
CONSERVATION AGRICULTURE IN AFRICA: CHALLENGES AND LESSONS LEARNED

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ABSTRACT

By 2050, the African continent will have a population above one billion. Agricultural production and access to food in a sustainable environment will represent one of the major challenges. The current dominant agricultural practices cannot meet this forthcoming challenges. Therefore new set of technological options are needed to ensure appropriate management of the interfaces agriculture/forestry, agriculture/climate and agriculture/human activities as well as provision of enough food to feed Africa.

Conservation agriculture as a combination of at least three techniques (no-till, direct planting and permanent soil cover) has progressively proven to be viable tool for increasing agricultural production while ensuring nature functioning and ecosystems various services. From small to larger scales there are been a number of pilot sites which yield beyond 50% increase of crops, protected the soil, levered biodiversity and contributed to water quality maintenance.

One of the largest success story is taking place in Zambia where conservation agriculture is part of extension services promoted systems provided to more than 250,000 small scale farmers.

The paper addresses the challenges of scaling up conservation agriculture on the basis of results obtained on the ground: strong policy decision, review of extension services curricula, sufficient credit for equipment, and appropriate mechanisms for access to inputs notably fertilizers.

Such investment is essential to ground conservation agriculture in its diversity of practices at larger scale for the benefit of modernized as well as small scale farmers' agriculture as a driver for the motto "*Africa can feed itself*".

KEYWORDS

Conservation, yields, upscaling, policy, Africa

Conservation Agriculture in Africa: Challenges and lessons learned

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What is Conservation Agriculture ?

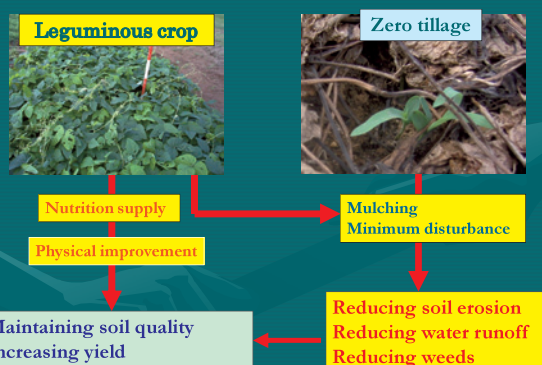
“Concept for resource-saving agricultural crop production that strives to achieve acceptable profits together with high and sustained production levels while concurrently conserving the environment” (FAO 2007).

Three key principles

- *Permanent Organic Soil Cover*
- *Crop rotation /intercropping*
- *Minimum tillage /Minimum soil disturbance*

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Expected effects of Conservation agriculture



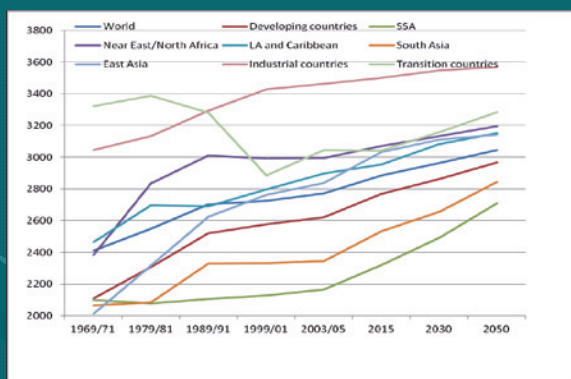
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Introduction

- By 2050, Africa's population will double to around 2 billions
- SSA : number of undernourished people has increase from 175 millions to 239 millions (FAO, 2012)
- Big gap between import and export of agricultural goods

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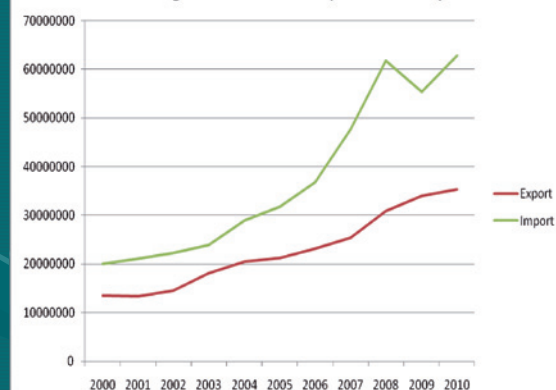
Apparent food availability per capita (FAO, 2012)



➤ Number of hungry people
from 175 to 239 million in 2012

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Total agricultural trade in Africa (value x 1000 USD)

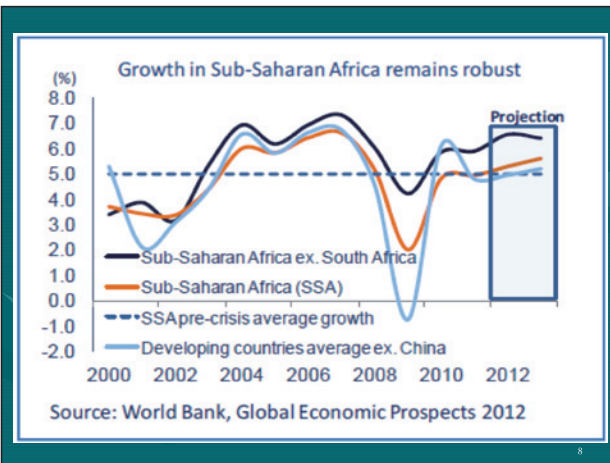


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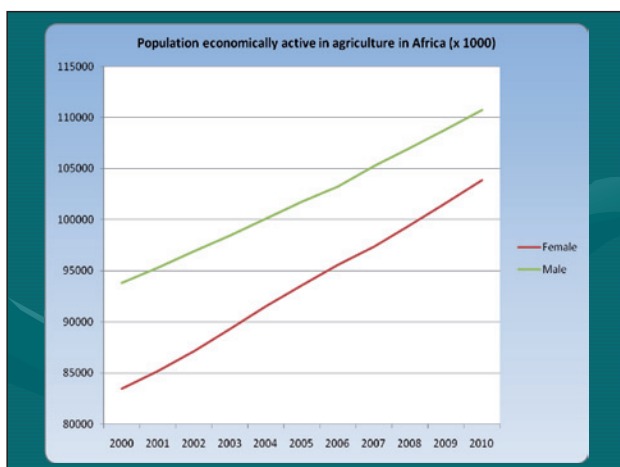
Introduction

- Increasing growth above 5%
- Gap between men and women economical power in agricultural sector

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Conservation Agriculture in Africa

- A tool to produce more for wealth
- A technology for modernization of agriculture
- An option to reduce women labor and to empower their economy

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Diversity of CA practices in Africa

- 1. CA *sensus stricto* with the three principles mostly in agricultural trials and the Sahel – millet and sorghum systems, commercial farms in South Africa and Kenya
- 2. Conservation Farming with use of seed basins: e.g. Lesotho and Zambia with maize cropping systems

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Diversity of CA practices

- 3. Conservation agriculture with trees (*Acacia albida*) e.g. Zambia with maize cropping systems
- 4. Conservation agriculture under forests for banana plantain production. Congo basin - Gabon

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CA components - Not new to African Agriculture

AA. Commonly used separately or combined

- *Permanent Soil Cover: Beans*
- *Crop rotation /intercropping*
- *Minimum tillage /Minimum soil disturbance: stick*

BB. Add value in combining the three components

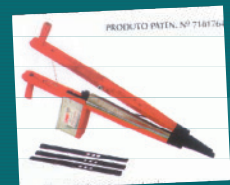
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Major Challenges

- Crops residues management with conflictual uses for livestock
- No tillage and direct seeding versus cultural norms
- Low purchasing power and needs for inputs
- Weeds management and pest control

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From tillage to direct seeding and ripping



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Prerequisite for up scaling

AA. Flexibility with identification of appropriate entry point

BB. Step based approach

CC. Building on existing experiences and knowledge

Factors to consider:

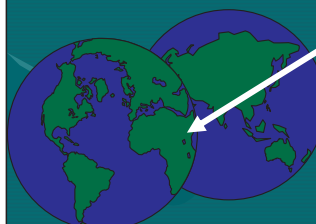
- *Agro ecological zones*
- *Type of crops and types of soils*
- *Existing knowledge and cultures*
- *With or without trees*

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From local ...



to global



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Leverage factors for up scaling

- Strong policy support , willing and commitment : case of Zambia and Lesotho
- Embedded in educational curricula
- Availability of initial investments and locally made equipment (South Africa and Kenya)
- Benefits and access to market

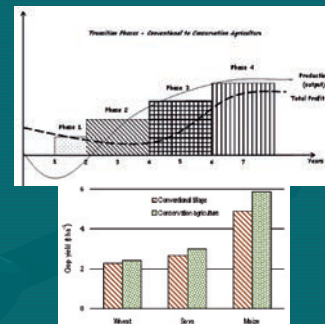
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Benefits from CA

- *Economical benefits*
(FAO, 2004)

- *Agronomical benefits*
(ex of Brazil)

- *Environmental and social benefits*



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CA/No-Till geographical coverage in Africa

More than 1/3 of countries

Zambia, Lesotho, Kenya, Mozambique, Swaziland, Guinea, Burkina Faso, Mali, Ghana, Cote d' Ivoire, Rwanda, South Africa, Tunisia, Morocco, Sao Tome et Principe etc. . .

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Lessons learned / Lesotho

- Women cooperatives supported through FAO project
- Adoption of *Matraca* technique easier for women than men
- Increase of yield two to three folds
- Innovation with wide spread of seeds basins technique for better moisture and water management
- Strong policy will built through Ministers and Members of Parliament

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Example of Zambia

- Conservation farming promotion through Farmers Organization and Federations
- More than 300 000 farmers applying CA techniques ; target of more than a million
- Inclusion of CA in curricula of extension services
- Strong political will
- Capacity building and training
- Strong alignment of donors and partners to support CA

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Example of Gabon

- Promotion of CA through Women cooperatives by FAO
- Part of new model of agriculture for the Congo basin
- Excellent weed and pest control under forest environment
- Conservation agriculture and forest ecosystems
- Yield increase as a stimulant for CA adoption

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Examples of Ghana, Cote d'Ivoire Rwanda and Sao Tome et Principe

- Conservation agriculture under cocoa and coffee plantations
- Small, medium and large scale plantations for cash crops
- Preservation of forests ecosystems functions
- Value chain approach with support for inputs, equipment and pesticides
- Strong political commitment

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South Africa and Kenya

- Part of modernized agriculture
- Commercial farming at large scale
- Local Manufacturers of CA equipment
- Promotion to small holders through support to ripping and use of CA equipment (out growers system)
- Partnership and training with support from Australia

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Conclusion

- Promising CA development throughout the Continent
- Present in diverse cropping systems
- Context specific and flexibility to increase rate of adoption
- Strong political commitment, investments and capacity building are keys
- CA a leverage tool for Africa to feed itself and boost agricultural trade and exports

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Thank you



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Chairman Dr. Ryoichi Matsunaga: I am Ryoichi Matsunaga, Director of Tropical Agriculture Research Front, the sole substation of JIRCAS. I will chair this session.

Before starting this session I would like to announce that the first speaker, Dr. Thiombiano, representative of FAO Office for Central Africa has not appeared on this stage. He is now in Ghana to attend a very important meeting. That meeting should have finished earlier, but it is still going on later than planned. That is why Dr. Nagumo, in place of Dr. Thiombiano, will present his subject. Please allow this change, due to his unforeseen schedule.

Before starting this session I would like to remind the speakers that you have 20 minutes for your presentation. Before ending this session, we will have 20 minutes of general discussion. We will have some questions and comments for the speakers in general discussion.

The first presentation is by Dr. Nagumo. He is a project leader of one of the JIRCAS research collaborative projects that is aiming at technology development for sustainable agriculture production in the African savannah. He is very familiar with conservation agriculture in West Africa, and he has long experience to work with Dr. Thiombiano, that is why the organizing committee has appointed him as speaker in place of Dr. Thiombiano. Please start, Dr. Nagumo.

Dr. Fujio Nagumo: Thank you, Chairman. Good morning, ladies and gentlemen. I will present his presentation on behalf of Dr. Thiombiano.

Before starting, I would like to explain what conservation agriculture is, because this phrase is not familiar at all in Japan. According to FAO definition it is the concept of resource-saving agricultural crop production that strives to achieve acceptable profits, together with high and sustained production levels, while concurrently conserving the environment. It has three key principles: permanent organic soil cover, such as crop residue, crop rotation or inter-cropping; minimum tillage or minimum soil disturbance. The combination of these three is most important in conservation agriculture techniques. From conservation agriculture, the expected effects are because of soil mulching with minimum soil disturbance, reducing soil erosion, reducing water runoff, and also reducing weeds. Finally, we expect maintaining or improving soil quality, then increasing yield sustainably. This is the concept of conservation agriculture.

Conservation agriculture originated from the success of non-tillage planting in the United States in the 1950s, then it non-tillage farming was expanded to other countries, especially to South American countries. Based on these successes FAO promoted Conservation agriculture worldwide, particularly in Africa.

What is the actual situation on conservation agriculture promotion in African countries? This is what we have requested from Dr. Thiombiano. So I will begin now.

By 2050, Africa's population will double to around 2 billion. In south-Saharan Africa the number of undernourished people has increased from 175 million to 239 million. There is a big gap between import and export of agricultural goods while the continent has huge potential for agricultural production. Some of the facts to consider are the: (i) increasing economical growth above 5% for the past and forthcoming years; (ii) the gap between men's and women's economical power in the agricultural sector. This consequently good background to introduced improved modernized agricultural practices for increased and less labor agricultural production.

Conservation agriculture is considered as a tool to produce more and sustainably while ensuring soil wealth. It gives the opportunity through the use of Jab planters or Matraca to reduce labor by women and to empower their economy.

With reference to the three principles of conservation agriculture—there is a lot of diversity in its practices at various scales in African countries: (i) in the Sahel, with millets and sorghum based systems including crop covers and intercropping are common; (ii) in countries such as South Africa and Kenya, the use of conservation agriculture in commercial farms is increasing; (iii) conservation farming with the use of seed basins in Lesotho and Zambia with maize cropping systems is another example. The hole is about 20 cm wide and 15 to 20 cm deep, with input of organic matter before planting. Such system is also considered to be a kind of conservation agriculture; (iv) Conservation agriculture with trees such as *Acacia Albida*, with maize cropping systems in Zambia; (v) Conservation agriculture under forests with banana plantain production. This is a case in the Congo basin particularly in Gabon. In this case, conservation agriculture combines with trees or forests, leading to the promotion of agro-forestry in predominant forest ecosystem areas.

We have talked about the three principles of conservation agriculture components. But it is not very new to African agriculture. Commonly used separately or combined are: permanent soil cover, sometimes it is covered by bean vegetation; crop rotation or intercropping is also very common in African countries; and minimum tillage/minimum soil disturbance using a stick, as sometimes it could be seen in traditional systems to make a hole for planting. This practice was largely used, before the ploughing system was promoted during colonial times. There is an add value in combining the three components. Before, these were separately used but now through a combination of the three principles more and more benefits may be obtained.

As ideal cropping system it seems there are still many major challenges for its wide adoption and scaling up: (i) One of the challenges is crops residue management with conflicting uses for livestock. As you may know, crop residue is a very important resource for farmers and it is used for livestock for feeding and for fuel and for house construction materials and also for making hedges; (ii) Another one is no tillage and direct seeding versus cultural norms; (iii) Sometimes it is said that a disadvantage of conservation agriculture is the problem of weeding. If the plant residue covers enough of the soil surface weeds do not come out so much, but if it is not so much then the weed problem is most important. In those cases we are obliged to use a weed site. In that case, if there is a problem then farmers can access weedicide. Weeds management and pest control are important challenges.

Next, from tillage to direct seeding and ripping. The left-hand picture is conventional; even in African countries tractors have been used and there is a lot of land disturbance due to ploughing. Instead of that, Conservation agriculture is promoting animal traction for making furrows or directs planting, ripping through mechanization.

Now, prerequisites for up scaling. He insists on the importance of flexibility with identification of appropriate entry point. Second it is essential to adopt a step based approach. Third, building on existing experiences and knowledge. Among the three principles of conservation agriculture, doing it at once is sometimes very difficult according to the actual situation. So step-by-step, for example we start with the intercropping and then we add the non-tillage farming. They call it a step-based approach. Among them, the factors to be considered are: Agro-ecological zones, types of crops and types of soils, existing knowledge and cultural values, and farming systems with or without trees. Trees are highly effective; in case of mechanization also it must be considered in the near future.

Because of the diversity of African contexts, there is such diversity in the conservation agriculture system practices in African countries; but this is not only in African countries but also in other countries, the concept can be adjusted to local conditions.

Then, leveraged factors for upscaling. He insists that strong policy support, willing and commitment is most important. This is the case of Zambia and Lesotho, which will be shown later. Then, embedded in educational curricula. Then, availability of initial investments and locally made equipment, which is the case for South Africa and Kenya. Benefits and access to markets is also important.

Next, benefits from conservation agriculture. Generally speaking it is said that the first or second year yield is sometimes slow, but year by year it is stable and more sustainable and increasing the yield. This graph shows it.

Actually, in African countries conservation agriculture or non-tillage farming cover many African countries, with increasing areas such as in Zambia, Lesotho, Kenya, Mozambique, etc.

Now, lessons learned from Lesotho. First, women cooperatives supported through FAO projects. Then, adoption of the *Matraca* technique was easier for women than men. The *Matraca* technique is a kind of non-till hand planter developed in Brazil that they are now using for non-till planting. Then, increase of the yield two- to three-fold. It is not only thanks to the non-till farming but also as a package they are using fertilizer. Then, innovation with wide spread of seed basins. I have already mentioned about seed basins, it is making a hole and putting organic matter and then they plant. Thanks to the seed basins they can ensure better moisture and water management. Strong policy will built through ministers and members of Parliament involvement in Zambia and Lesotho has boosted the adoption of such techniques.

Next, the example of Zambia: conservation farming promotion through farmers' organizations and federations; more than 300,000 farmers are applying conservation agriculture techniques, and they are intending a target of more than 1 million; inclusion of conservation agriculture in the curricula of extension services was also executed; strong political will in Zambia; capacity building and training; strong alignment of donors and partners to support conservation agriculture—he wants to insist on a strong willingness by government or assistance agencies.

This is an example of Gabon. First, promotion of conservation agriculture through women cooperatives, also conducted with FAO and Government support; Then, part of new model of agriculture for the Congo basin. They are trying banana plantations under the forest in the Congo basin. Then, excellent weed and pest control under the forest environment. This means that fallen leaves from the forests can cover soil surface very well and does not allow weeds to grow. Then, conservation agriculture and forest ecosystems—keeping the forest ecosystem in farming is a very interesting idea. Then, yield increase as a stimulant for conservation agriculture and adoption. So they are getting more yield under the forest ecosystem.

Next, examples of Ghana, Code d'Ivoire, Rwanda and Sao Tome et Principe: conservation agriculture under cocoa, and coffee plantations; small, medium and large-scale plantations for cash crops; preservation of forest ecosystem functions; value chain approach with support for inputs, equipment and pesticides; strong political commitment. Here, strong political commitment is also insisted on.

Next, the case of South Africa and Kenya. They are more developed countries and so part of modernized agriculture is being executed. Commercial farming at large-scale also exists. Then, local manufacturers of conservation agriculture agreement are also being developed. Promotion to smallholders through support of ripping and the use of conservation agriculture equipment. He insists on assistance to not only farmers themselves, but also surrounding service sectors like private are important. Then, partnership and training with support from Australia.

The conclusion is: promising conservation agriculture development throughout the continent; present in diverse cropping systems; context-specific and flexibility to increase the rate of adoption; strong political commitment, investments and capacity building our key; conservation agriculture is a leveraged tool for Africa to feed itself and boost agricultural trade and exports.

Thank you very much.

Chairman: Thank you very much for your wonderful presentation, despite such a sudden appointment for the presentation. Thank you very much indeed.