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Session 9: Adopting Conservation Agriculture to Smallholder Production

ORAL ABSTRACTS

Pitfalls to Avoid and Lessons Learnt for Conservation Agriculture Sustainable Adoption

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Background

Conservation agriculture (CA) has been promoted in southern Africa since the late 1990s with the aim of reversing the effects of declining soil fertility and productivity on current farming systems as well as adapting to projected increase in climate variability and change (Thierfelder et al., 2014). It is based on three interlinked principles: a) minimum soil disturbance; b) surface crop residue retention and c) crop rotations and mixing (FAO, 2012). Although these technologies have been widely promoted in Southern Africa, adoption rates are low and often partial, the benefits for farmers remain highly debated and impacts seem to be context-specific (Baudron, et al, 2012; Arslan et al, 2013) Proponents of the technology argue that the whole system has to be adopted simultaneously for farmers to capture the synergies and full benefits [Gowing and Palmer 2008; Guto et al., 2011]. This implies that it is relatively unprofitable for farmers to adopt only one or part of the technology option. For example in Zambia and Zimbabwe, the few farmers that have adopted CA technologies tend to do it partially, either practicing some components or adopting CA on some plots but inconsistently (Umar, 2013; Mazvimavi and Twomlow, 2009). Use of mulch and adoptions of rotations and crop mixing are neglected the most by those who adopt. Partial adoption of CA has been observed by some as a step toward full adoption in some cases. Some adopt enough to facilitate access to free inputs.

Results

Research evidence from the region shows that CA maintains high levels of water infiltration thereby increasing the available soil moisture (Thierfelder and Wall, 2009). However, the adoption of CA is often constrained by numerous factors as a result of the diversified and complex farming systems and the socio-economic circumstances. These include lack access to critical inputs, high cost of labour for weed control, mulch gathering challenge, lack of access to viable markets, competition for crop residues in mixed crop-livestock systems, and finally the mindset of farmers that agriculture is only possible and adequate if the soil is tilled (Christian Care 2010., Thierfelder et al., 2014). The question of labour has reduced farmer adoption, farmers capacity to increase the plot sizes and reduced time invested on CA. (Christian Care 2010:15) The cost of labour required to address weed proliferation (such as mulch gathering) is often beyond the reach of many farmers (Nyamangara *et al.,* 2013). The FAO defines mulch as "material which is applied to the soil surface in order to reduce water loss, suppress weeds, reduce fruit splashing, modify soil temperatures and generally improve crop productivity". Most CA extension in semi-arid zones of Zimbabwe do not emphasize the mulch role in weed suppression other do not promote it at all on the assumption that farmers will not get it or its use will result in an unhealthy competition between CA and livestock. They focus on water loss and moderating soil temperatures (Ndah *et al.,* 2013) and promote 30% coverage of mulch as adequate. The farmers who are producing more than they require for their own consumption have challenges in accessing a viable market to sell their produce. (Christian Care 2010)

Application and Implication for CA

The major challenges to dry land crop production in Zimbabwe are moisture (due to erratic rains and prolonged mid season dry spells) and soil fertility. Prevailing soil fertility options depend on external and

expensive inputs. Locally available and sustainable resources provide an answer to the challenges which small holder farmers face. Promotion of mulch, organic manure and seed production and banking has provided sustainability to grain production. Labour and soil fertility are a major challenge to expansion and green manure cover crop is now being promoted to deal with it. Market linkages are required for such farmers who now produce more than they require.

Experimental Approach

Christian Care has implemented CA projects with support from Christian Aid since 2004 and the United Church of Canada and Canadian Foodgrains Bank since 2006. The methodological approaches applied in the promotion and cascading of CA by Christian Care included training of government agricultural extension staff on the principles of CA. This involved conducting baseline surveys to identify current smallholder farming practices and information gaps with regard to cereal production. Identification and selection of potential farmers with requisite capacity, primarily labour to adopt and adapt the technology was done in a participatory manner with some joining on voluntary basis. During the initial stages of CA promotion smaller plot sizes (30mx20m) were promoted. Later larger plot sizes (50mx50m) were promoted after realizing that they would produce enough cereal to meat annual grain requirement for a house hold of six members. Widows and smaller families practiced on smaller pieces of land enough to meet their requirements. Yield per unit area and total production comparisons between CA plot and conventional plots were done. Establishing farmer clusters of between 4 and 10 farmers per cluster to facilitate farmer-to- farmer extension was key. This approach has allowed for greater adoption of CA since it allows for cross-learning and also close monitoring of the cluster farmers by the lead farmers. Training at least one high potential lead farmer per cluster so as to train other farmers and provide technical backstopping. Initial focus was on the resource constrained farmers. Later deliberate efforts were made to select successful and popular farmers who also doubled as community opinion leaders in order to facilitate buy-in and voluntary adoption of CA practices by other farmers within the community. This led to a constant increase in the number of farmers adopting CA. CA promotion has now been diversified to include water harvesting technologies such as pit traps, Phiri pits, dead level contour ridges and pot holing.

Results and Discussion

The evaluation of Christian Care programming (2011) established results which are summarised below. It established that minimal tillage was universally adopted by CA farmers, permanent soil coverage/mulch was adopted by 83% of those evaluated. Crop rotation was adopted almost universally in Chirumhanzu 100% where seed was provided, and practically not at all in Nkayi where it was not part of the project design (Christian Care Evaluation 2011). Maize yields increased dramatically under CA, averaging between 2.9 and 3.9 MT/ha during the last cropping season, while conventional yields averaged between 0.5 and 0.7 MT/ha(Christian Care Evaluation 2011). Improved maize yields increased the amount of food available at the household level. In addition, increased income levels from surplus production allowed project participants to send children to school, buy livestock and purchase supplies such as cooking oil and sugar. The majority of CA farmers, especially women, felt that maize production using CA was less labour intensive per unit of production. In Nkayi, approximately 15% of the households were trained in CA, and now approximately 50% of the households practice CA(Christian Care Evaluation 2011). Adoption was enhanced by working closely with government agriculture extension agents and coordinating with other institutions. Critical issues facing continued adoption of CA include sufficient procurement of mulch or production of mulch in situ (Green Mulch) and plant nutrients (both organic and inorganic forms), clarifying actual labour demands and promotion of CA for crops other than maize.

Farmers took time to increase dramatically on the plot sizes. 80% of the respondents confirmed increasing their plot size in the 5^{th} year of the project. There has been a rapid up-scaling of the number of farmers practicing CA in both of the districts evaluated, and this is a clear indicator of sustainability of the program. Chirumhanzu district Year 1- 240 farmers, Year 2 - 480 farmers, Year 3 – 720, Year 4 - 1086, Year 5 – 1014, Year 6 – 1265. CA has not been abandoned even after exit in certain wards as farmers have continued to practice it and extend their plots without external support.

References

Corbeels, M., de Graaff, J., Ndah, T.H., Penot, E., Baudron, F., Naudin, K., Andrieu, N., Chirat, G., Schul er, J., Nyagumbo, I., Rusinamhodzi, L., Traore, K., M zoba, H. D., Adolwa, I .S., 2013. Understanding the impact and adoption of conservation agriculture in Africa: A multi-scale analysis. Agriculture Systems and Environment, in press.

Ngwira, A.R., Thierfelder, C., Lambert, D.M., 2012. Conservation agriculture systems for Malawian smallholder farmers: long-term effects on crop productivity, profitability and soil quality. Renewable Agriculture and Food Systems FirstView, 1-14.

Thierfelder, C., Rusinamhodzi, L., Ngwira, R.A., Mupangwa, W., Nyagumbo, I., Kassie, G.T., Cairns, J.E., 2014. Conservation agriculture in southern Africa: advances in knowledge. Renewable Agriculture and Food Systems, in press.

Thierfelder, C., Wall, P.C., 2009. Effects of conservation agriculture techniques on infiltration and soil water content in Zambia and Zimbabwe. Soil and Tillage Research 105, 217-227. Thierfelder, C., Wall, P.C., 2010. Rotations in conservation agriculture systems of Zambia: Effects on soil quality and water relations. Experimental Agriculture 46, 309-325.

Thierfelder, C., Wall, P.C., 2012. Effects of conservation agriculture on soil quality and productivity in contrasting agro-ecological environments of Zimbabwe. Soil Use and Management 28, 209-220.

Wall, P.C., Thierfelder, C., Ngwira, A., Govaerts, B., Nyagumbo, I., Baudron, F., 2013. Conservation Agriculture in Eastern and Southern Africa. In: Jat, R.A., Sahrawat, K.L., Kassam , A.H. (Eds.), Conservation Agriculture: Global Prospects and Challenges. CABI, Wallingford Oxfordshire OX10 8DE, UK.

Mashavave T, Mapfumo P, Mtambanengwe F, Gwandu T, and Siziba S. 2013. Interaction patterns determi ni ng improved information and knowledge sharing among smallholder farmers. *African Journal of Agricultural and Resource Economics* 8 (1): 1-12

Ndah H.T., Schuler J., Uthes S., Zander P., Traore K., Gama M.S., Nyagumbo I., Triomphe B., Sieber S. and Corbeels M. 2013. Adoption Potential of Conservation Agriculture Practices in Sub-Saharan Africa: Results from Five Case Studies. Environmental Management (2013). DOI 10.1 007/s00267-01 3-0215-5

Nyamangara J, Mashingaidze N, Masvaya EN, Nyengerai K, Kunzekweguta M, Tirivavi R and Mazvimavi . 2013. Weed growth and labour demand under hand-hoe based reduced tillage in smallholder farmers' fields in Zimbabwe. *Agriculture, Ecosystems and Environment.* In press

Shannon CE. 1948 A mathematical theory of communication. *The Bell System Technical Journal,* 27, 379–423 and 623–656.

Conservation Agriculture for Building Resilient Farming Systems in Africa: Extracts of the Lusaka *25by25* Congress Declaration

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Background

The African Conservation Tillage Network (ACT) in close liaison with partners convened the 1st Africa Congress on Conservation Agriculture (IACCA) in Lusaka, Zambia, from 18th to 21st March 2014. This was held under the theme *"Conservation Agriculture (CA): Building entrepreneurship and resilient farming systems"*. The Congress brought together 414 delegates from 42 African and other countries of the world to share experiences and lessons and facilitate alliances to unblock hindrances to expanded and scaled-up adoption of CA. The congress was convened in the backdrop that 2014 has been designated by African Union Heads of State and Governments as the year for agriculture and food security, and marks the 10th anniversary of Comprehensive African Agriculture Development Programme (CAADP). It also marks the adoption of a new CAADP results framework, which recognizes the role of climate-smart agriculture in addressing agriculture and climate change challenges.

Nine of the ten countries with the largest gains in human development index (HDI) in the world and 8 of the top 10 global performers on non-income dimensions of the HDI indicators are from sub-Saharan Africa (UNDP 2012). Africa has been on the rise in the last 10 years bringing rays of hope. Despite this outstanding performance, it remains a fact that hunger has increased by 64 million in Africa over the last 20 years (FAO; WFP and IFAD 2012). Additionally Africa is a net importer of agricultural products in the last three decades with a trade deficit of USD 22 billion in 2007 (FAOSTAT, 2011). While global population is projected, by 2013 basis, to increase by 33% to 9 billion people by 2050, Africa's population will increase by 115% (from 1.1 to 2.39 billion) by the same date; thus requiring a similar increase in food production. These figures point to the bitter reality that urgent efforts are needed to transform the way food is produced in the continent. A shift from conventional to more efficient, sustainable and climate resilient food production practices is required. Conservation agriculture (CA) holds that promise. It is from this recognition; the CA stakeholders at the IACCA congress deliberated and eventually made a declaration on how to scale up and out the adaptation, adoption and benefits of CA in Africa.

The First Africa Congress Approach

The congress approach put "farmers first" and at "the centre" of all congress discussions. Outputs of the "farmers' forum" dictated what all other sessions must not fail to address. All other participants – being service providers in their various disciplines and stakes – needed to identify a niche value adding service - under the seven sub-themes[1] of the congress - to assist farmers to adapt and adopt profitable CA in the millions. The congress targeted unconventional but strategic players and interest groups including the media and private sector players. It was interactive, allowing active participation and discussions through seven thematic working groups, five panel discussions, open space posters, exhibition booths, videos, print materials, and six field visit sites to smallholder, medium, and large scale commercial CA farming.

[1] 1. Growing more with less; 2. Weather proofing agriculture; 3. CA for sustained wealth creation; 4. Food sovereignty; 5. Effective research and targeting strategies for enhanced CA adoption; 6. Harnessing the power of collaboration; 7. Increasing CA adoption

Results and Discussions

Documented impact and the feedback from practicing CA farmers across Africa confirm that CA is set to become a cornerstone in transforming the way farming is done in Africa and major contributor to achieving CAADP's goal 6% annual growth in the agricultural sector which employs 80% of Africa's rural population (ACT, 2014). CA increases soil productivity and inducing resilience to climate change and variability, and convert marginal semi-arids (of up to 400 mm rainfall) into grain baskets without the need for costly irrigation investments. This attribute gives CA an edge for it to be adopted by millions of smallholder farmers in Africa affordably and swiftly.

The congress recognised the African Governments' efforts in support of sustainable agriculture intensification. However, more efforts to create a more conducive environment for the adoption of CA are needed. The need to strengthen partnerships, communication and information flow within the CA community of practice at national and regional levels was evident. New knowledge and experience exchange are an important resource for uptake and spread of CA. The crucial need to upscale mainstreaming of education on the science and practice of CA in existing educational systems at all levels was highlighted. The importance of South-South cooperation, in the form of exchange of expertise, information and experience was also recognised. CA has significantly positive impact on practicing farmers across Africa in their incomes, livelihood, wellbeing and on empowerment of women farmers. The roles of women and the youths in the accelerated upscaling and adoption of CA cannot be ignored. CA gives farmers the choice to apply CA principles to a range of production systems including, horticulture, agroforestry and crop-livestock integration, amongst others;

In order to achieve the CAADP goal of 6% growth of the agricultural sector CA stakeholders called for policy and political commitment and leadership; private sector engagement especially to proactively support up scaling of CA through further innovations and increased investments financing in appropriate CA technologies and related services and training, extension, research and innovation, and knowledge support. To realise the calls, for example, National and international stakeholders have to support the up-scaling of CA to reach at least 25 million farmers across Africa by 2025 – coined as 25by25. Governments have to create conducive environment for the adoption and development of CA. Support to CA farmers and their organizations is necessary. Governments have to create enabling policy environment to allow investment financing, and technological development. Support from development partners to CA programmes need be increased. Quality assurance system for accredited agricultural training institutions that provide CA training certificates has to be in place. CA adopter farmers have to be supported to be champions and educators for their counterparts. Agricultural training institutions have to take up CA as an integral part of their training programmes and farmer sensitization and training efforts. Research and extension on CA should be farmer-focused and responsive to the needs of farming communities. The need to supporting knowledge management by stakeholders, including the CA task force is vital.

References

ACT, 2014. Conservation Agriculture: Building entrepreneurship and resilient farming systems. Book of Condensed Papers of the First Africa Congress on Conservation Agriculture (http://www.africacacongress.org/sites/default/files/attachments/book_of_condensed_papers.pdf)

UNDP, 2012. Africa Human Development Report 2012. United Nations Development Programme.

Regional Bureau for Africa (RBA). 1 UN Plaza, New York, NY 10017, USA

FAO, WFP and IFAD. 2012. The State of Food Insecurity in the World 2012. Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition. Rome, FAO.

FAO, 2011. Why has Africa become a net food importer? Trade and markets division, Food and Agriculture Organization of the United Nations, Rome, 2011.

Why Farmers Don't Do What We Tell Them (And Why That's a Good Thing)

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Background

Famers' ability to identify promising technologies is an important asset in developing context-specific conservation agriculture (CA) approaches. Ten year of evidence from Canadian Food Grains Bank (CFGB)-funded CA projects in sub-Saharan Africa provide ample support for this hypothesis and illuminate best practices for building long-term institutional capacity for innovation.

Academics and practitioners struggle to understand why CA has not spread more quickly and pervasively among small-holder farmers in sub-Saharan Africa (SSA). Farmer attitudes and conservatism are sometimes cited as factors in non-adoption of CA, suggesting that non-rational factors outweigh reasoned judgment. A recent aggregation of farmer-field data from 40 CA studies in eastern and southern Africa found that CA produced maize yields more than 10% *higher* than conventional farming techniques in 23 cases and more than 10% *lower* in six others (Wall *et al.,* 2014). Data on relative net returns (especially those incorporating labor inputs) further suggest that CA has *not* always benefited farmers (Pannell *et al.* 2013), and that its broader adoption necessitates adaptive approaches utilizing farmers' creativity and evaluation skills (Liniger, *et al*. 2011*).*

Experimental Approach

Over the past 10 years, CFGB has supported CA projects implemented by African NGOs. They currently fund 32 CA projects throughout SSA (http://www.foodgrainsbank.ca /where_we_work.aspx). In 2014, CFGB launched a new initiative designed to evaluate and learn from their partners' experiences. Initial findings include best practices for programs that wish to harness farmers' creativity, and include farmers in developing and promoting CA technologies appropriate to their own farming systems.

Results and Discussion

The following best practices were derived from evaluation of CFGB CA programming in SSA:

Develop context-specific CA technologies – Agronomic dogmatism has blinded many projects. Herbicides have been viewed by some as essential (Ito *et al.* 2007) and by others as unthinkable. Intercropping is sometimes rejected out of hand as untidy and backward. CA should take as many forms as there are farming systems. Projects need to abandon the idea that one size fits all, and embrace diversity in programming.

Use adaptive training approaches – Training approaches have often been overly rigid. Field officers should be equipped with a toolkit of CA technologies, not a "package" to promote. Farmers should be presented with options to test, not solutions to accept. Training materials should be developed in editable, electronic formats free from copyright so that projects are free to customize them to local languages and farming systems.

Verify net returns to CA – Few projects have had the time or resources to fully document the impact of the technology they promote, yet farmers decide for or against adoption of CA based on net benefits (often weighted toward short-term returns) and risk. Projects need to document *in their particular context* the farm-level impacts of CA, factoring in labor as an essential input.

Promote farmer-to-farmer learning – Farmers learn best from each other. Most successful projects utilize successful CA farmers as trainers. They also budget for exchanges between farmer groups and projects.

Focus on building knowledge, not on supplying inputs - Projects have often provided free or subsidized inputs (equipment, seed, and chemicals) to encourage farmers to adopt CA technologies. Such inputs have created a false enthusiasm that obscures farmers' evaluation of the inherent value of the CA approach, and have nearly always reduced the sustainability of CA adoption.

Build institutional capacity for innovation – Project management and reporting requirements have often been overly rigid. Funders need to build flexibility into reporting and value learning as much as anticipated outcomes. They also need to move beyond three-year project cycles. A thorough process of participatory innovation and promotion may take 10 years or longer.

Move women out of the crosshairs and into leadership – Most projects evaluated have begun to target women. Some also recognize that women are more than "targets" for CA promotion, and seek to place them in leadership roles. Women are at the heart of agricultural innovation and decision making in SSA. Unless we include them in technology development and project leadership, we forgo a major resource.

Applications and Implications for Conservation Agriculture

A growing body of literature provides evidence that CA projects in SSA have sometimes promoted packages that are not in the best interest of small-scale farmers and that one key to addressing this problem is to develop context-specific CA technologies and approaches. The best practices described in this study provide practical guidelines for CA projects to utilize farmer creativity and expertise to accomplish this goal.

References

Ito, M., Matsumoto, T., Quinones, M.A., 2007. Conservation tillage practice in sub-Saharan Africa: the experience of Sasakawa Global 2000. Crop Prot. 26:417-423.

Liniger, H.P., R. Mekdaschi Studer, C. Hauert and M. Gurtner. 2011. Sustainable Land Management in Practice – Guidelines and best Practices for Sub-Saharan Africa. TerrAfrica, World Overview of Conservation Approaches and Technologies (WOCAT) and Food and Agriculture Organization of the United Nations (FAO).

Pannell, D., R.S. Llewellyn, and M. Corbeels. 2013. The farm-level economics of conservation agriculture for resource-poor farmers. Agric. Ecosyst. Environ. 187: 52–64.

Wall, P.C., C. Thierfelder, A. Ngwira, B. Govaerts, I. Nyagumbo, and F. Baudron. 2014. Conservation Agriculture in Eastern and Southern Africa. Ch. 11 in: Jat, R.A., Graziano de Silva, J., (Eds.), Conservation Agriculture: Global Prospects and Challenges. CABI, Cambridge, USA.