

New concepts for sustainable management of cultivated soils through direct seeding mulch based cropping (DMC) systems: the CIRAD experience, partnership and networks

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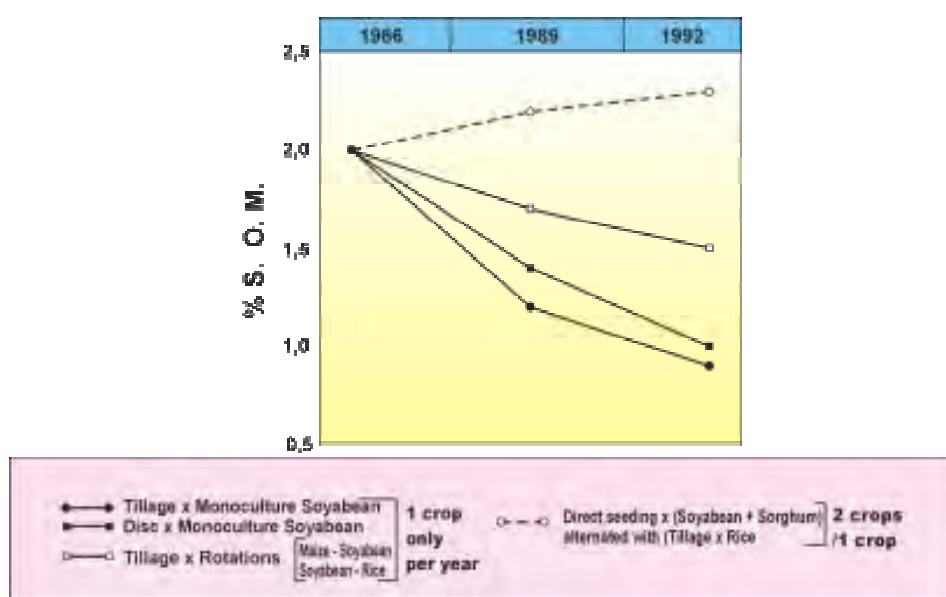
20 years of developing DMC systems for the tropics in Brazil and all around the world



In the humid Tropics, tillage = soil erosion

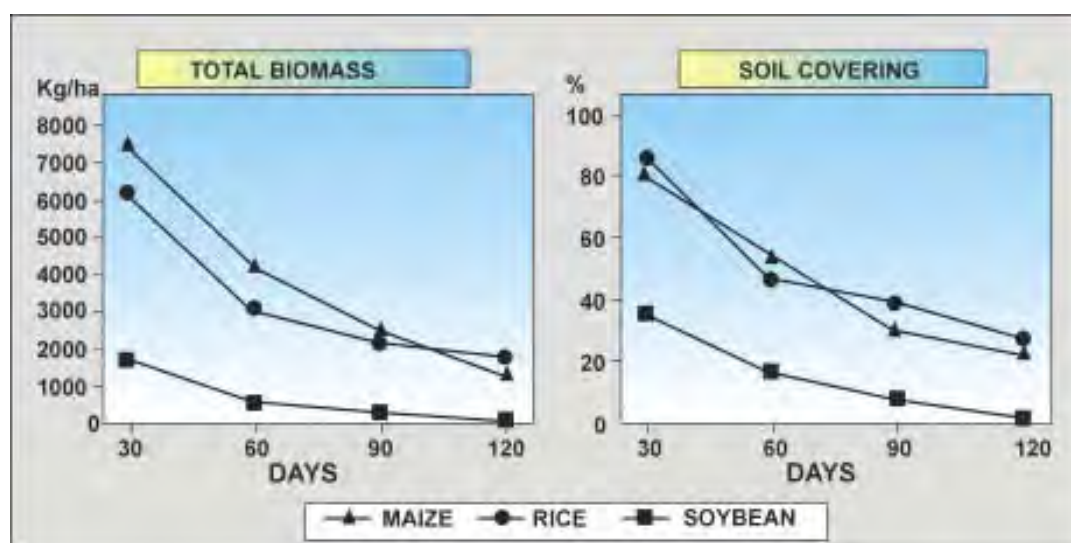


In the humid Tropics, tillage = rapid SOM mineralization



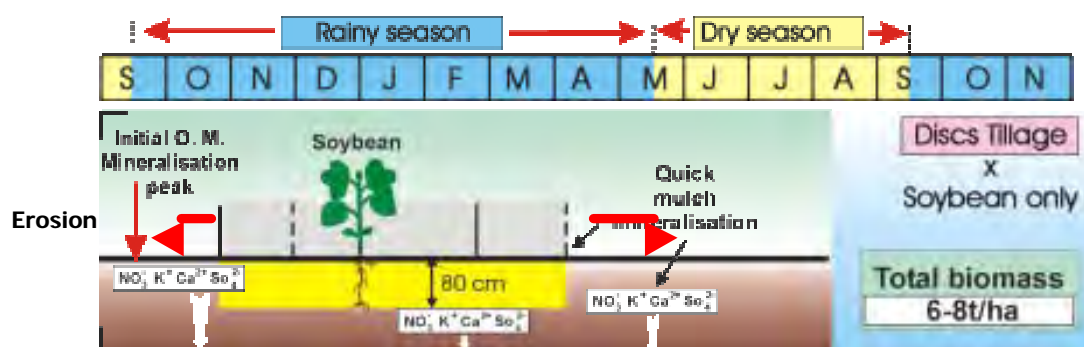
SOURCE: L. Seely & Douglas CIRAD-CAHORS
 M. Minibara Fazenda Progresso Lucas do Rio Verde-MG 1986/87

In the humid Tropics, rapid mineralization of crop residues



SOURCE: L. Seguy & Bouzinac CIRAD CA V Matsubara 1985/89

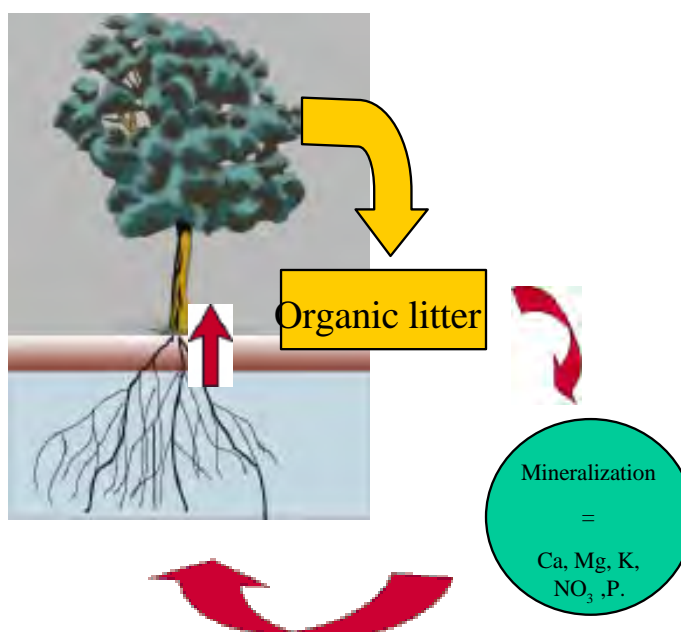
First cropping systems in the Cerrados region (Brazil)



SOURCE: L. Seguy, S. Bouzinac, CIRAD-CA; A. Maronezzi, Agronorte - Sinop/MT - 2001

The tropical forest ecosystem : a model to reproduce

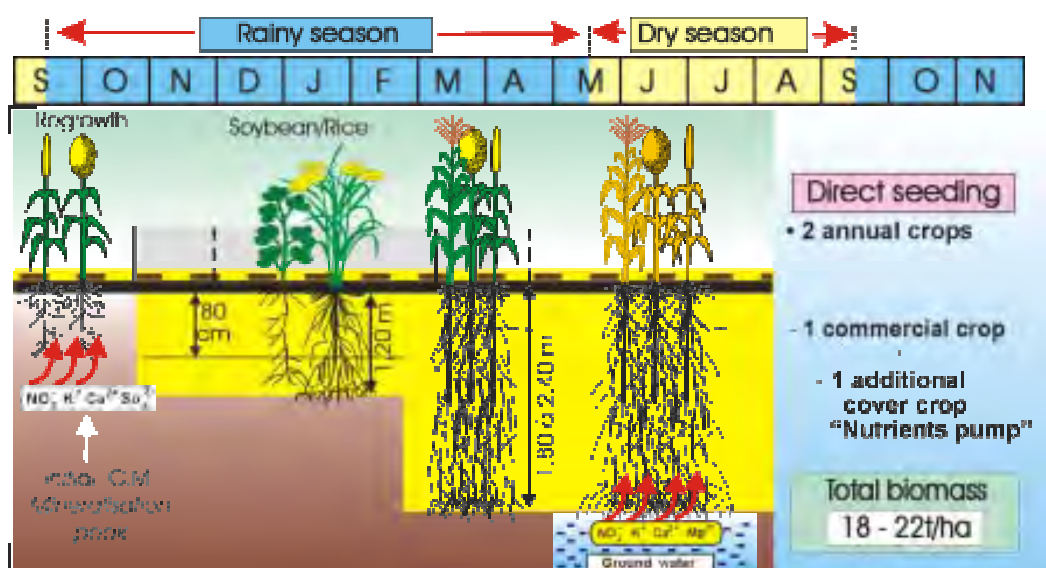
- A protected soil
- Diversified species able to benefit from restricted resources
- A closed system



The first concept:

To introduce new cover crops as “Nutrient pumps”

New DMC systems in the Cerrados region (Brazil)

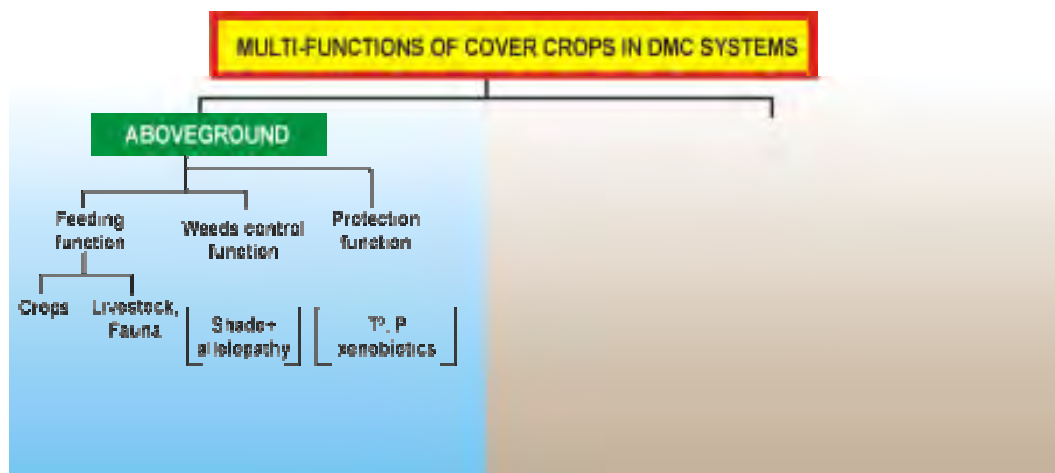


SOURCE: L. Seguy, S. Bouzinac, CIRAD-CA; A. Maronezzi, Agronorte - Sinop/MT - 2001

The second concept:

To increase the “multi-functionnality” of the cover crops

Multi-functionality of the cover-crops

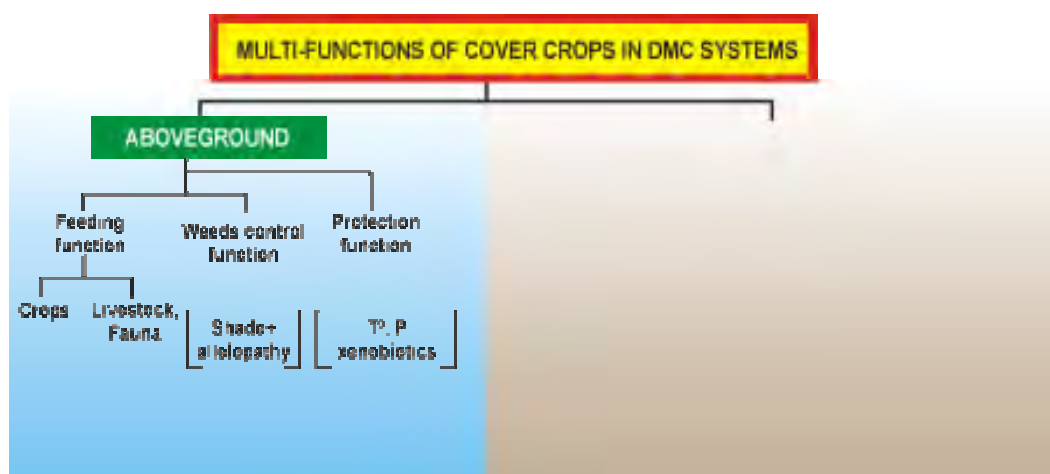


SOURCE: C. BOURG & B. BALANDIER (2003) & J. M. MATHIEU (2004) - CIRAD - FRANCE

Integrating crops and livestock production with DMC



Multi-functionality of the cover-crops

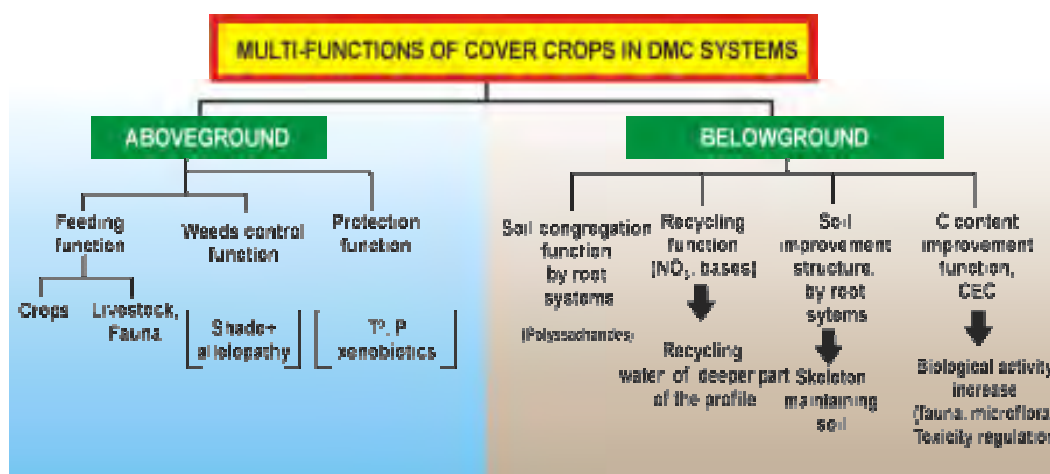


SOURCE: <http://www.cirad.fr> - <http://www.cirad.fr> - <http://www.cirad.fr> - <http://www.cirad.fr> - <http://www.cirad.fr>

Total cover = soil protection and weed control



Multi-functionality of the cover-crops

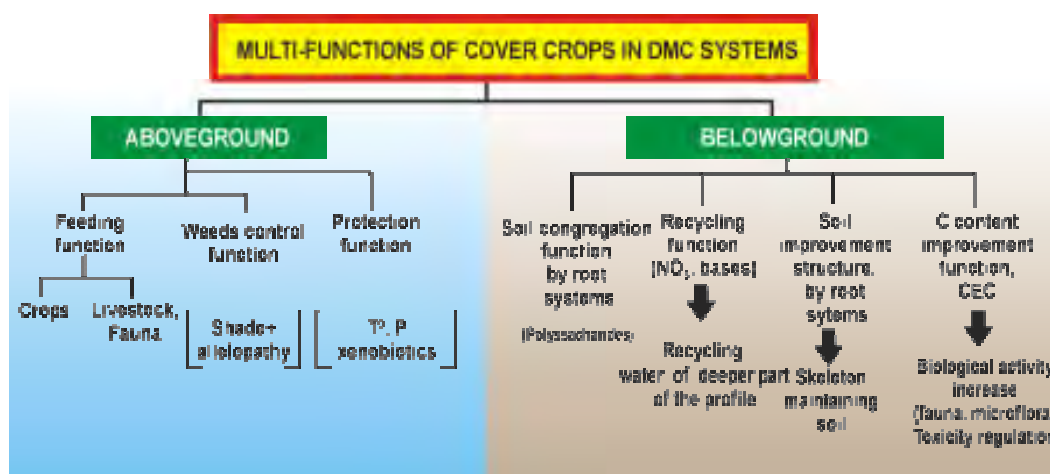


SOURCE: <http://www.cirad.fr> - <http://www.cirad.fr> - <http://www.cirad.fr> - <http://www.cirad.fr>

Strong root system = no compaction and good porosity



Multi-functionality of the cover-crops

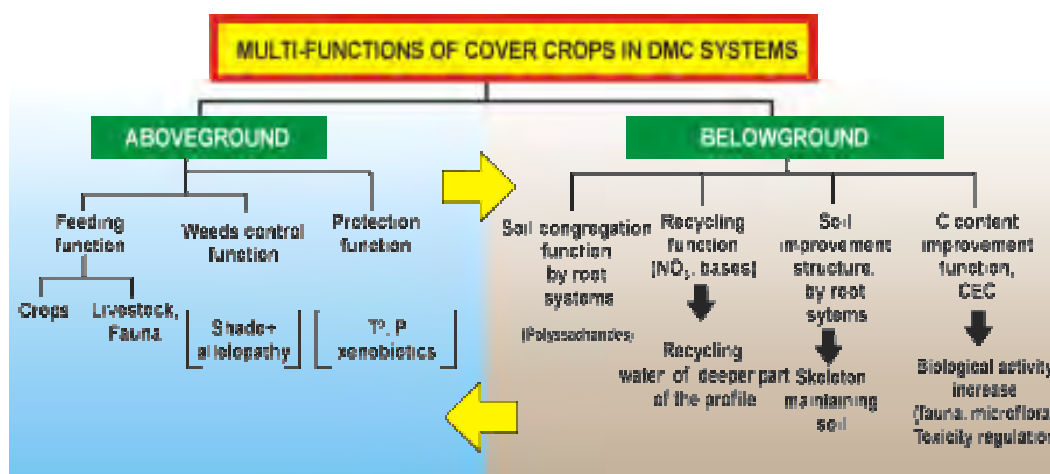


SOURCE: <http://www.cirad.fr> - <http://www.agroecologie.cirad.fr>

Strong fauna activity



Multi-functionality of the cover-crops

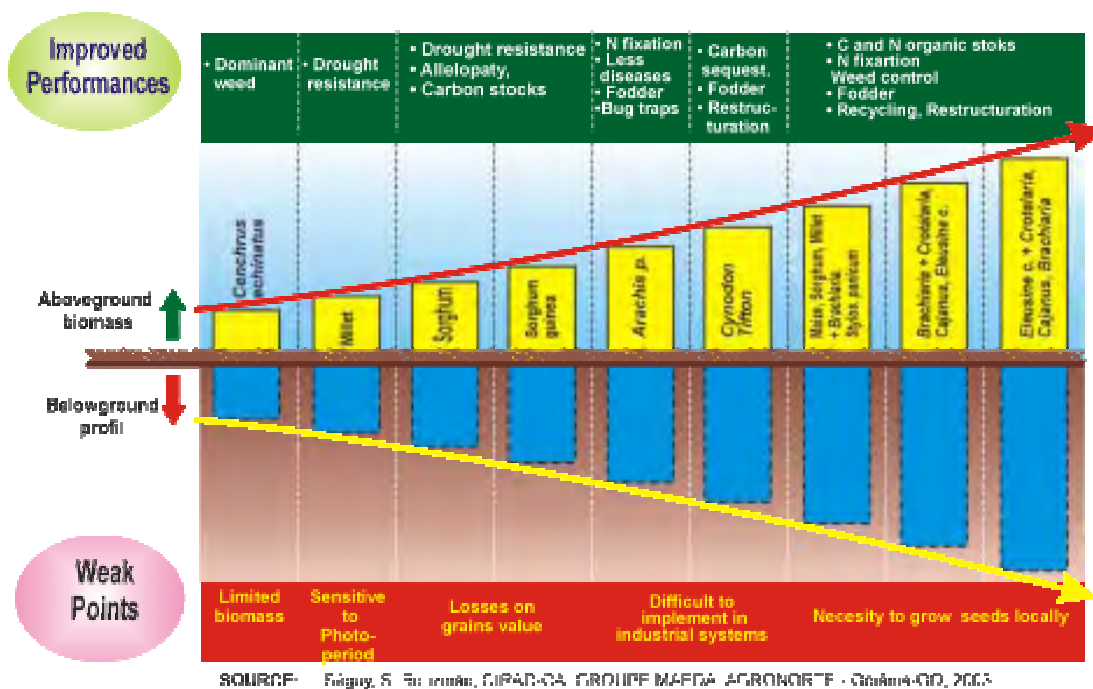


SOURCE: I. Inyang, S. Rattan, J. SAGGAR & D. Mander. *AGRONOMY* 1998, 17, 19-30

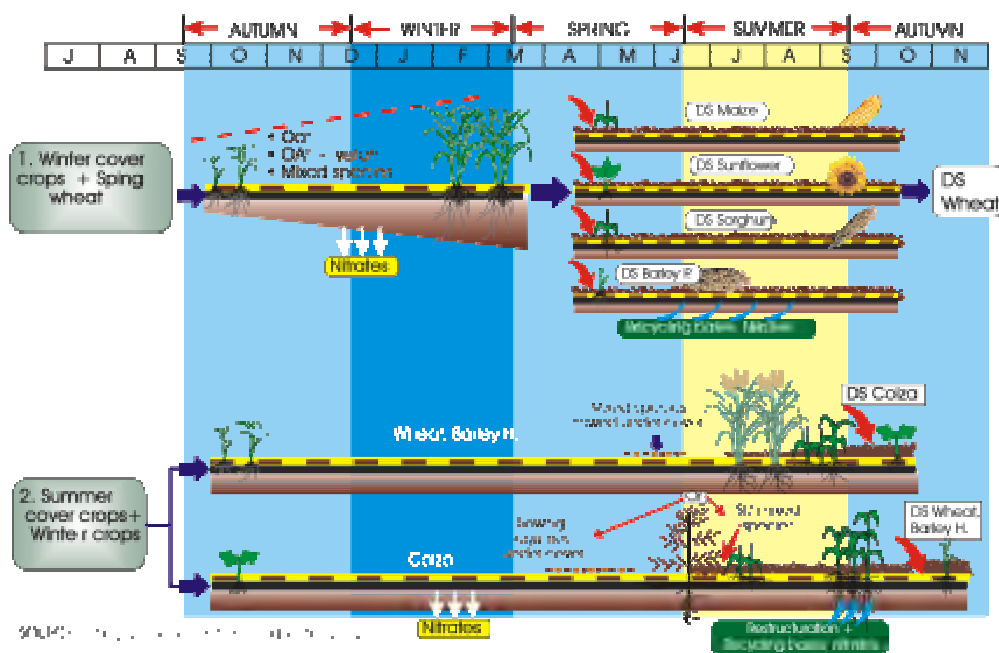
Function efficiency for some cover-crops

	Maize + <i>Brachiaria r.</i>	Sorghum + <i>Brachiaria r.</i>	<i>Eleusine coracana</i>	<i>Eleusine cor.</i> + <i>Cajanus c.</i>	<i>Eleusine cor.</i> + <i>Crotalaria sp.</i>	<i>Brachiaria r.</i> + <i>Cajanus c.</i>
MAIN FUNCTIONS						
• Soil porosity	++	++	+++	+++	+++	+++
• Carbon stocks	++	+++	+++	+++	+++	+++
• Weed control	++	+++	++	+	+	+++
• N fixation	-	-	++	+++	+++	++
• Grains- livestock integration	++	++	++	+++	+	+++
• Biomass production during the dry season	++	++	-	++	-	+++

The gradual improvement of DMC performances



Some DMC systems for temperate climate (France)



CIRAD and networking on DMC systems:

- **The Action Plan for Agroecology**
- **The DMC network**



Action Plan for Agroecology

An integrated approach proposed by French partners : MAE, AFD, FFEM, CIRAD

Action plan for Agroecology

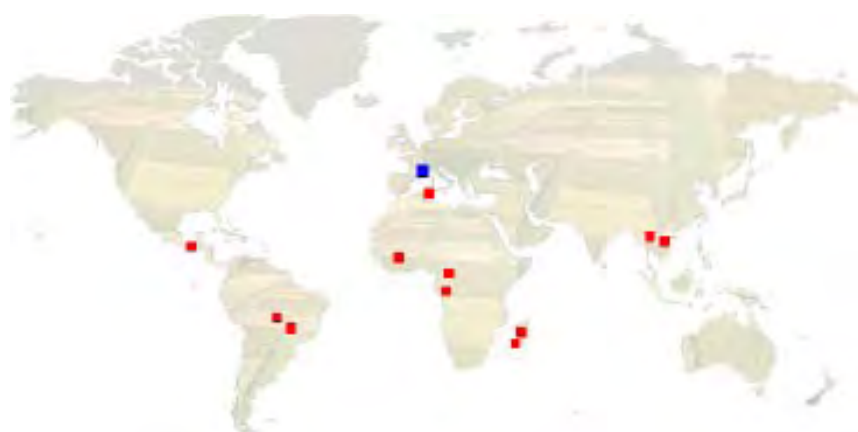
□ Goals:

- ↑ To adapt D.M.C. systems to different ecosystems and countries
- ↑ To enhance their adoption locally by farmers
- ↑ To prove through RxD projects the technical and environmental interest of those techniques in various contexts (C sequestration)

□ Two components :

- ↑ Pilot projects in key ecosystems (Tunisia, Cameroon, Mali, Madagascar, Laos)
- ↑ Transversal Program for Monitoring & Support

CIRAD projects on DMC



15 projects over 10 countries and 4 continents

The DMC Network

A Global Partnership Program under GFAR since 2000

DMC Network

□ Goals:

- ↑ To strengthen the capacity of key stakeholders to develop suitable DMC systems
- ↑ To accelerate their wide adoption
- ↑ To share experiences through a process of learning and synthesis

□ Two tools:

- ↑ Case studies (Bolivia, Tanzania and Ghana)
- ↑ A DMC website



DMC systems: a pertinent tool for sustainable soil management and crop productivity in Tropical environment