

## OPPORTUNITIES AND CONSTRAINTS FOR CONSERVATION AGRICULTURE IN AFRICA

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Considerable efforts have been made in Africa to try to arrest the tendency towards soil degradation, loss of fertility and frequently declining yields. These have focused on better ways to conserve soil moisture, to prevent soil loss, to improve soil fertility and to introduce suitable cover crops. Techniques such as in-field water harvesting, soil conservation infrastructures and reduced soil tillage, have all been introduced to varying degrees and all are widely practised in some regions. It is also common for several different techniques to be used together, indeed water harvesting and reduced tillage are often used together in what is generally referred to as conservation tillage (Biamah *et al.*, 2000).

Zero tillage or direct planting is also widely practised, for instance in the Sahel, where as soon as sufficient rain arrives, many farmers merely dig a small hole with their hoe and drop in the seed, the land not having previously been ploughed. There has been considerable research into zero tillage and one of the first “No Till Clubs” was formed by a group of commercial farmers in KwaZulu-Natal in the 1970s (Fowler, 2002). Cover crops have also been the subject of research for many years, as have more suitable crop rotations and the integration of crop and livestock production.

FAO believes that conservation agriculture could make a major contribution to food security on the continent, in a similar manner to the success that is now being achieved in other parts of the world. There is of course nothing new about any of the three principles upon which CA is based: minimal soil disturbance and direct planting, maintenance of a permanent soil cover and a judicious choice of crops rotations. But what is new is ensuring that all these three principles are applied at the same time. A number of international workshops have been held in recent years in Africa and pilot projects to promote CA are now starting in several countries. The most recent workshop was held at Jinja, Uganda in May 2002 and amongst other events, a range of CA equipment was exhibited, suitable for use by hand, with draft animals and with tractors (Fig.1).



*Fig.1 Demonstration of a Brazilian-made ride-on animal drawn sprayer in Uganda*



*Fig. 2 The first animal-drawn knife roller to be fabricated in Swaziland*

Work is also commencing in Swaziland and already, 24 indigenous legume species have been identified in the Lubombo mountain region and are being studied for their potential to be used as cover crops. The first animal drawn knife roller to be constructed in the country was demonstrated last July (Fig.2) and it is planned to introduce CA on pilot plots over the coming months. Other CA equipment has also been fabricated in Ghana (Fig.3) and Uganda. Projects to create awareness of CA are commencing in Eritrea and Uganda, whilst additional projects are likely to commence within a few

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months in Kenya, South Africa, Mozambique and Tanzania. Requests for assistance have also been received from Lesotho, Ghana and Guinea Conakry.



*Fig.3 Hand jab-planters fabricated in Ghana*

### **Overcoming major constraints**

to sustainable agriculture is the primary task for the introduction of CA. Fortunately, CA can provide answers to many of the immediate problems facing African farmers, as well as improving living conditions and relieving drudgery in the rural areas.

#### *Declining soil fertility*

is common in many parts of Africa, often on a dramatic scale. Large areas are already seriously degraded and heavily eroded. One of the major contributing factors to soil degradation in tropical climates is soil tillage, which leaves the soil exposed and causes mineralization of the organic matter. In consequence, the soil loses structure, compacts and erodes and valuable soil nutrients are lost in the process. No-till agriculture seems to be the only way to stop the degradation process in tropical climates.

#### *Drought, unreliable rainfall and water deficiencies*

are common and increasingly serious problems in many parts of the world, including in Sub Saharan Africa. But with exception of the truly arid climates, the water deficit is often relative and not absolute and so maximising the use of available water is of paramount importance. Conservation Agriculture builds up the soil structure and its content of organic matter, improving water infiltration and reducing surface runoff. CA practices avoid mechanical tillage and the soil is permanently covered with crops and/or residues which retain moisture, so enabling planting to be done earlier. The crops can also better tolerate periods of drought due to this increased water holding capacity of the soil. The mulch cover over the soil reduces moisture losses due to evaporation and avoids wide soil temperature variations, which in tropical regions can be so detrimental to crop development.

#### *Labour shortages and the AIDS pandemic*

are seriously affecting the availability of farm labour in Africa. In many countries, the rural population is steadily being reduced through migration to urban centres. This particularly concerns the younger male population, meaning that those with the best potential for heavy physical work are no longer working on the land (Mrema, 1996). The situation is being aggravated by the HIV/AIDS pandemic that is so tragically striking many parts of the African continent. As a result, many African households are now headed by women who are coming under tremendous pressure as not only must they care for the household and family, but at the same time they must now run all the farm operations. Farming methods that can reduce human labour requirements and the drudgery of heavy farm work are becoming essential. Conservation Agriculture can offer an answer to this problem.

Covered distances (km) by man (m/f) for the cultivation of one hectare of maize, using animal traction under conservation agriculture and conventional tillage (Melo, 2000).		
Operation	Conservation agriculture	Conventional tillage
Ploughing	-	40
Harrowing	-	15
Furrowing	-	10
Planting	5	5
Fertilization	10	10
Knife roller	7.5	-
Weeding	-	30
Nitrogen application	10	10
Bending over of the cobs	10	10
Harvest	15	15
Total distance (km)	57.5	145

### Which are the issues influencing the adoption of CA in Africa?

#### *Awareness of the problem*

by a critical mass of stakeholders is a major precondition for change, particularly if the solution requires dramatic changes in traditional behaviour or practices. The perceived problem must be serious enough to provide the pressure and incentive for the change.

#### *Lack of knowledge*

regarding alternative farming systems, appropriate implements and affordable inputs such as cover crop seeds and chemicals is often seen as a major constraint for the development of CA in Africa. However, there is a wealth of such knowledge already available, for example in Latin America where CA has been successfully adopted and this creates an ideal opportunity for the development of South-South exchanges with Africa. The context might be rather different but the basic principles of CA are universal. Moreover, in some areas such as in Zimbabwe, Tanzania and Zambia, they have already been proven to work.



*Fig.3 A Maasai farmer group in Kilimanjaro Region, Tanzania, using a direct seeder from Brazil*

### *A permanent soil cover*

is an essential aspect of a sustainable CA system but the availability of sufficient biomass both in quantity and throughout the year can create a problem in Africa for a variety of reasons. Firstly, the decomposition rate of biomass in the humid tropics is very fast and secondly, overall rainfall may constitute a further constraint for biomass production. But CA can lead to yield increases and with this, the quantity of crop residues and so the same amount of residues will still be available for alternative purposes, while the additional quantity can be retained as soil cover (Mrabet, 2002).

The need for a permanent soil cover can compete with traditional arrangements such as communal grazing of farmer's fields after harvest. Solutions to this problem have to be found through involving all the stakeholders. But uncontrolled grazing should in any case be avoided if animal nutrition is to be improved. The annual seasonal feed demands of the livestock must be integrated into the design and planning of CA rotations so as to ensure adequate supplies. Specific measures that can be adopted include controlled grazing, zero grazing, improved pastures, forage conservation, improvement of the cut-and-carry system, etc. (Mueller et al., 2001).

The integration of livestock into CA systems is very important in Africa, particularly when livestock constitutes a major component of the local economy. For CA to be successfully adopted in such a context, crop rotations and cover crops must allow production of enough residues for soil cover, livestock feeding and other purposes. To help achieve this objective, shrubs or trees can also be included in the production system, intercropped or planted as fences. Leguminous and forage cover crops can be included in the rotations to improve livestock nutrition, and plant selection must take into account residue production as well as grain production.

### *Land tenure*

is a critical issue influencing the adoption of CA as stakeholder commitment to land management is more likely to improve if there is clarity concerning land titles and property rights. People generally tend to take far better care of their own property, rather than rented or common land and so tenure rights constitute an important factor influencing investment in the land.

### *Organization of stakeholders*

in order to improve public commitment is another important factor for the introduction of CA in Africa. Use should be made of existing groups such as Farmer Field Schools (FFS) and exchanges between farmers should be promoted through publicity campaigns and study tours. There are many examples of where the development of farmers' groups and movements have stimulated and supported the members to face the change needed to adopt CA.

## **CA - a major opportunity for agriculture and rural development in Africa**

CA offers answers to many different problems facing agriculture and rural development in Africa. One major opportunity for CA is the time saving and reduced drudgery of the field activities, of particular importance given the "feminisation of agriculture" that has been observed since the 1990s. The combined effect of massive male migration towards the urban areas and the development of HIV/AIDS is leaving the women to have to provide over 70 percent of the labour input needed for food crop production, in addition to their responsibilities to the family and household (Benites et al., 2000). Land preparation and weeding are the most serious labour bottlenecks and often prevent timely interventions and the possibility to extend the production area. But CA offers the opportunity to significantly reduce the workload on these women and so to contribute towards the general economic development of rural communities.

Another opportunity for CA is through better mitigation of drought and adverse climatic situations, so contributing to improved food security. It has already been shown that the principles of CA are applicable in many different parts of Africa, ranging from the humid tropics to the arid areas. The major challenge for the wide-scale introduction of CA depends more on the human factor and the willingness to change habits and cultural traditions. It is to be hoped as major efforts are made to

introduce CA to other parts of Africa and as the benefits become apparent, there will be ever increasing support for its adoption.

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