1. *Double world food production, esp. in Africa*
2. *Make farms, fields and landscapes more resistant to extreme weather, while…*
3. *… reducing greenhouse gas emissions*

The context: cereal yields by region



World Bank World Development Indicators

The context: fertiliser use by region



World Bank World Development Indicators

African facts

- **Population growth has made fallowing impossible** in many communities
- **Land overuse is depleting** soil organic matter, soil carbon and soil microbiology
- Consequenlty, across drylands Africa, **soil fertility is dropping**
- Deep poverty and logistical bottlenecks makes **fertiliser unaffordable for most**
- Funding for fertiliser subsidies is scarce and fickle

So where will soil fertility, soil organic matter and climate resilience come from ?

From trees.

Faidherbia Albida trees in teff crop system in Ethiopi

Fertilizer tree options from the short to the long term

Relay Fallow intercropping (grain yield: 2-3 tons)

Improved Fallows (grain yield: 3-4 tons)

Gliricidia / Maize intercropping (grain yield 3-5 tons)

Faidherbia/ Maize intercropping (grain yield 3-5+ tons)

1 year | 2 years | 3 years | 5+ years

Waiting period before benefit accrues

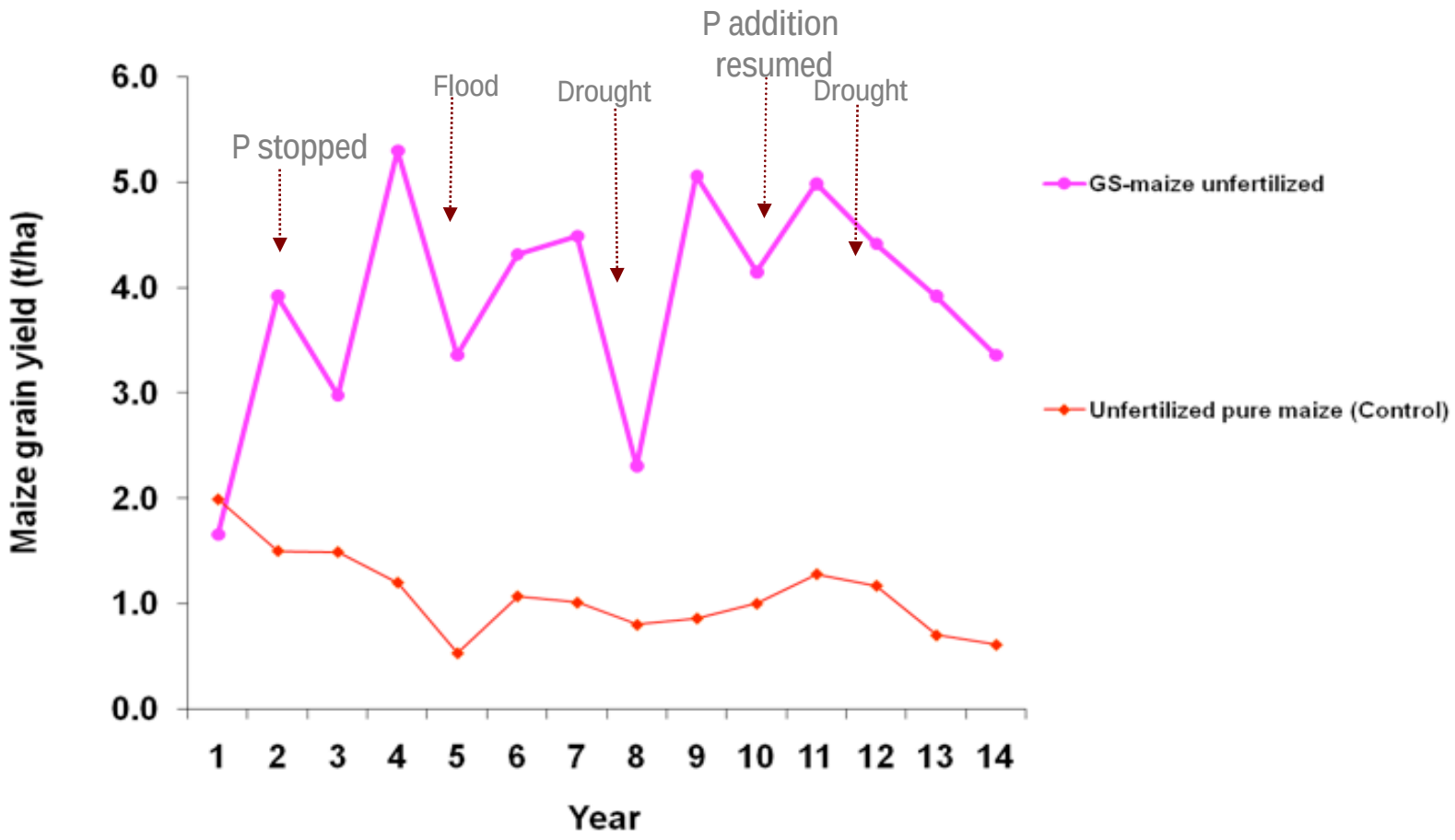
Malawi: impact of fertilizer trees on maize yield under farmer management

	maize yield (t/ha)
Maize only	1.30
Maize + fertilizer trees	3.05

2011 Survey of farms in six districts (Mzimba, Lilongwe, Mulanje, Salima, Thyolo and Machinga)

Trees boost long-term yields

Maize yield evolution in unfertilized plots, without and with *Gliricidia* trees, in Malawi



Gliricidia is a **a leguminous coppice tree interplanted with maize in this photo. The leaves are cut and turned over into the topmost soil layer, providing nitrogen and other nutrients to this season's crop. The coppiced trees then grow back below the maturing maize.**

Zambia: conservation agriculture with trees

National recommendations for maize: *Faidherbia* fertilizer trees at 100 trees / hectare

Conservation Agriculture with Trees: results in Zambia

Maize yield - zero fertiliser (tons/hectare)

	2008	2009	2010
Number of monitored trials	15	40	40
With Faidherbia	4.1	5.1	5.6
Without Faidherbia	1.3	2.6	2.6

With Faidherbia trees and no fertiliser, yields exceed the average yield observed in East Asia

Niger: Farmer-Managed Natural Regeneration

This is the Zinder district in the 1980s

In FMNR, farmers select the best shoots from trees regrowing naturally from stumps and eliminate the rest. This promotes the growth of vigorous new trees adapted to local conditions.

Niger: Farmer-Managed Natural Regeneration

The initial stages of FMNR regeneration: shrubs

Niger: Farmer-Managed Natural Regeneration

Mature FMNR fields: here, *Faidherbia* and millet

Today: 5 million hectares of *Faidherbia* parklands in Niger producing 500,000 tons of extra grain a year

Trees on fields: Kantché district, Zinder, Niger

A district of 350,000 people with high tree on-field densities. Rainfall averages ca. 350 mm per year, typical of Sahel drylands.

Annual district-wide grain surplus:

2007	21,230 tons
2008	36,838 tons
2009	28,122 tons
2010	64,208 tons
2011	13,818 tons

Yamba & Sambo, 2012

Kantché produces grain surpluses even in drought years. This is mostly exported to northern Nigeria, providing cash revenue.

What trees give to farms:

- Increased **crop nutrient availability** in rainfed food crop systems
- **Improved microclimate** and soil water relations conveying greater adaptation to climate change
- Increased and more stable **food crop productivity**
- Increased **food micronutrient** availability (fruits)
- Enhanced **dry season fodder** availability
- Dramatically **increased carbon accumulation** in food crop systems: 6-10 tons of CO_2 per hectare per year are common
- Enhanced **biodiversity**
- **Reduced deforestation** due to on-farm fuelwood and timber production

Aggregate maize yields with fertilizer trees are closing to gap with East Asian averages

2009/2010 season; data from 6 Malawian districts

Plot management	Sampling Frequency	Mean (Kg/Ha)	Standard error
Maize without fertiliser	36	**1322**	220.33
Maize with fertiliser	213	**1736**	118.95
Maize with fertiliser trees	72	**3053**	359.8
Maize with fertiliser trees & fertiliser	135	**3071**	264.31

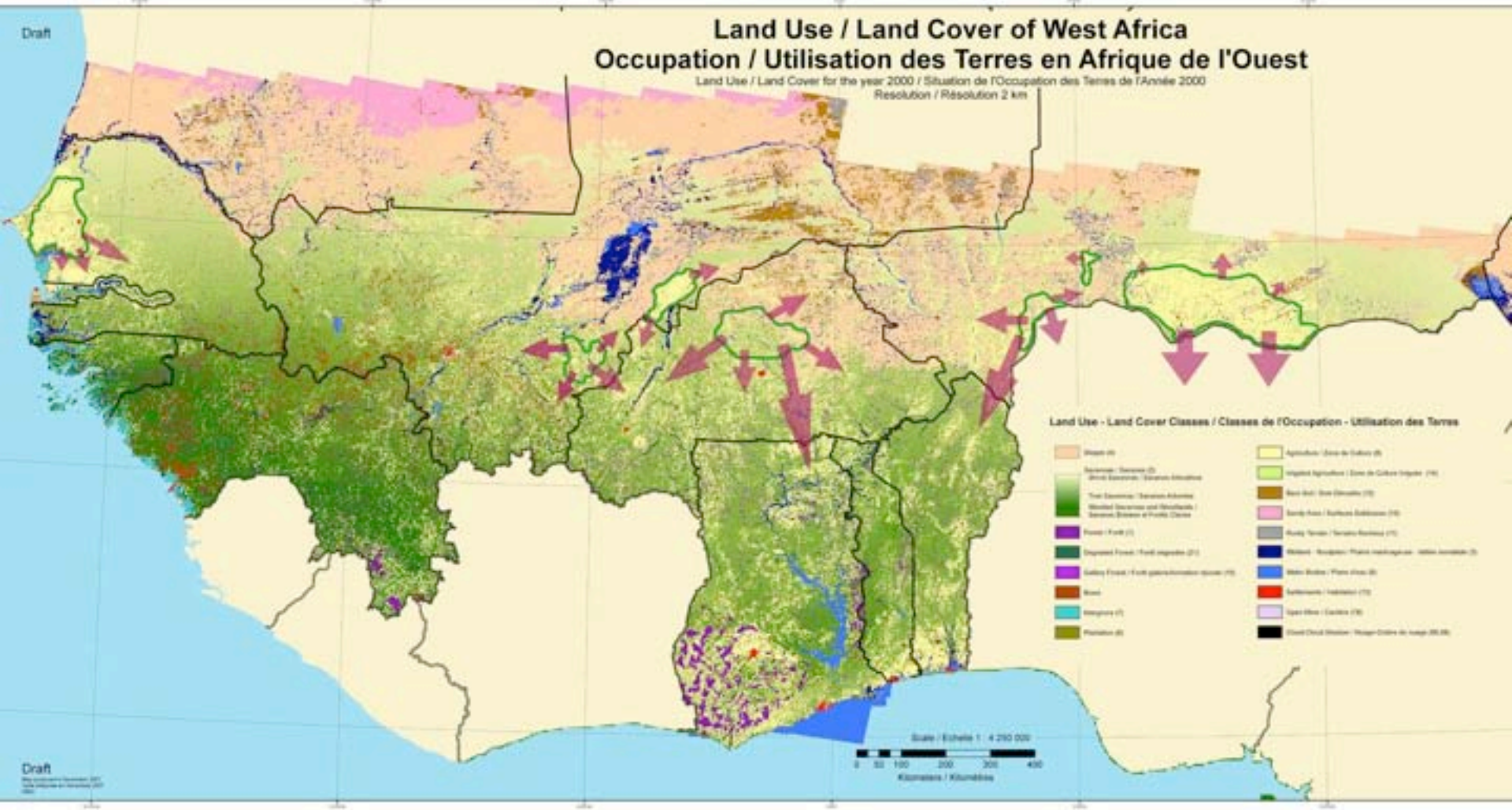
Mwalwanda, A.B., O. Ajayi, F.K. Akinnifesi, T. Beedy, Sileshi G, and G. Chiundu 2010

Because it works, evergreen agriculture and agroforestry are spreading across Africa, both from the grassroots and through government programmes.

This spread must be hugely speeded up to meet the needs of tens of millions of smallholder farmers.

Maize farming in a *Faidherbia* agroforest in Mbarali District, Southern Highlands, Tanzania. 2008
Photo: Saidi Mkomwa

Grassroots spread: agroforestry in West Africa is slowly expanding



Government support: 16 countries are now engaged in Evergreen Agriculture

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What must be done?

Growing Evergreen Agriculture on farms

1. Offer support to countries launching evergreen agriculture programmes:
   - Help establish the right policies
   - Technical support to define and establish best systems
   - Boost extension services reach and quality

2. Research, develop and support the implementation of scaling up and scaling out to many millions of smallholders
   - Support to pioneer farmers, to national extension services, to NGOs and INGOs

3. Encourage more partnerships between research and development *(the World Agroforestry Centre already work with World Vision, Oxfam, CARE, Concern Worldwide, AGRA and many more)*

4. Help spread the idea of “trees on farms” further at national and international levels

Building the science of Evergreen Agriculture

- Grow the science by encouraging research partnerships across the region to tackle key questions:
  - Develop systems adapted to as many agroecological regions as are encountered
  - Resolving complex policy issues
  - Enhancing targeting & scaling-up
  - Ensure quality tree genetics and plentiful tree seed supplies
  - Enhance tree propagation and establishment
  - Adapt to integrated production systems
  - Estimate potentials for climate change adaptation
  - …

Conclusion

Agroforestry and EverGreen Agriculture are

- **fresh, low-cost approaches** to land regeneration and food security that have their roots in Africa and are spreading across the tropics and that are
- **being adopted by millions** of smallholders.

- **Poor households should be targeted** over large areas to end hunger on small farms; working in the
- **many nations that are creating the policy and institutional environments** to favor adoption.
- **Research is critical to underpin** the acceleration of more widespread adoption

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