



Joint Research Unit "Integrated approach  
for producing quality food"

# Post-harvest drying, storage and handling/value chain analysis

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# CIRAD expertise on mycotoxins & food safety

## Previous projects on mycotoxin control in food chains

	Food/Mycotoxins	Financing/Period	Geographical area
CIRAD coordination	Groundnut/AF Corn & wheat /AF, FUM, ZEA... Brazil nut/AF	FP6 INCO-DEV (2001-06) FP5 INCO-DEV Mycotox (2003-06) STDF (WTO) Safenut (2006-08)	Sahel Africa (Senegal, Mali) Latin America Brazil, Amazon region
Other projects	Cocoa/OTA Coffee/OTA	Caobisco/ECA/FCC (2000-04) ICO/CFC/FAO (2001-05)	Ivory Coast Ivory Coast, Kenya, Uganda, Asian & Latin American partners

## Current projects on food safety, including mycotoxin aspects

	Project	Financing/Period	Geographical area
CIRAD coordination	AFTER, African traditional foods 3CIvoire, Food safety	FP7 (2010-13) EuropeAid (2011-13)	Senegal, Ghana, Benin, IC, Egypt, Cameroon, Madagascar, South Africa
Other projects	EDES, Food safety	9th EDF (2010-14)	ACP

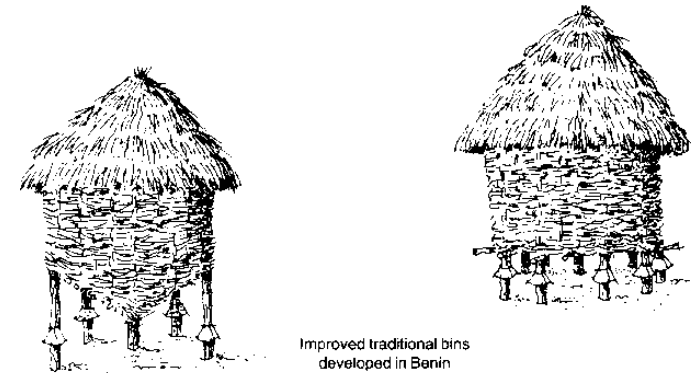
# Post-harvest practices for aflatoxin control (1/4)

<b>Critical factors</b>	<b>Proper drying as quickly as possible</b>
Low moisture content and water activity ( $a_w$ )	<b>Appropriate temperature &amp; time</b>  Products should be dried to a safe moisture content ( $a_w < 0.7$ ) Grains: MC < 14% Groundnuts: MC < 8% Cotton seeds: MC < 10%  Process adjustments where operating limits are violated
Avoid cross-contamination	Cleaning of dryers



# Post-harvest practices for aflatoxin control (2/4)

Critical factors	Proper storage
<p>Low moisture content and <math>a_w</math> to be kept after drying (avoid re-wetting)</p> <p>Temperature</p>	<p><b>Control of humidity, temperature, ventilation</b></p> <p>Appropriate storage facility &amp; packaging</p> <p>Process adjustments where operating limits are violated</p>
<p>Avoid immature, mouldy &amp; damaged products</p>	<p><b>Manual or mechanical sorting/segregation</b>, based on product density, colour, damages, greenish-yellow fluorescence under UV light...</p> <p>Use of antifungal treatments</p>
<p>Avoid pest physical damages</p>	<p>Appropriate packaging</p> <p>General hygiene</p> <p>Pest control</p>
<p>Avoid cross-contamination</p>	<p>Cleaning of stores &amp; packaging</p>



Intact



Mouldy



Insect attack

# Post-harvest practices for aflatoxin control (3/4)

Critical factors	Proper transportation
Low moisture content and $a_w$ to be kept	Control of humidity, temperature, ventilation Appropriate packaging
Avoid mouldy & damaged products	Appropriate food state
Avoid pest physical damages	Appropriate packaging General hygiene Pest control
Avoid cross-contamination	Cleaning of containers... & packaging Containers should be clean, dry and free of insects & fungal growth



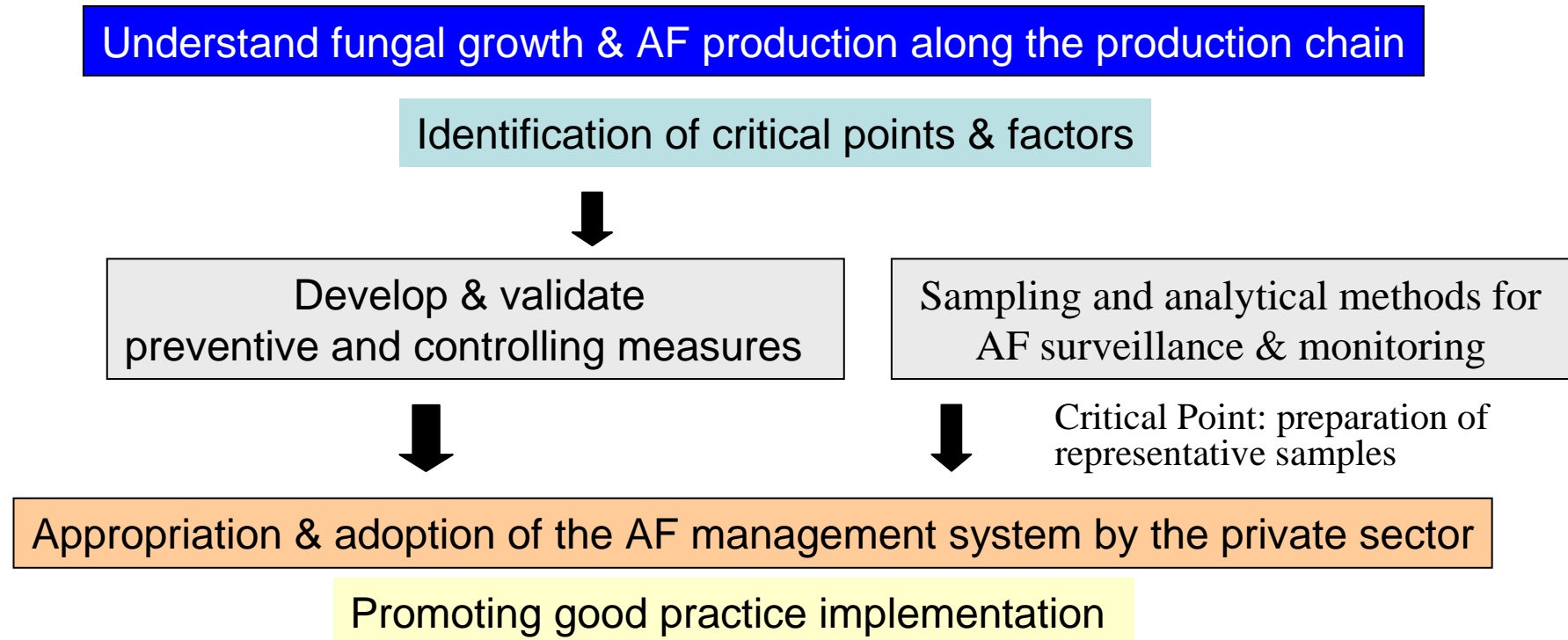
# Post-harvest practices for aflatoxin control (4/4)

## Processing

<b>Physical treatments</b>	<p><b>Heating</b> (autoclaving, groundnut roasting; maize extrusion...) Decreases AF levels, but AF not completely destroyed</p> <p><b>Controlled atmosphere:</b> AF production greatly restricted if O<sub>2</sub>&lt;1% and CO<sub>2</sub> increased</p> <p><b>Milling:</b> Separation of grains into fractions and elimination of the toxic portions (bran and germ in dry milling)</p> <p><b>Pulsed light</b> (UVC-near IR), during 300 μs, up to 5 times/s</p>
<b>Chemical treatments</b>	<p><b>Ozonation</b>, but nutritional value affected</p> <p><b>Application in feedstuff industry:</b></p> <p><b>AF adsorption/binders:</b> calcium alumino-silicates</p> <p><b>AF decomposition</b> (95-98%): Ammoniation</p>
<b>Biological treatments</b>	<p><b>Microbial detoxification</b></p> <p><b>Fermentation, silage</b></p>

## Existing guides of good practices

# Diagnostic: gaps and needs for AF control in Africa (1/2)



- ☞ **Existing knowledge and preventive measures already tested and validated**
- ☞ **Nevertheless, needs to confirm critical points & factors, to adapt to the local context, test and validate technical procedures/equipment**

NB: Biological control: check that other mycotoxins are not produced



## Diagnostic: gaps and needs for AF control in Africa (2/2)

### Applied & participative research actions focusing on:

- **Preventive measures** instead of curative by limiting the risk at each stage from the field to consumption
- **Sustainable measures** : cost-effective & environmentally friendly (use of alternatives to chemicals, renewable energy...)
- **Constraints and strategies for the adoption of an AF management system**  
Evaluation of the cost/benefit of preventive measures, promoting incentives...

**No research without impact on society**

### Contribution to innovation dissemination and education for AF awareness

- **Training in good practices for the private sector**
- **Strengthening laboratory and surveillance capacities**
- **Promoting information and communication (specialized media...) to encourage political support**



# To summarize: proposed strategy for PACA

- **Integrated approach, from farm to fork**

Limit the risks of AF contamination along the food chain as they are at each step

- **Concerted effort of all actors along the food production chain**

Private sector (farmers, industries...), R&D institutes, public and regulatory authorities, NGO, Civil Society Organizations...

☞ Need for adequate social organization & coordination between chain actors

- **Multidisciplinary approach**

By integrating technical and socio-economical aspects to develop a sustainable AF management system

- **In coordination with other projects/activities, as platform for complementary actions**

- FP7 Mycored project (2009-13) : Novel integrated strategies for worldwide mycotoxin reduction in food and feed chains

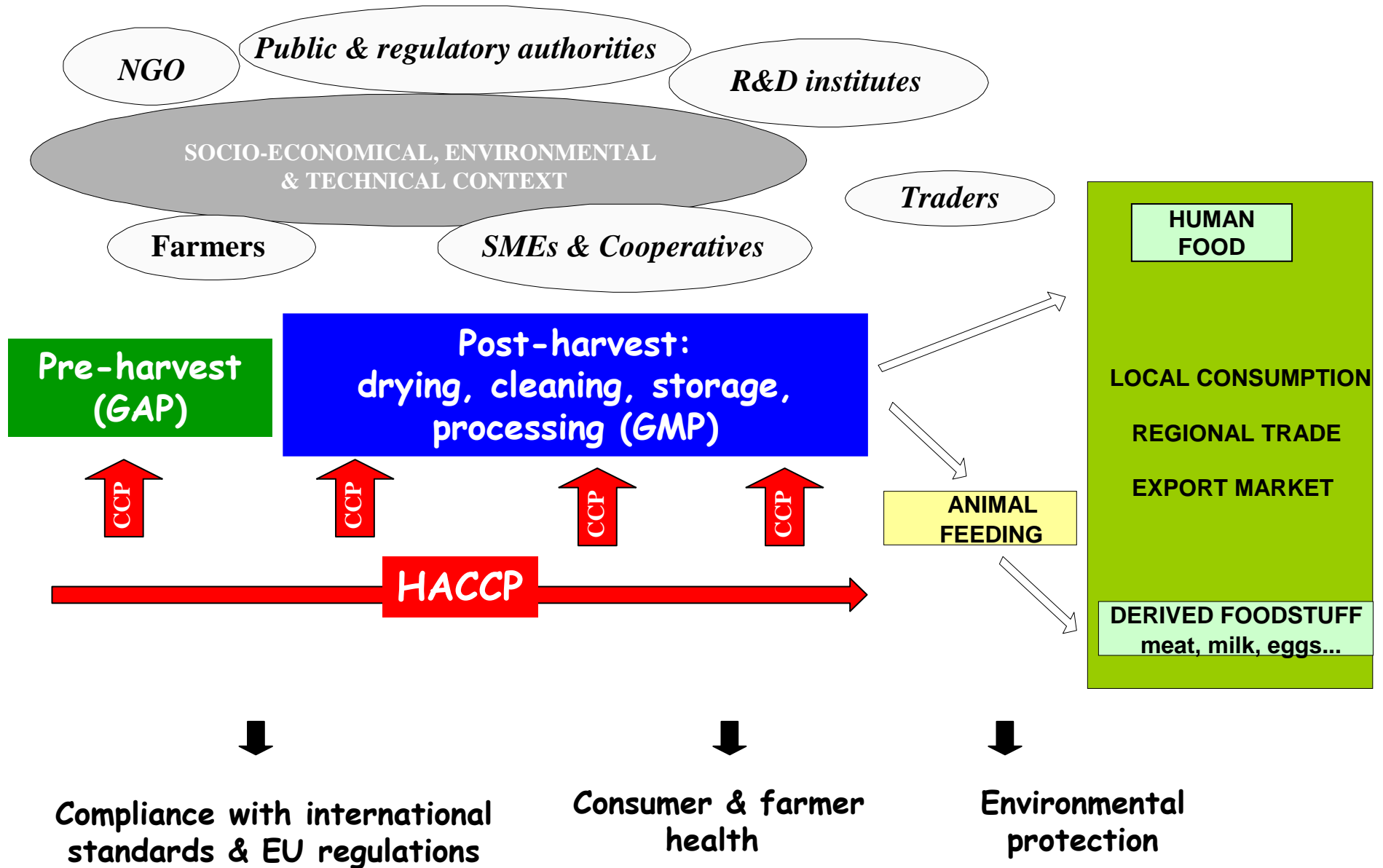
Mycored Africa 2011, 4-6 April, South Africa

- EDES project

- AFTER project

- STDF program...

# Schematic representation of proposed strategy



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**African Union Common Repository**

**<http://archives.au.int>**

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Agriculture and Food Security

Partnership for Aflatoxin Control in Africa (PACA) collection

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2011

# Post Harvest Drying, Storage and Handling/Value Chain analysis

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<http://archives.au.int/handle/123456789/54>

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