

## **CROP-LIVESTOCK INTEGRATION IN CONSERVATION AGRICULTURE: THE CASE OF SMALLHOLDER FARMERS IN AFRICA**

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### **Introduction**

Africa has unique development peculiarities that translate into culturally and land-tenure challenged crop and livestock integrated systems. While 60 percent of global food production is rain-fed, sub-Saharan Africa has upto 80 percent of the population engaged in (over 98% rain-fed), smallholder subsistence farming activities. Smallholder farming activities may be only for subsistence purposes but they are reported to be highly destructive to the environment, recording upto 40 tonnes per ha per year in soil losses. Deeply engraved traditional practices whether under shift cultivation (slash and burn), the traditional hand hoe or even animal powered, soil-turning tillage operations, are just as detrimental.

In Africa, largescale rainwater control is difficult and smallscale water control must be given attention. The sought water control originates at advancing traditional soil and water management practices such as terracing, Zai, Ngoro pits and others, to include the way soil is manipulated or even simply the condition in which it is held, in-between hot and extended dry periods.

Smallholder farming in Africa is a complex crop and livestock integrated system. It is a system which calls for special development attention and approaches. Smallholder farming in Africa is a low input, high-risk undertaking of high vulnerability. Africa's smallholder farmers are experts at taking on activities that give them a chance to spread risk. For this they are often described as ignorant as they remain relatively non-innovative and slow in taking on the new or different technology transfer ventures brought their way.

One of the ways that Africa's smallholder farmers spread their risk is by undertaking practices that integrate both crop and livestock sub-systems. The resulting operation system has humans, crops and livestock eating from and depleting the soil of all its fertility and health.

### **Africa's smallholder conservation agriculture system**

Africa's smallholder conservation agriculture system presents itself in two distinct categories. One is the minimal (under 20%) high potential tropical forest or highland environment with rich soil and adequate rainfall (between 800 and 1500 mm per year). These areas record high population density. The other is the semi-arid to arid land, with under 800mm of rain, relatively larger tracts of land and low population density. Semi-arid lands call for dry-land farming approaches and these areas are often best suited for cattle. These areas occasionally see land use patterns of successful highly mechanized or irrigated, capital-intensive largescale farming. For the largescale farmers, CA is easy to undertake, adopting tractorisation and classical CA equipment. For smallholder farmers, resources training and exposure may not and will not allow for this direct-adoption scenario. The fall-back situation is one

where smallholder farmers with access to relatively large chunks of land, farm insignificant portions. They do this with animal powered but traditional soil turning equipment. Such farming practice is not good for these risk-averse areas with vulnerable and delicate soils. Unpredictable and recurrent drought patterns coupled with surface crusting and naturally compacting soil types tends to curtail farming practice.

Under these circumstances, livestock rearing becomes the alternative choice; alone, or together with struggling crops, in a risk-spreading strategic and operational scenario. CA development in Africa faces many challenges, from natural or intervention food security measures to technology transfer issues. In the past many interventions have been non-holistic and profession based. They have been inclined to view crop and livestock systems separately, even within the same household.

### **Land tenure, operational and cultural challenges**

An African farmer, whether in a rich forest environment or semi-arid land is likely to have both crop and livestock in the same farming system. Cattle and draft animals like donkeys may not survive in areas like the forest zone of West Africa where the environment arbors tsetse and other disease causing parasites. In a high potential area with heavy population density the farmer is likely to zero-graze animals with little land but capable of supplying adequate biomass for feed. In turn the semi-arid area farmer will have both crop and livestock on a more spread-out scale. For this farmer, the herd is likely not to be zero-grazed and left to loom. Unpredictable food supply for livestock will place extra pressure on the cropped area. Under these conditions the farmer is unlikely to keep crop and livestock land apart, allowing room for the herd to loom and graze on the cropped land after harvest. time and even between seasons. In areas where land is communally owned the semi-arid area farmer may have to face the extra pressure of looming herds that belong to neighbours.

The problem is not any easier even for large scale farmers surrounded by pastoral communities, such as the wheat farmers in Kenya who lease farm land from the Maasai community. They too find it difficult to leave crop cover on the land between seasons. Pastoralists believe that it is their God-given right to graze their animals on crop residue, in-between seasons when animals have little else to feed on. Pastoralists and their looming herds fail to see why a practice of centuries can now be curtailed by land tenure changes. In turn and to be effective these developments may need much participatory introductions of change from operational to policy level. Pastoral semi-arid land is expansive and therefore highly capital-intensive for effecting fencing practice by those who must farm in these environs. In any case pastoralists will rarely relate to development trends towards sedentary life, and activities that in any way interfere with the food supply or the freedom of their livestock.

### **Integrated crop and livestock systems**

The natural co-existence of crop and livestock calls for a system where the crop feeds livestock and livestock feeds the land. It is however seemingly not possible to strike the balance right. Even in areas with high agricultural potential, humans, crop and livestock eventually deplete the land of fertility and general health. It is in the said crop-livestock co-existence context that African farmers need to be taught about CA principles. Farmers in semi-arid lands have to learn to leave a fraction of their limited biomass stock in the field as cover and not to graze it out during the dry period. Farmers in Machakos, Kenya are quickly learning that harvesting their maize by cutting it a foot above the ground level and also leaving a fraction of maize stalks on the field improves their soils by making them spongy and rainwater absorbent. They have learnt that such stover keeps the ants off their next season's young crop. They now know that ants do prefer the mature stover they find around soon after the rains have subsided. The ants feed on this one, leaving their young crop to grow. Farmers in the arid, Sahel in Burkina Faso have learnt to generate manure in pits on-farm, the best use of the little biomass generated, other than feeding these on the livestock.

### **Understanding work animal needs**

The draft animal is a real resource for the modern-day introduction of CA in smallholder farming communities, and particularly those in semi-arid lands. This animal needs to be catered for in a special way. A healthy, well-fed, well-managed draught animal is essential when providing animal power for conservation agriculture. Health and nutritional status of draft animals can directly influence the success of CA efforts. Rural farm work demands are seasonal in nature. The greatest demand for farm power is at the start of the growing season when animal feed is least available and poor condition animals are in greatest demand. This is especially true in areas which have a long dry season.

Smallholder farmers keeping work animals lack the financial means to provide the best for their work animals. Cash is often only available after livestock sales and after harvest and then family needs are met first. Often in remote rural areas where many draught cattle are found, access to veterinary services is poor. Communal grazing gives little incentive to work animal owners to practice tick and worm control. Communal grazing of livestock also means there is little incentive to improve pasture or range land to improve the supply of feed or protect the environment.

### **Recommendations for Africa's conservation agriculture programmes**

- Training Africa's smallholder farmers in CA practice needs a conscious effort to consider the farming system as an integrated one with humans, crop and livestock in harmonious co-existence. The interdependencies are critical with, humans, livestock and crop subsystems challenged to continuously replenish and keep alive the soil, from they feed. This is particularly critical where biomass supply is scarce or unpredictable.

- African CA farmers need to be trained to grow trees and crops with nitrogen fixing and high biomass generation qualities. These should be grown even when they are not of direct food-value to humans, as long as they have food-value to their livestock. Such biomass can be grown along terraces and fences, from where it can be cut during its peak growth, dried and stored for the dry season. Mechanical ways of compacting the biomass for efficient storage need to be explored.

- Training for CA in Africa needs to go the extra step to view CA as a rainwater harvesting technique, hand in hand with irrigation and other water- resource management schemes. Farms with better-managed rainwater arresting techniques are more likely to generate adequate food for animals as well as generating time and resources for their care.

- Africa CA work needs support at policy level if it will manage to mobilize the necessary resource and publicity support. Only through policy will peaceful cohabitation between upcoming farmers and pastoral communities result. Regulations need to address the issue of looming herds and their destructive ways, over and above the need to mainstream other basic CA practices and efforts. Government led efforts of the 60s and 70s need to be revived only this time in farmer-centred, public and private sector partnerships.

- There is need to provide for access to appropriate documentation and independent financing of a vibrant CA development sector. This way, communities will be empowered within continent-wide decentralized intervention structures which are currently taking root. Flow of information and networking in a continent with physical, political, drought mitigating and other remedial measures like the fight against HIV/AIDS are needed.

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