



## Enhancing Farmer Productive Capacity: Case of Action Research Based Conservation Agriculture

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### Abstract

The study sought to explore approaches for co-creation of conservation agriculture (CA) knowledge amongst farmers, nongovernmental organizations (NGOs), government and specialist researchers. The aim of the study was to explore farmer initiated food security strategies among small holder resource poor farmers, through enhancement of farmers' own productive capacity. The study was born out of the limitations observed in the prescriptive linear extension models that failed during the green revolution in Africa. Five sites were purposively selected to explore farmer initiated CA modeled on action research approach. Action research is flexible, adaptable, cyclical allow for immediate application of findings, emancipatory, builds confidence and is collaborative. Results showed that farmers are socialized to believe that innovations only come from experts, and as a result do not believe that they can solve their own farming problems from own initiated innovations that is, Research→Extension→Farmer. For a sustainable food security, the study recommends that CA innovations should align with the farmer mental model built on existing norms and values that people are grounded in, i.e. Co-creation of knowledge and not transferring of information from specialists. Farmers ought to rebrand specialist researchers in order to create meaningful, sustainable and relevant wealth.

### Keywords:

Conservation agriculture, Action research, Extension

### 1. Introduction

The past decade has seen Zimbabwe experiencing a sharp decline in food production, frequent and severe droughts that could be linked to effects of climate change. The majority of people in Zimbabwe, >65%, reside in rural areas and earn their livelihood from agricultural activities. Small holder agricultural sector is therefore a key determinant of rural livelihoods and poverty levels. The major contributor of food production in Zimbabwe is the small holder farmer (Government of Zimbabwe and UNDP, 2006). Small holder farmers are faced with a plethora of problems that constrain their farming activities. Some of the constrains, among others, include high cost of inputs, energy shortages or lack of it, lack of appropriate innovations and poor access to markets owing to dilapidated infrastructure. Zimbabwe therefore continues to suffer problems of food availability (World Bank, 2014). According to World Bank (2014), one third of Zimbabwean children live in households registered for food support. That is supported by the demographic and

health survey report 2010–2011, that says one quarter of Zimbabwean districts have high rates of malnutrition and stunting among children due to food shortages.

Since small holder agriculture is the core contributor towards food security, various strategies aimed at enhancing agricultural production and nutritional security were put in place by various stakeholders. Zimbabwe requires about 1.8 million metric tonnes of maize annually and the country is currently producing about 0.8 million metric tonnes of maize (Yue, 2013).

Most researchers do argue that the strategy of conservation farming might be the panacea to the challenges being faced in the tropics. With an increase in competition between maize consumption and bio fuels the country might end up requiring above 1.8 million metric tonnes of maize annually, so there is need to promote farming practices that will increase the total output of maize and at the same time conserving land for the future generation to come. The major strategy formulated and

implemented among other strategies is conservation agriculture (CA). The strategy of CA is premised upon moisture and soil conservation, timely planting, crop rotation, minimum soil disturbance and effective weed management. Though the CA strategy towards food security has been embraced and accepted by the government of Zimbabwe (GOZ) and other stakeholders, there seems to be little uptake of the technology by small holder farmers on a sustainable basis. Low sustained uptake by small holder farmers could be linked to the approaches used in introducing the technology (Douthwaite, 2009). According to Douthwaite (2009), new approaches to agricultural research and development (R&D) that support and evolve from local innovations are needed in order to tackle global food insecurity in a sustainable manner. Any meaningful agricultural research must be initiated from local innovations. Current approaches to agricultural research are not benefiting the poorest of the poor since they treat farmers as outsiders to knowledge and wealth creation.

Douthwaite (2009) further asserts that specialist researchers are truly outsiders providing solutions. They need to become insiders and be part of the local process. Small holder farmers are mostly poor and not amenable to 'magic bullet' technology-driven approaches from specialist researchers.

Approaches that yield the most lasting benefits to the small holder farmers are those that support farmers' own abilities to innovate locally and to develop or adapt their own solutions through action based research (Yue, 2013).

This study was therefore premised on how the process of farmer initiated research could be systematised, intentionally induced, successfully supported, and measured. According to Dugan et al (2013) reimagining of small holder agricultural research from the farmers' perspective can follow the following three steps;

Integrating the design and implementation of agricultural research with inputs from local communities and its leadership in order to nurture conditions for sustained innovation and the spread of successful approaches.

Specialist agricultural researchers must develop substantive partnerships with communities, development agencies and other key stakeholders who will play a leading and central role in achieving sustainability and spread of innovations to achieve sustainable poverty eradication.

Specialist agricultural researchers must be equipped with the requisite skills to manage the different processes, projects and programmes required to deliver research effectively from the farmer's perspective.

## 2. Materials and Methods

### 2.1 Description of study site:

The study was carried out in Mashonaland central communal farming districts of Mazowe, Madziva, Goora, Mt. Darwin, Shamva and Bindura in Zimbabwe. The districts are situated in agro-ecological region 2b to 3 which lies between latitude 17° 08' south and longitude 31° 21' east. The area is characterised by erratic average rainfall of 700 mm per annum and mean daily temperature of 25- 33° C. Soils are brown coarse grained sands to similar sandy loams over reddish brown sandy clay loams derived from granitic rocks, shallow to moderately deep (40-100cm) in most of the small holder farming sector.

The province's population is largely rural (> 70%) and > ¾ of the farmers are into subsistence farming. Population growth is greater than agricultural growth thereby creating conditions favourable for malnutrition and food insecurity.

Maize crop yields (0.85t/ha Mash central vs. 0.69t/ha national yield average) have been consistently declining in the province and the poor are getting poorer. Rural economy performance in 2009 has been reported to be worse off than 1975 and stagnant 2005 - 2009 (SAT, 2011). It owes to low yield levels that more grain imports and aid for rural farmers have become the order of the day. Rural poverty is deepening among small holder farmers in the province. People continue to multiply in the poverty stricken rural areas and continue seeking for outside farming innovations for own survival.

### 2.2 Data collection:

Purposive sampling method was used to select the districts that were studied. Focus group discussions (FGDs), field observations, informal interviews and questionnaires were used to collect data. Five focus group discussions were conducted, one per district. FGD helped to elicit in less rigid way information on own CA initiated practices.

Respondents to the questionnaires were purposively selected from the farmers involved in CA practices. The data collected was on: farmer initiated CA innovations, perceptions on outside research based CA approaches, modernization of CA within local indigenous knowledge systems (IKS), CA and food security.

Direct field observations were done to validate cultivation systems, size of cultivated plots and levels of farmer motivation. This was also done to supplement and ground truth information collected through interview discussions and questionnaires. During the field observation, farmers not involved in the action research based CA, were also interviewed since they constituted key individuals in CA practice.

### 2.3 Statistical analysis

Group discussion and field observation data was analysed qualitatively through content analysis description. Data from questionnaires was presented using graphs in order to come up with descriptive statistics of the responses to the questionnaires.

### 3. Results and discussion

#### Conservation Agriculture (CA) innovation: Farmers' conceptual understanding:

Small holder farmers had the following understanding about CA. The majority of small holder farmers view CA as a grass mulching technology and 20% did not have any idea about the practice of CA (Table 1). Based on table (2), most of the CA practices (60%) are initiated by organizations that are outside farmers' farming areas.

Table 1. Farmer Conceptual understanding of CA

CA Concept	Understanding level %
Grass mulch	40
Timely planting	20
Minimum tillage	20
No CA idea	20

Table 2. CA innovations initiation

Source of innovation	CA initiation %
Farmer initiated CA	40%
Externally initiated CA	60%

#### Assistance/ Role played by external CA organizations:

External organizations involved with CA, mainly offer advisory services and setting up of demonstration plots (Figure 1).

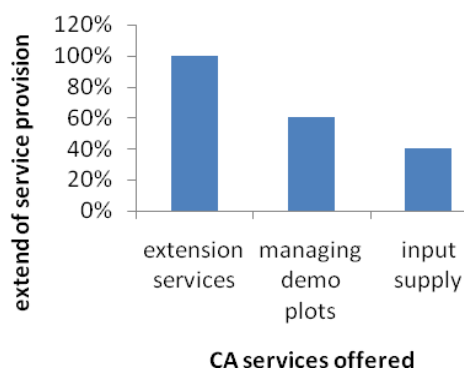


Figure 1. Roles of CA organizations

Small holder farmers prefer CA approaches that are led by themselves and based on their understanding. Farmer based approaches to CA were said to be sustainable creates relevant wealth for the family and links well with IKS.

Table 3. Preferred approach to CA implementation:

Approach to CA mplementation	Preferred approach %
Farmer based	100 %
Specialist or government based	0%
Funding organization	0%

Table 4. Farmer perceptions on current CA Approaches

Farmer perceptions on CA approaches	Farmer %
Appreciating	60
Challenging	20
Innovation for the poor	20

Farmers showed an appreciation of the present outside CA initiated projects (Table 4). However a number of challenges such as labour and inputs were given as shortcomings of the specialist based CA approach.

#### Coordination of current CA projects:

Management and coordination of current CA projects was said to come from experts in agriculture with peripheral input from local farmers.

Table 5. CA coordination

CA coordination	Level of coordination %
Specialist	80
NGOs	20
Government	20

#### Application of locally based CA principles:

All CA principles were externally prescribed by specialist researchers. Farmers expressed the need to apply own CA principles based on their cultural, natural and spiritual belief system. Such principles would incorporate the concept of extended family and family relations, collectivization and local indigenous knowledge system (IKS).

#### Relevance of IKS to CA Approaches:

Farmers expressed that CA knowledge should be projected within their cultural/traditional or spiritual knowledge system, thereby making farmers insiders and not visitors to innovations in their localities and environs.

#### Limitations of Specialist CA Approaches:

CA innovations brought by outside experts were seen as related to the following short comings and ranked by farmers as follows (Table 6);

Food insecurity, Unsustainable, Not complementary to IKS, Heavy reliance on external inputs, Labour intensive.

Table 6. Limitations of Specialist CA Approaches

Limitation of Specialist CA	Farmers %
Food insecurity	30
Unsustainable	25
Not complementary to IKS	20
Heavy reliance on external inputs	15
Labour intensive	10

### Discussion

#### CA conceptual understanding:

Farmers had a partial understanding about CA since they did not define it as a package. This could be the reason why CA practices have failed to yield results similar to those obtained at experimental sites. The majority of farmers opted for the simpler version of the innovation whereby they would cut grass and provide mulch. Partial understanding of any technology may result in partial uptake as well. This is in line with Rukuni (2012), who said African agriculture cannot be developed on western or green revolution principles that placed emphasis on research to farmer link approach.

#### The Role played by CA organizations

All CA organizations offered extension services to farmers as their core business. Organizations advised farmers on technologies obtained from research stations. That helped to confirm the traditional view of rural development which is based on specialist research and dissemination approaches. CA demonstration plots that were set on farmers' plots were modeled on outside expert research findings with little input from the farmers if any. The extension services were complemented by input supply in form of vouchers or donations. Such approach to input supply further cultivated the dependency syndrome spirit thereby killing out and self creativity among farmers. Such approaches sustains food insecurity as farmers fail to solve own problems through own means and creativity.

#### Approaches to CA implementation:

Farmers gave a big nod to CA approaches that supported local innovations grounded in own local knowledge systems. Specialist researchers, government and funding organizations should assume the local brand of farmers thereby getting a rebrand and locally amenable approaches to CA implementation. Locally based approaches to CA, that are build on research knowledge system from IKS, were judged to be sustainable, relevant, able to create meaningful wealth for the family and adjacent communities.

#### Farmer perceptions on CA Approaches:

Most small holder farmers, 60%, appreciated current CA initiated projects that are based on outside specialist knowledge. However a number of

challenges were highlighted (labour and inputs) and the projects suffered a stigma that they were meant for the poor who were said to lack capacity to produce enough food for their communities. Outside initiated CA approaches therefore gave a contradictory view to the local thinking as to who should be targeted for new innovations.

#### CA projects Coordination:

Farmers marginally get involved in the coordination of expert initiated CA projects since the activity is a key result area of specialist researchers, NGOs and the government. The system is modeled on the RDD model that places consumers of research output as outsiders.

#### Implementation of CA principles

The results showed the CA principles being implemented by farmers were under the guidance of expert mentorship, or done through a delegated lead farmer who sees through the lenses of the specialist researcher. Farmers expressed the need to implement own CA principles based on their knowledge system. The local knowledge principles would embrace, among other issues, the extended family and family relations concept, collectivization and the spiritual guidance principle. There is need therefore to cherish and identify with farmers' norms and values. Once experts and specialist researchers start to identify with local cultural/traditional or spiritual knowledge system, they make farmers insiders and not only imbibers of innovations from outside IKS.

#### Specialist CA Approaches:

The study established that outside expert initiated CA innovations could not offer sustainable food security, did not embrace local knowledge systems fully, failed to align with demands of local environments, relies on expensive inputs and are labour intensive. Such initiatives may sustain poverty and fail to create sustained wealth among small holder farmers since it is not grounded in local family models. This agrees with Dugan et al (2013), who said that the main reason that some agricultural areas are left behind is that in many complex farming systems "the available technologies or innovations are not adapted to the specific challenges that the farmers are facing".

#### 4. Conclusion and recommendations

In pursuit of increased investment for sustainable agriculture productivity and food security in Zimbabwe and rest of the developing world in general, the study established that farmers prefer CA approaches that give lasting benefits, complementary to farmers' own abilities to innovate locally and to develop own farming solutions. Specialist based CA approaches socialize farmers into believing that innovations only come from experts, and as a result

lose the confidence that they can solve their own farming problems from own initiated innovations.

Agricultural innovations and investments could therefore best be used to benefit the small holder farmer, most of who leave on less than US\$1.25 a day, if emphasis is placed upon processes that could consciously systematise, and support locally initiated researches that embraces farmers as leaders, insiders and an integral part of the agricultural process.

The study recommends for much more blended forms of innovation development premised upon the Holistic mental model (local norms and values), that can help develop the conditions within which farmers pursue their own farm based action research.

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