CATIE Centro Agronómico Tropical de Investigación y Enseñanza

Opportunities for carbon sequestration in Grassland Ecosystems

by
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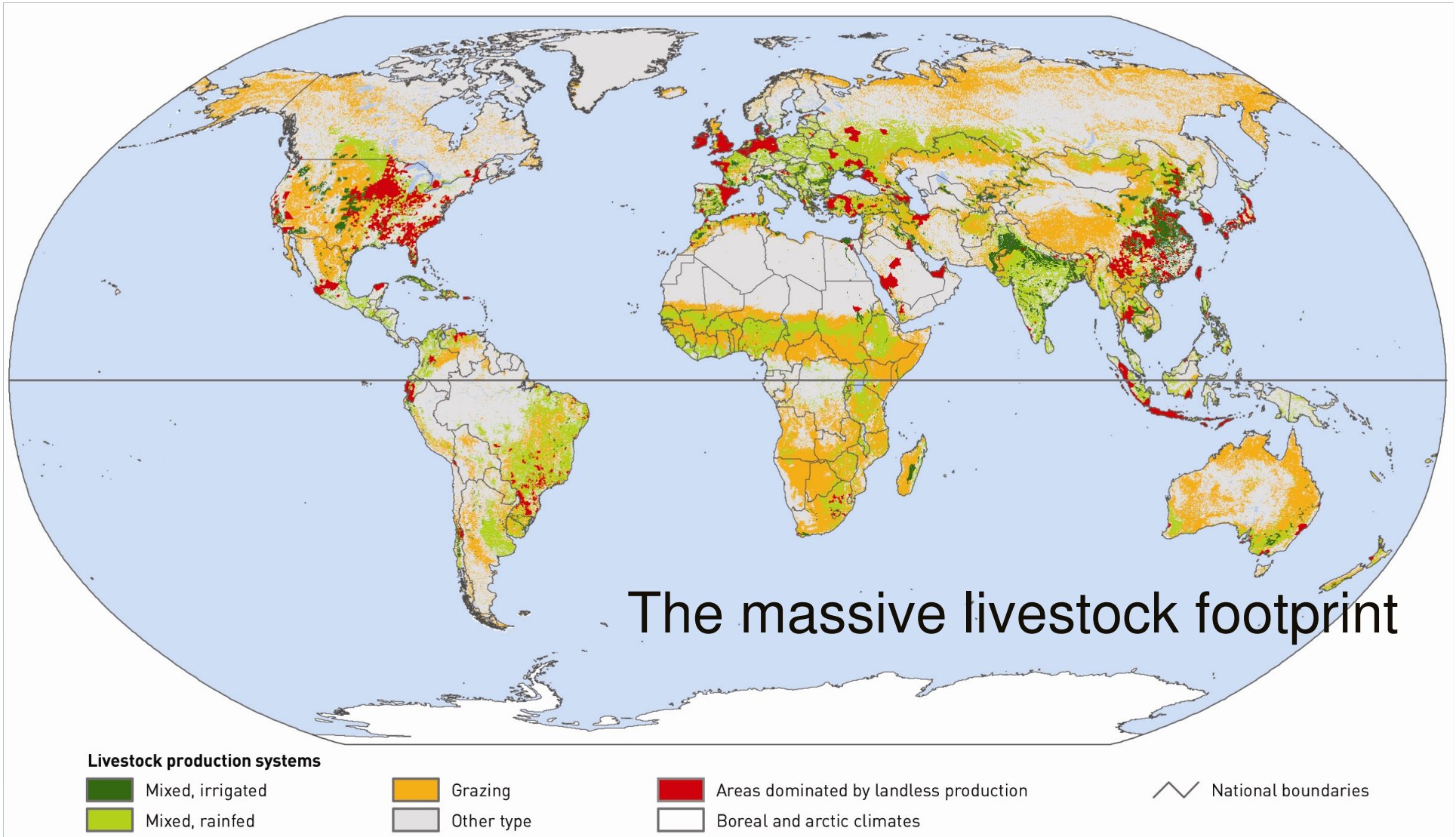
Grasslands & Pasture are key for mitigation

Poor grazing practices lead to:

- High levels of GHG emissions from livestock
- Environmental degradation
- Loss of biodiversity
- Reduction in flow of water resources

The massive livestock footprint



Estimated distribution of livestock production systems. Livestock's Long Shadow. 2006

Grasslands & Pasture hold potential for C sequestration

Total land for grazing is huge:

- 26% of the land surface
- 69% agricultural land

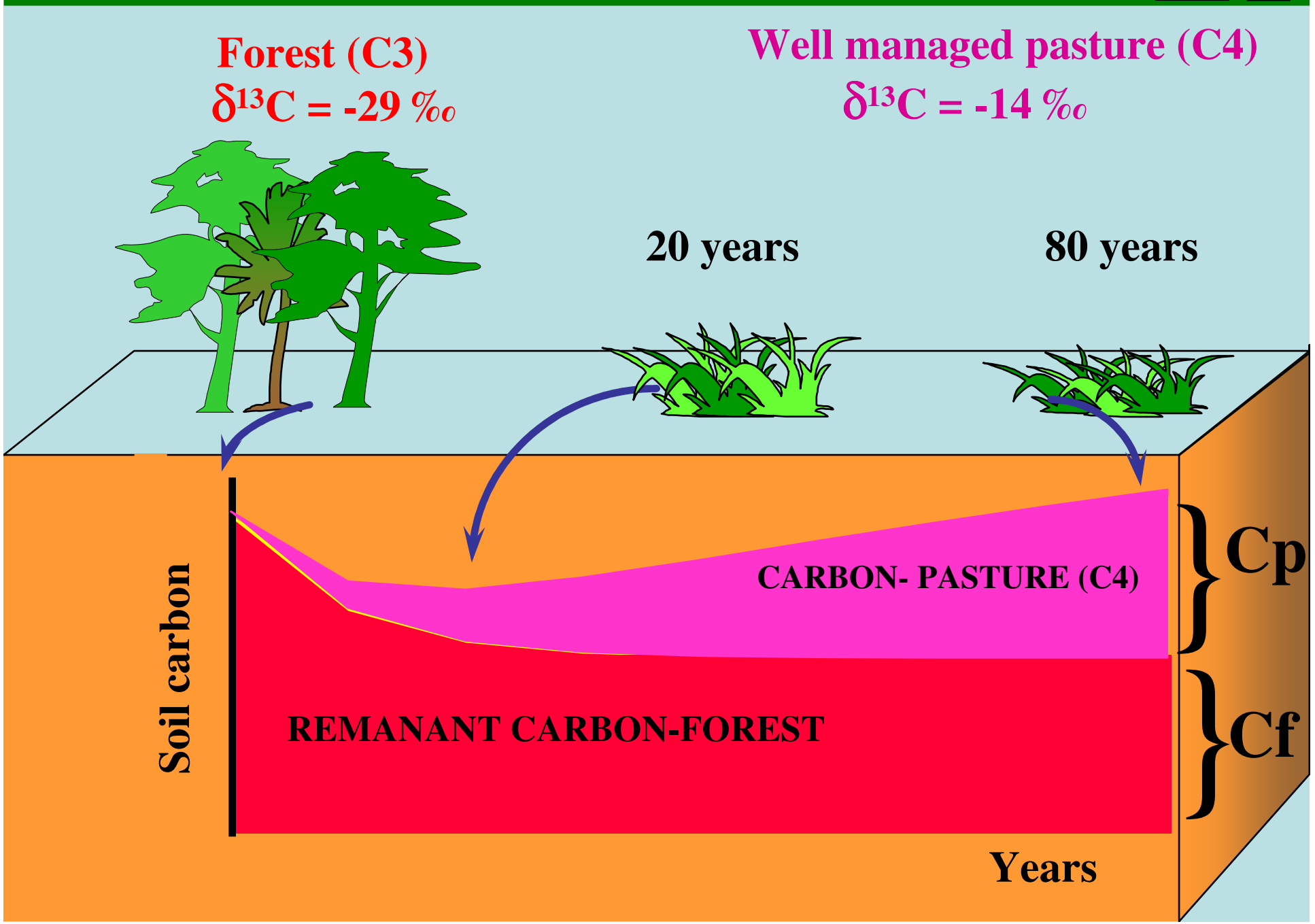
Carbon Sequestration in Grasslands

- Well managed grasslands can fix similiar or even higher amounts of C compared to forest ecosystems

C_4 tropical grasses in good environments growth rate is 50 t0 200 kg DM/day/ha

= 25 to 100 kg C/day

Carbon balance from conversion of forest to pastures



Farmers are at the centre

Stable carbon stocks vary according to farmer's management practices

Soil carbon stocks from different grasslands management practices in Costa Rica

Grassland management practices	Mean total C (ton/ha)	Mean oxidisable C (ton/ha)	Mean stable C (ton/ha)
I. ciliare pasture	208.16 a	182.23 a	25.93 a
B. brizantha+A. pintoi	193.67 a	165.46 b	27.63 a
B. brizantha	134.17 c	119.54 cd	14.84 b
Forest	127.69 c	110.84 d	16.84 b
Degraded pasture	94.08 d	83.93 e	10.14 b

Farm-approach for C budgets for mitigation of GHG

- **Accounting Interaction between C and N**
- **Tradeoffs between emissions of GHG and C sequestration**
- **Possible offset on other gases- NH3 and NO3 can be established**
- **Farmers can adapt strategies: feeding to reduce CH4 and N20, and sequester C**

Chain of carbon footprint in conventional systems

Grupo Ganadería y Manejo del Ambiente

419
KgCO2e

22 miilking cows71519
KgCO2e

Concentrates

80.4
KgCO2e

Supplements

206.4
KgCO2e

pasture

Fertilzers

206.1
KgCO2e

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carbon footprint

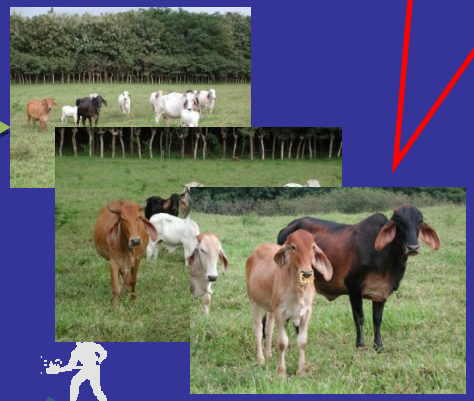
Chain of carbon footprint in silvopastoral systems

Grupo Ganadería y Manejo del Ambiente

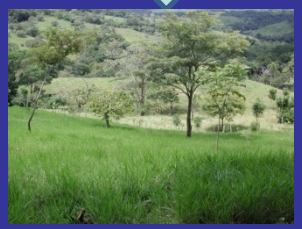
15 milking ows
37735.8 KgCO2e

419
KgCO2e

Concentrates



206.4
KgCO2e



Forage banks

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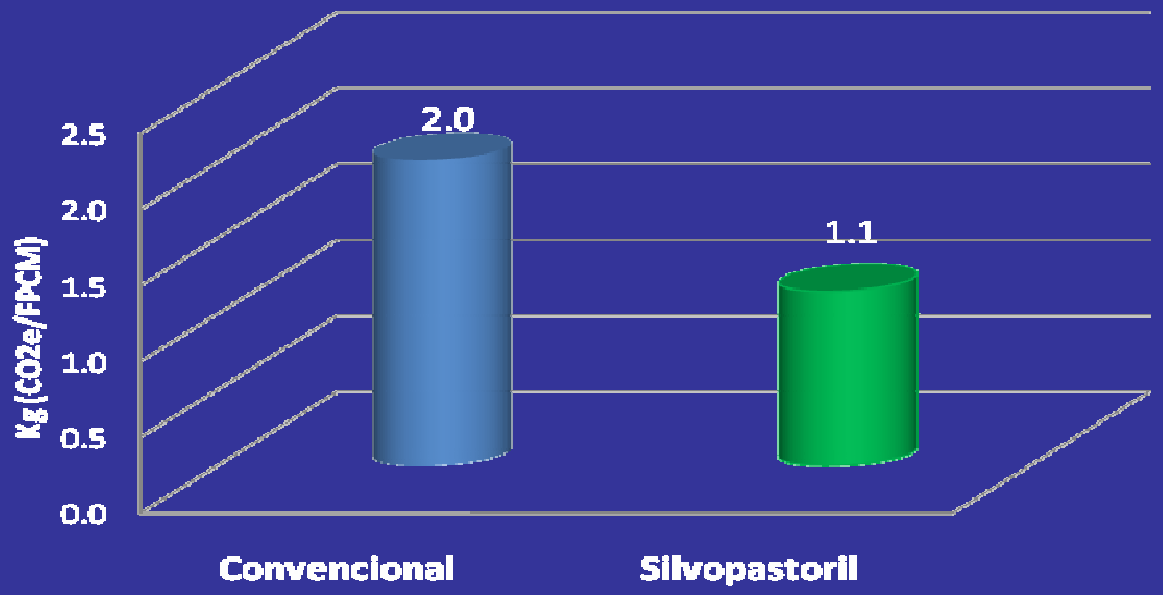
carbon footprint

CO_2 equivalent per kg of milk produced



Nota: FPCM= fat and proteine corrected by milk

Carbon foot print

Well managed pastures and silvopastoral systems results in small footprint leading to carbon neutral products

Payment for environmental services (PES): carbon and biodiversity

Project: **Integrating Grassland and Silvopastoral systems for Ecosystem Management**

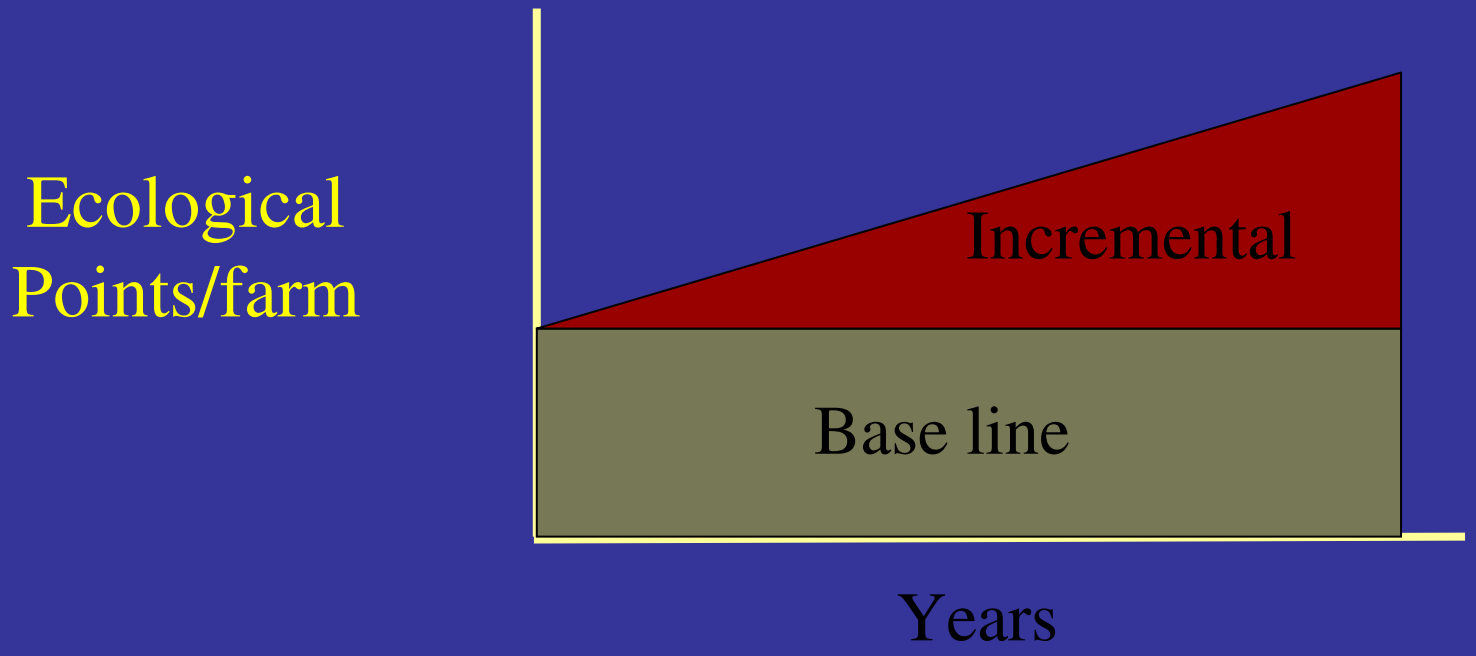
Objectives:

- Determine how livestock farmers make decisions on land use changes to benefit from PES;

- Determine the impacts of PES on C sequestration, biodiversity and water resources;

- Develop methodology for PES

Payment is based on annual increments in relation to base line.



Ecological points/farm as the sum of Carbon Index plus Biodiversity Index

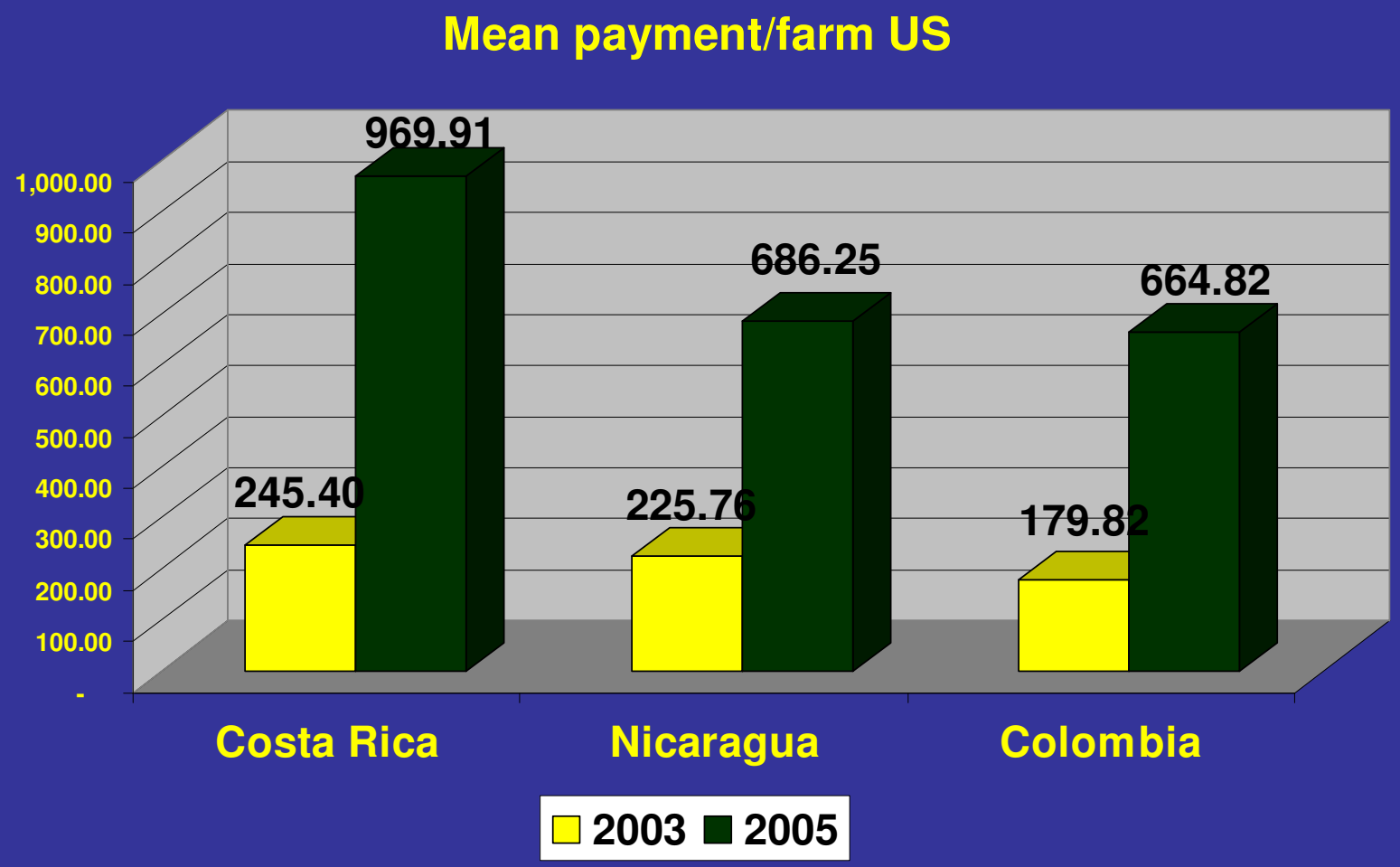
Degraded pastures **0**

Live fences **0,6**

Fodder banks **0,8**

Native pasture high tree density **1**

Riparian forest **1,5**



Payment of environmental services equivalent to 2400 to 4000 litres of milk/farm/yr

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Land use changes from 2003 to 2007 in farms that received PES in Esparza

Degraded pastures reduced from 549ha to 123ha

Improved pastures with tree increased from 186ha to 810ha

Fodder banks increased from 13 ha to 14 ha

Win-win practices

- Improved pasture management
- Improve agro-forestry systems
- Wise fertilizers management

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Payment for Ecosystem Services

Carbon sequestered up by 71%
Livelihood improved (Farm income up by 115%)
Herbicide use down by 60%
Degraded pasture down by 64%
Fodder Bank up by 256%
Reduction of deforestation

Mainstreaming Payment for Environmental Services

In Costa Rica, FONAFIFO which is the institute responsable for payment of environmental services, passed a regulation for compensating farmers for adoption of silvopastoral practices: pays 40 to 50 US/ha/yr

Conclusions

Pastures and SSP systems offer the highest potential for C sequestration in developing countries that have 60% of grazing land

Additional estimations of emissions and sink of GHG from different grassland systems are needed

Financial, technology transfer, and capacity building are required

Better designed support mechanisms and robust methodological approaches

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Thank you for your attention

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