Is conventional small-scale cotton-based agriculture sustainable in West and Central Africa?

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Northern Cameroon: A context with constraints…

Climatic and soil fertility constraints

A high demographic pressure with effect on soil utilization.

Population movement from high to low density population regions, with same extensive agricultural practices.

A heterogenous milieu with real need for appropriate adaptation of technical solutions.

Small-scaled farm unit with little adaptation margin (2.6 ha average total area), with little agricultural equipment.

Differentiated farmers and livestock owners communities, with a high pressure on crop residues and generated conflicts.

A strong cotton based cropping systems with cotton depending input supply and extension.

A fluctuating cotton price on the international market.

An increasing input price figure, especially fertilisers.
What is Sustainable Agriculture?

Sustainable agriculture addresses the issue of ensuring sustainable satisfaction of food and other services (monetary revenue) with respect to the three main components of sustainable development (Guyomard 2004), (FAO 1999):

- **Economic sustainability** also called economic efficiency, dealing with the ability of the farming system to ensure sufficient and competitive output production to fulfil market and population needs;

- **Social sustainability** or social equity, dealing with agricultural ability to ensure equitable revenue or return to different stakeholders of the agricultural production chain;

- **Ecological sustainability**, dealing with intergenerational preservation of the environment referring here to the sum of natural resources used to ensure agricultural production.
Economic sustainability
Total production, Total area cultivated and number of farmers of cotton
2000-2008
Average Yield, fertilizer cost, Purchasing price and farmer revenue from cotton.
2000-2008
Social sustainability
Social equity …

1. Even though reinforced through equalizing prices in input supply and purchasing prices of cotton seeds all over the cotton belt

2. Limited by effect of ecological differences on agricultural performances

2. Limited by effects of input availability to farmer

2. Limited by traditional organic matter management among community stakeholders
Ecological sustainability
Soil fertility degradation due to...

Erosion due to unappropriate soil management practices

Unappropriated management of soil organic matter and soil nutrients balance
Opportunities with DMC
Increasing economic efficiency…

With increasing average yields

Decreasing fertiliser application need over time

Decreasing labour constraint especially weeding constraints

Enhancing agro-climatic conditions for diversification
Reducing social differences in agricultural returns

1. Enhancing yield in low fertility soils with minimum fertiliser application

   Increasing yield over time with minimum fertiliser application 50 % of fertiliser recommended level

   Decreasing yield differences between high and low fertiliser plots

2. Decreasing climatic constraints effects on agricultural yields

   Climatic stabilised yields over time

3. Introducing crop residues management issues between farmers and livestock owners
Average yield evolution in cotton on station results, Zouana (750 mm rainfall average)
2002-2007
Low fertiliser application

Plots 2, 3, 4, 5

- SD
- Labour
- SCV

- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
… enhancing ecological sustainability by:

1. Reducing soil erosion
   
   Protecting soil against splash-effect…

   and hence increasing its productivity

2. Increasing soil organic matter content

3. Increasing global ecological diversity in cropping systems → macrofauna and plant diversity and complementarities
Conclusion and perspectives

Small-scaled, cotton based agriculture, progressively fails to fulfill sustainable development, mainly due to economic and technical constraints.

DMC appears to be more suitable to fulfil the three main components of sustainable development in relation with agriculture.

Shifting from conventional agriculture is necessary and must be accompanied by both scientific and institutional community.

Especially within small-scale agriculture with little alternatives.
Merci pour votre attention