

AN EVALUATION OF CONSERVATION FARMING AS A DRIVE TOWARDS SUSTAINABLE AGRICULTURAL PRODUCTION AT SIVOMO AREA, NKAYI DISTRICT, ZIMBABWE

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ABSTRACT

The purpose of the study was to evaluate conservation farming as a drive towards sustainable agricultural production at Sivomo area which is located in Nkayi District, Zimbabwe. The evaluation was measured against the following indicators (i) the effectiveness and sustainability of CF practices in enhancing productivity of smallholder farmers (ii) the adoption and success of CF practices by smallholder farmers. The study applied the qualitative research design to assess the CF adoption and sustainability efficacy from 60 participants who included NGO employed field officers, Arex Officers, State employed Officers, and household heads. Findings that revealed the adoption of CA depends on farmers' choice which to a great extent is based on observation and trying out of the programme. The study also revealed that the use of crop residue as soil cover reveals complexities over priorities in smallholder farms. Smallholder farmers have insufficient paddocks for their livestock which end up destroying the soil in the farmland. Farmers have painted a vivid picture of some of these complexities by revealing how adoption is not an *event* but constitutes a *process* which varies from agent to agent as a result of differing decision-making procedures. Basing on these findings, the researcher recommends less technocratic approaches to agriculture to be adopted. Increased or enhanced use of social capital to leverage farmers against the CA's demand on labour is also of paramount importance.

KEYWORDS: Agricultural Production, Agrarian Policy, Conservation Farming, Conservation Agriculture, Sustainable Agriculture

INTRODUCTION

The history of rural agriculture in Zimbabwe has colonial antecedents and racial connotations. The colonialists imposed farming solutions to smallholder/peasant farmers in numerous ways that benefitted the state other than the farmers themselves. A utilitarian ideology was espoused by the state when it came to peasant farming, as a way of gaining more agricultural mileage. Drinkwater (1989:288) acknowledged this anomaly vis-à-vis the Land Apportionment Act by propounding that "the belief was that peasant agriculture was backward and inefficient and that through land apportionment, standards of living could be raised in the reserves". Such an approach made sure that most of the peasant farmers had small portions of land for sustenance tillage only, and not for income generation. Hence, the Alvordian model (Baudron, Andersson, Corbeels, & Giller, 2012) adds that the water retention systems (Gumbo, Snelder, Wuta, & Nyagumbo, 2012) were thus made available to benefit the peasant farmers. Hence, in the colonial era, peasant farmers were provided with few agrarian resources for sustenance. Ironically, after independence, the Zimbabwean government maintained the technocratic approach towards small scale rural agriculture, despite the fact that it embraced this as a vital

part of the whole agriculture sector (Drinkwater, 1989). The state however, continues to give technical advantage to large scale commercial farmers and minimal aid to rural smallholder farmers. Although the mentality of the situation changed significantly from that of the colonial era, (due to the land reform/appropriation/tenure and use of technological farming) conservation agriculture is still lauded as a farming method that improves the food security and livelihoods of smallholder peasant farmers, compared to any other forms of conventional agriculture (Moyo, 2011).

AN OVERVIEW OF CONSERVATION AGRICULTURE/ FARMING

Conservation agriculture (CA) is a broad term that encompasses activities such as minimum tillage and zero tillage, tractor powered, animal powered and manual methods, integrated pest management, integrated soil and water management, and it includes Conservation Farming (ZCATF, 2009). Conservation farming (CF) is akin to Conservation Agriculture (CA) but does not use mechanical equipment; instead it employs tools such as hand-held hoes. In other words, it is a modification which suits poor rural communities who have no access to modern day machinery. The most recent variant of CA in Zimbabwe is that which uses planting basins. These basins act as planting stations for the crops (Twomlow, Urolov, Jenrich, & Oldrieve, 2008). In the CA process, smallholder farmers use hand tools such as hoes, shovels, ground diggers, as well as mattocks and picks to prepare spaced planting stations. Conservation farming using hand-held hoes, focuses on the creation of planting basins in the dry season (Hove and Twomlow, 2007). The option has been promoted mainly to address the draught power shortages in the communal farming sector, which lead to delays in planting seeds and consequently have negative effects on the crop yields. The number of farmers who practice CF has increased from 4700 households in the 2004/2005 planting season to more than 50,000 in the 2008/2009 planting season (Twomlow, Urolov, Jenrich, & Oldrieve, 2008). Recent evaluations conducted indicate an incremental uptake of the various components of the CF technology in Zimbabwe (Mazvimavi, Twomlow, Belder, & Hove, 2008).

In spite of the increased uptake of CA/CF in its many guises, the method continues to provoke debates around its efficacy, as well as specific contributions of its components (Wall, 2007; Giller, Witter, Corbeels, & Tittonell, 2009; Kassam, Theodor, Shaxson, & Pretty, 2009; Andersson & Giller, 2012; Baudron, Andersson, Corbeels, & Giller, 2012; Anderson & D'Souza, 2013). These debates have been complemented by a nascent yet rich empirical literature on CA in Zimbabwe (Mazvimavi, Twomlow, Belder, & Hove, 2008; Thierfelder & Wall, 2009; Mazvimavi & Twomlow, 2009; Thierfelder, Cheesman, & Rusinamhodzi, 2012). This paper adds to this rich literature by providing a localized analysis of effectiveness and sustainability of CA in the area under study. It is molded around such research into agriculture, participation and sustainability by Ndlovu, Moyo, Zikhali, & Mabhena (2015) who focused on the Makwe irrigation scheme in Gwanda, which thrived on conservation agriculture. In the process, the voice of the peasant farmers is heard; their economic and social dynamics which are in interplay are fostered. This scenario brings into perspective the qualitative and localized pros and cons of conservation farming. Consequently, attention is largely afforded to such matters as farmer participation, meanings of adoption and potentiality for sustainability in the farming community. The aim is not to dispel the studies made elsewhere by other researchers but to provide a richer, more varied analysis of CA uptake in Zimbabwe.

RATIONALE FOR CONSERVATION FARMING PROGRAMME IN ZIMBABWE

Three quarters of the world's poorest people live in rural areas, and their livelihood depend on farming, pastoralism, forestry, and artisan fishing – all of which can be subsumed under the term agriculture. Support to agriculture is well recognised as essential for poverty reduction and for securing people's right to food. Agriculture is also recognised

as an engine of pro-poor growth (OECD, 2006; World Bank, 2007; Oxfam, 2009). Conservation Agriculture connects economic growth and the rural poor. Its importance goes beyond individual incomes through the reduction of poverty, by lowering and stabilising food prices, improving employment for poor rural peasants and increasing demand for consumer services (OECD, 2006). Subsistence agriculture in rural areas provides both food and a steady income which cover up to 75% of the needs of two million people in Zimbabwe (Rukuni, Eicher, & Blackie, 2006). Due to the centrality of agriculture for livelihoods and sustenance, it is of paramount importance to conceptualise CA approaches to improve services in a Zimbabwean context.

The importance of CA is particularly colossal in the developing countries. Over the past decade, there has been growing recognition of this agricultural approach in poor farming communities of the Sub-Saharan Africa (SSA) and Asia (Hobbs, 2007). Makwara (2010) also observes that there is a great need to consider conservation farming as a solution to alleviate hunger among the smallholder farmers. He argues that conservation farming initiatives (if properly followed) become a panacea in improving agricultural output in those regions characterised by precarious agro-ecological climatic conditions. Rockstrom & Falkenmark (2000) also bolster this assertion by propounding that substantial opportunities exist to increase small-holder farmer yields through improved soil and water management. This initiative best suits those disadvantaged populations in drought prone areas of Zimbabwe (Makwara, 2010). As such, conservation farming primarily targets the poorest and most desperate of farmers who get support from the state in the form of farm inputs such as maize seed and fertilizer among others. Support from the state often starts with policy. Agrarian policies in Zimbabwe have transformed since 1980, reflecting changes in priorities, outlook and the tenure system. CA is situated within this transition policy framework and therefore helps to reveal priorities of the Zimbabwean state in terms of food security and environmental management.

It is paramount to note that in Zimbabwe, a significant proportion of small scale farmers face risks in farming loss due to poor and erratic rainfall, low soil fertility, and lack of market access. Yield levels and productivity of most smallholder farmers in sub-Saharan Africa are generally low and have a declining trend in the region (Thierfelder and Wall, 2009). Additionally, climate change patterns, have greatly affected the agriculture yields which have declined tremendously [with complete crop failure in some areas] due to extended dry spells (Nyagumbo et al., 2009). Water constraints, soil degradation (due to water logging, soil erosion and nutrient depletion) affects the sustainability of food production across sub-Saharan Africa (Waliyar, Collette, & Kenmore, 2003). With most of rural Zimbabwean farmers employing alternative cropping methods such as ploughing by reducing exposure to climatic and crop-failure risks, it is therefore important for farmers to use conservation methods such as the German Agro Action Conservation. Hence, CA/CF has been proffered as the potential 'green' solutions to alternative cropping methods. The methods are recognised as approaches that allow for climate change adaptation (Kassam, Theodor, Shaxson, & Pretty, 2009), as well as mitigation of land degradation, improvement of soil carbon content and increased output (Marongwe, et al., 2011). In addition, conservation agriculture enables farmers to intensify or increase yields from available land, which is an appropriate model for many of Zimbabwe's densely populated rural smallholder farms.

THE STUDY LOCATION: SIVOMO AREA, NKAYI DISTRICT

Nkayi is situated in the Matabeleland North Region of Zimbabwe. Zimbabwe is a landlocked Southern African country occupying 390,757 km². It comprises of five agro-ecological regions identified as Regions I, II, III, IV and V. The regions are largely differentiated by average annual rainfall amounts which is highest in Region I and lowest in Region

5 (Moyo, 2000). Alternatively, Zimbabwe is a country divided into four geographical regions, namely the Eastern Highlands, the Highveld, the Middleveld and the Lowveld. The Lowveld is characterised by hot, humid weather and low rainfall. Nkayi District, where Sivomo is located is situated in the Lowveld which also falls in Region IV (Mazvimavi & Twomlow, 2009). It has a total population of 109135 that is 52088 (47.7%) males and 57047(52.3%) females (Census, 2012). In Nkayi region, inhabitants rely on dry farming as their primary livelihood source, and hence low agricultural production levels often expose households to starvation. This scenario is also exacerbated by a poor road network which affects the farmers' access to markets for either sourcing or selling foodstuffs for their families. It is in the Sivomo area of Nkayi that the researcher witnessed the exploits of the German Agro Action Conservation method.

RESEARCH METHODOLOGY

A qualitative research design was applied to assess the CA's adoption and sustainability efficacy. The study was premised on the constructivism paradigm, and therefore used the exposés from the participants to interpret CA through their perspectives and experiences. The process of gathering data was multi-pronged, spread over a period of three (3) weeks. The first phase entailed conducting semi structured in-depth interviews ($n=15$) with key professional informants during the first week. Key informants were conveniently selected from the officers and officials who comprised of the Agriculture and Rural and Extension officers (AREX) Non-Governmental Organisation officers (NGOs) and Rural District Council (RDC) involved in technical assistance of CA/CF¹ in Nkayi District. Conducting key informant interviews at the onset was important because it allowed the researcher to identify the homesteads which engaged in CF and those that did not do so within the ward –a process which proved useful in purposively locating and selecting the homesteads for the subsequent interviews and Focus Group Discussion (FGD).

The second phase was carried out in the 2nd and 3rd week. In this phase, purposively selected farmers, in which interviews ($n=15$) as well as focus group discussions ($n=3$) which included 8 participants per group were conducted. These data gathering procedures were held with the respondents during the community days when farming is prohibited in the area². The residential distribution of villagers who practice CF in Sivomo Ward 18 followed a linear pattern and this made mobilization of the villagers logistically uncomplicated. After these interviews, observations were conducted on the farming process in order to ascertain spatial size and use of farmland, crops grown as well as practices followed. After conducting household interviews, participants ($n=6$) of those who practised CF were invited to participate in the FGD. This use of triangulation enriched the findings, data validation and its analysis.

The study was premised on the objectives below:

- To investigate the effectiveness and sustainability of CF practices in enhancing productivity of smallholder farmers.
- To assess the adoption and success of CF practices by smallholder farmers at Sivomo ward 18, Nkayi District, Zimbabwe.

Guided by the objectives above, the paper presents the findings, draws conclusions and makes the following recommendations.

¹Henceforth, unless specified, CA and CF are used interchangeably.

FINDINGS AND DISCUSSION

Profile of Participants

Table 1: Profile of Key Informants and Households Interviewed

Key Informants (n=15)	Implementing NGO Director
	GAA
	4 NGO-employed Field Officers
	4 AREX Officers
	1 District AREX Officer
	6 State-employed Field Officers
Household Heads (n=45)	Average age = 50.6 years
	Gender = (52% Male;48% Female)
	Average Household Size = 8
	Farming Experience = 32 years
	Percentage on CF = 87%
	Labour above 15yrs of age = 44%
	School-going Household Members = 47%

The sources of learning about CA revealed a broad number of actors who have contributed to information and knowledge sharing. These main sources alluded to, included among others the facilitation by the schools in the area, GAA, NGOs, AREX officials and shared knowledge in agricultural meetings. The distribution of the sources identified is presented in Figure 1 below.

Sources from which farmers learnt about CA

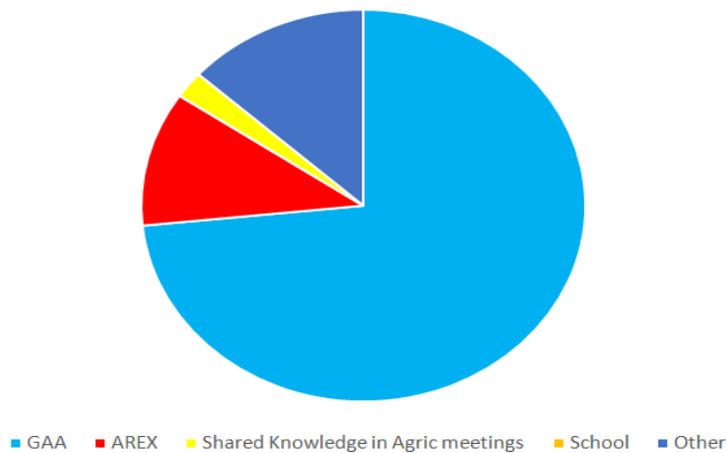


Figure 1: Source of Learning for Farmers at Sivomo (n=45)

The findings reveal that most farmers (73.3%) initially learnt about CA from GAA. The rest learnt from AREX officials (11.1%), shared knowledge in agricultural meetings (2.2%), learning from school (0%) as well as other sources (13.3%).

EFFECTIVENESS

The findings show that estimates improved between 2003 to 2004 and the 2004 to 2005 agricultural seasons. The major reason being that the farmers at Nkayi had an above average rainfall experienced during that period. Table 2 below presents a summary of these findings according to the official reports.

Table 2: Average Size, Output and Yield at Sivomo (n=15)

	Conservation Agriculture		Conventional Agriculture	
	2003	2004/05	2003/04	2004/05
Average Size	1.2	1.2	1.3	1.4
Average Output	480	520	450	500
Average Yield	400kg/ha	433kg/ha	346kg/ha	357/ha

Table 2 above shows the estimated output for the two seasons 2003/04 and 2004/05 for both conservation and conventional farming. The output for both farming methods was marginally different. The estimated yields per hectare also improved across both farming methods largely due to the decent rainfall experienced 2004/05 farming season. Yield assessment revealed that crops per hectare for conservation agriculture 8.25%, whilst that for conventional agriculture yielded a lower margin of 3.1%. The above findings both support and contradict some of the findings reviewed in related literature. Below are the findings from selected studies in Zimbabwe in Table 3 below:

Table 3: Plot Size and Yields – Selected Studies

	Baudron (2012)	Mazvimazvi & Twomlow (2009)	Siziba (2007)
Plot Size	2.1ha hand draught 3.5-6ha animal draught	2123m ²	0.73ha–Zimuto Home 1.4ha-Shamva Home 1.02ha-Zimuto Topland 5.83ha-Shamva Topland
Yield	-	1520kg/ha for CA 368kg/ha in conventional	702kg/ha to 2091kg/ha

Table 3 above depicts the findings of selected studies by plot size as well as yield per area cultivated. The research methodologies as well as sample sizes of each study cited differ, hence comparisons are made with caution. This study is in line with that made by Mazvimazvi & Twomlow (2009). The farm sizes in Nkayi tend to be larger than those in other areas studied by other researchers such as those in Siziba (2007) in Zimuto and Shamva. Notable differences are also recognised in the yields per hectare in these studies. Average estimated yields for farmers practising CA over two seasons were between 400 and 433kg/ha. This tends to be on the lower end of findings from both Mazvimazvi & Twomlow (2009) and by Siziba (2007).

ADOPTION

Findings on adoption are presented from two perspectives:

- key informants who solicit or encourage adoption of CA by farmers and
- Household interviews that reveal the process of adoption.

PROMOTING CA: PROCURING ADOPTION FROM FARMERS

Interviews with key informants revealed that all technical experts (100%) had disseminated information on ‘the ideal’ method of engaging CA. This constituted part of the ‘selling’ of the technology as well as reinforcing it. The dissemination of information was bolstered by periodic training sessions as well as frequent visits to sites by both AREX and GAA officers. Training and visits encompassed demonstrations by officers so that villagers became innately familiar with the correct methods of tending to their farms. Dissemination of information as well as support were not marketing

gimmicks². Key informants (100%) indicated that they genuinely felt that CA is a plausible farming alternative compared to other conventional farming methods for smallholder farmers in the region under study. However, this unanimity could not be maintained when it came to the total adherence to the model's standard edicts. Results show that 68 % of the participants indicated that it could not be applied in a totally rigid form, that is, farmers had to slightly deviate from the model's outlined process because of their indigenous knowledge of farming practiced over time.

The agricultural elements which were least suited for the area under study was ranked as, permanent soil cover (67%), crop rotation (20%) and minimal tillage (13%). The high ranking given to permanent soil cover deviates from the findings made by Mazvimavi, Twomlow, Belder, & Hove, (2008). Their observation was that farmers tended to neglect crop rotation in most cases. This incongruence is explicable considering the differences in the research participants and their locality. In this study therefore, the above question was posed to key official informants compared to Mazvimavi, Twomlow, Belder, & Hove, (2008), whose inquiry was directed to the farmers. In addition, the focus of this study was aimed at soliciting for the *opinions* of the agriculture officers, whilst Mazvimavi et al (2008) study targeted the personal *experiences* of farmers.

Focus of the discussions that were conducted out also bordered around the agricultural requisites that were lacking in Nkayi District. These were pointed out as livestock requirements, poor quality of soils for agricultural purposes and the shortage of the labour force. An example given by the respondents concerning provisions for livestock was that, most of the households who had livestock in the form of cattle, donkeys, goats or a combination of these, had insufficient grazing land. They resorted to stock feed, which was only afforded by a few farmers in the area. Hence this became a hindrance to livestock rearing due to land shortage. Farmers' perspectives and experiences on this matter are revisited in the findings below.

SUSTAINABILITY OF THE CA AT SIVOMO

On its inception in Sivomo, the conservation agriculture programme was open to everyone but mainly followed a similar launch-path for such programmes in the region i.e. vulnerable households were the primary targets. Most farmers interviewed recounted how the programme was promoted in 2003 through the use of attendant 'incentives' for the majority of would-be participants. Such incentives included seed handouts and fertilisers. However, it was the resultant merits of the method of farming that was more effective in luring other farmers to engage in the conservation agriculture than the use of incentives. Farmers (69%) who decided to join the programme did so a season or two later. The initial group proved to be the test case whose purpose appeared to be that of offering a demonstration effect for others. Upon observing the process and outcomes, other new farmers who joined the programme, tacitly followed the standard CA principles, which they later selectively employed. These farmers demonstrated the highest outlook on selecting those aspects of CF they found effective. Reasons that were provided for the selective bias revealed that the underlying logic was to adopt those aspects of the method which the farmers already had prior knowledge of. This knowledge base coupled with the observations made from the initial target group (12 farmers) formed a basis for selection. When further tasked to identify and rank the principles they were most likely to forego, farmers corroborated the sentiments of the key informants (see Table 2), 59% ranked permanent soil cover first, 31% ranked soil disturbance while 10% identified crop rotation third. What this suggested was that permanent soil cover was more likely to be neglected by the farmers compared to the other two

²Although distribution of inputs to interested farmers appears to be a way of 'selling CA'

principles, with crop rotation having the least risk of being relinquished. Permanent soil cover faced a high likelihood of neglect due to lack of grazing space for livestock in the area, as earlier on enunciated upon in detail above on the issue of livestock requirements. Moreover, adoption of a project/ programme is a process and not just an event. It takes time.

Farmers in Nkayi demonstrated that they mostly resorted to their prior knowledge and past experiences in the decision making aspects of the conservation farming activities. Armed with this reservoir of knowledge, farmers are greatly informed of the outcomes of what they are offered or engaging in. Consequently, they conceive this process not merely from a consumer perspective, but as partners who are worthy of consultation if and when there is need to.

An important question that needs to be answered regarding the CF programme in Nkayi is: Why did farmers at Sivomo hold back from participating when this programme was launched? Apart from the ploy to observe and learn discussed above, the participants' delay in accepting the agricultural approach is premised on two main reasons: (1) uncertainty over longevity of development interventions and (2) suspicion of the merits of the programme. The longevity of development interventions introduced by international NGOs are said to have aroused anticipation that was mingled with uncertainty. There was hope that the positive outcomes would emerge that would lead to the betterment of people's lives regarding food security and households' sustenance. However, because the existence period of the NGOs within the District and the government's support for the programme were not guaranteed, the longevity of it was questionable. As one participant remarked, *'they come here with good projects but once they leave, that is the end of everything'*.

From further discussions, it appears that CA was not perceived in different light from other development interventions which the communities had previously been exposed to. Many of the previous interventions had followed a similar path and were perceived as NGO promoted programmes that started off well but later died a natural death when organisations left. A 'wait and see' approach was therefore adopted by farmers to ascertain whether the new programme was just a passing phase or a permanent one.

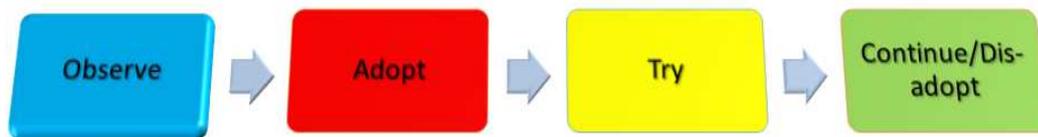
In addition to uncertainty, participants revealed that there was an element of suspicion concerning the arrival of any 'experts' who would introduce some 'good' programmes which turned out to be of limited benefit to the communities. Such rebuttals in the initial phases of projects have historical antecedents. As noted in the introduction, interventions in the form of new technologies in agriculture have a long history from colonial Zimbabwe (Wilson, 1995). Such a history reveals that other interventions that were promoted became symbols of oppression (Gumbo, Snelder, Wuta, & Nyagumbo, 2012) and therefore positions for resistance were rife (Mandondo, 2000). As Mandondo (2000:7) observes of colonial Zimbabwe, 'conservationist concern justified state intervention and inspired the beginning of centralised forms of environmental regulation, especially for native areas'. It is from such a perspective that CA is viewed with suspicion. To curb this mentality, there was need to spell out how the recent programme was different from the technocratic colonial one. As one participant farmer put it, suspicions in CA like any other programme that had a hidden agenda, had been fuelled by the promotion criteria that used some form of incentives to lure them. Suspecting that there were strings attached to the programme, the farmers first of all declined to engage in the process because they felt that it was a move to trap them somehow. However when the CA was finally adopted at Sivomo, the peasant farmers' involvement in CF, yielded positive outcomes and gained the trust of many. The average number of years in which farmers had been practising it now was 2yrs (see Table 2 below). The programme was facilitated by GAA which started with fewer households upon its inception. However, in the observations made by Mazvimavi et al (2008) the participation of households in some areas of Zimbabwe had dropped by 12%. Table 4 below, shows the participation of households for three consecutive years at Sivomo.

Table 4: Duration of Participation in CF, Sivomo (n=45)

	Number	% of Sample
<i>Been a part from inception i.e. 3yrs</i>	12	27
<i>2 years</i>	23	51
<i>1 year</i>	4	9
<i>Never</i>	6	13

The above table reveals the distribution of participants by duration of participation in CA. What it does not reveal is the number of those who ‘dis-adopted’ (Pedzisa, Rugube, Winter-Nelson, Baylis, & Mazvimavi, 2015). Upon further probing on the reasons for having been ‘laggards’ in joining the programme, we discovered that apart from the need to observe, 40% of participants had adopted the technology at one point and then dis-adopted it. The recurring reasons for this scenario is that (60%) pointed out that there were high labour demands for the process, with (20%) citing the declining yields to the method, the other (20%) revealing that there was little support proffered by their technical partners and the NGO contributed (13%) of lack of support. The approach regarding adopting the technology therefore appears to be taking an “observe, adopt, try, continue/dis-adopt” depending on the experience of individuals. The process is discussed in more detail below. The findings below point at whether the farmers at Sivomo still needed to sustain the CA/CF programme or not, in the event that GAA withdraws its support.

Not every farmer at Sivomo became a participant in CA when the programme was introduced by GAA. Those interviewees in this study who have continued to be involved in CA (n=45), (69%) joined the programme after an initial group of twelve (21%) vulnerable households had participated for at least a year. The study discovered that most participants had undergone a process whose key stages are outlined in the figure below.



OBSERVATION AS A PROCESS AT SIVOMO

The process outlined is drawn from the responses of in-depth household interviews. There was no time frame to this process. Farmers would undergo the stages over the course of one season/one year while others took two years. Observation entailed watching processes and activities in an attempt to understand and compare CA with other conventional methods. In this regard, farmers were made aware of the costs and benefits of the project. Some crucial considerations in this stage included the input support from the development partner as well as technical support from officers. These are resources which for a farmer yet to adopt CA, appear to place participants in CA at an advantage. It was not uncommon for farmers who were not involved in CA to attend demonstrations and training sessions in order to learn more about the technology and to assess the farming methods they could adopt themselves. Labour input comparisons also formed an extensive part of the farmers’ observations. This involved taking stock of the amount of labour input expended in weeding and tending to the farm in CA as compared to similar farming activities under conventional methods. From interviews conducted, most of the participants indicated that more human was required. Therefore as a reaction to this demand, some farmers formed labour groups that were bent on harnessing labour from the community that was pooled towards one area at a time. These labour groups were called ‘amalima’ and are observed elsewhere in the region (Nkayi RDC, 2014). Apart from the comparisons in inputs and support, farmers also took note of the output over comparatively

similar-size farms. The evidence in the literature largely supports CA as a more productive farming method (Marongwe, 2011; Thierfelder, Cheesman, & Rusinamhodzi, 2012). However, perceptions in this study which are important in shaping the decision-making process in either to adopt or dis-adopt, provided a mixed picture of events. Farmers were divided over which farming method they felt yielded more output with 48% citing CA, 32% citing conventional methods and 20% uncertain. In discussing the perceptions further in focus group discussions, it was revealed that some farmers selectively applied principles of CA in conventional farming method. This cross-breed of methods made it impossible for the farmers to strictly align the success of their yields to one method. After making these lengthy observations, it was then up to each individual farmer to weigh the costs and benefits of the programme so as to either or refrain from adopting CA.

ADOPTION AS A PROCESS

In the second stage of the process, the study was largely concerned with those who adopted CA. The adoption stage revealed an interesting dynamic. Participants who adopted the technology did so largely because of the support they anticipated in terms of inputs (38%) and technical support (31%). Others were drawn by the merits of CA (23%) as well as what appeared to be held behaviour or social pressure (8%). These findings have varied implications for the sustainability of the programme. If merits of the technology and its efficacy are not primary attractions for adoption, it is uncertain whether participants will continue with the programme once the key attractions (inputs and technical support) are withdrawn or reduced. From the data, the researcher could neither conclusively state that farmers would stop practising CA nor that they would revert to conventional, ploughing methods because these questions were not explicitly asked.

TRYING OUT AS A PROCESS

A common term used in describing the active participation in CA was '*zama*' which loosely means try. Trial comprised the third stage in the adoption process. *Zama* was used in many variants such as '*siyazama nje*' meaning we are just trying. The suggestion is that CA is a technology which farmers are trying out and by implication have not fully adopted at Sivomo. This approach then leads to the fourth process which comprises of either continued participation (which is full involvement) or dis-adoption (which involves discontinuing). The persistence of trial period as part of the process suggests that farmers take time to 'warm up' to the technology, a reality which most likely results partly from the fact that the benefits of CA are incremental and therefore take time to fully materialise (Giller, Witter, Corbeels, & Tittonell, 2009). For some, trial is a long drawn-out affair which lasts many seasons while others take relatively less time.

CONTINUE/DIS-ADOPT AS A PROCESS

Upon completion of the trial period, farmers either adopt or withdraw from the project. In this study, this is a very important stage because it represents the 'real' hands-on or practical adoption or none of it in CA programmes. In other words, farmers may participate in the project as part of the decision-making process for a short period as in trying it out on their own. It is after they have experienced this stage that farmers who persist with it can be deemed to have adopted it. To claim that farmers have adopted a technology simply because they have merely been drawn towards it is –from the findings– an anomaly in analysis.

To clarify this further, a question was posed to the farmers on their choice of method between conventional or conservation agriculture. The farmers' responses are presented in the chart below.

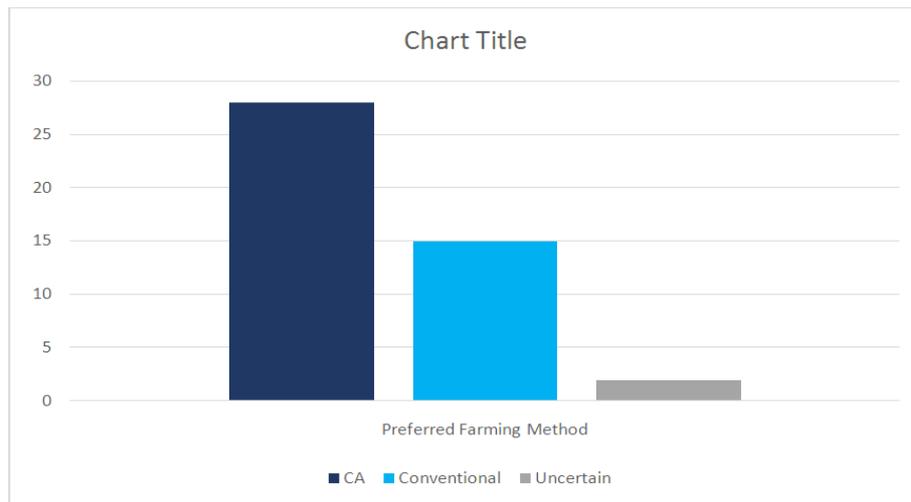


Figure 2: Preferred Farming Methods at Sivomo (n=45)

Figure 3 above reveals that most farmers preferred to persist with CA (28) while others leaned towards conventional farming (15). Only two farmers were uncertain. The findings suggest that although CA was received in varying degrees, it had drawn some popularity. Given the yield levels identified earlier, this would make sense because the CA estimated increase in maize yield per hectare was 8.25% while conventional agriculture yielded a lower margin of 3.1%.

OTHER FACTORS AFFECTING ADOPTION

Sumberg (2005) argues that for a more careful conception of adoption, influence should not be based (on what he calls) exogenous factors of adoption, but should focus on endogenous factors which lie within a farmer’s control. With this in mind, the study explored the livelihoods formations –beyond farming- available to households at Sivomo. This enriched the findings because it revealed that there are multiple strategies that smallholder farmers adopt to hedge themselves against unforeseeable agricultural shocks and vulnerabilities. However, perceptions on agriculture policy were incorporated in the discussion because of the role that past experience with policy and practice played in farmers’ decision-making.

ALTERNATIVE LIVELIHOODS

The findings suggest that rural farming households are active economic agents with a diverse livelihood portfolio from which they derive alternative means of income. Table 5 below depicts the livelihood alternatives exercised at Sivomo, broken down into frequency by household.

Table 5: Livelihood Alternatives in Sivomo (n=45)

Livelihood Option	Frequency	Percentage of Sub-Sample
Gold panning	7	16%
Selling of wares (artefacts, clothing etc.)	12	27%
Vegetable gardening	28	62%
Alcohol brewing	9	20%

Table 5 above reveals that households adopt a variety of livelihood strategies to earn income which form a bulwark for agricultural produce and income security. The study includes this dimension because of the precarious nature of agriculture as a livelihood option despite its centrality. Other assessments have tended to look at agriculture alone,

which gives the impression that when this option fails, rural economies are ruptured and livelihoods completely lost. While the study cannot ascertain the extent to which the livelihood options identified support households, it is recognised that rural farm communities are not helpless entities incapable of finding solutions to their challenges. Strategies (however meagre) are available to rural communities. Moreover, communities employ these livelihood options even as they embrace technologies such as CA. The result is often a diverse portfolio which yields incomes of variable sizes and also places demands on available labour. With regards to the labour component, the study has already noted how CA is perceived as being labour-intensive. This perception corroborates findings in other studies (Mazvimavi, Twomlow, Belder, & Hove, 2008; Marongwe, 2011; Pedzisa, Rugube, Winter-Nelson, Baylis, & Mazvimavi, 2015). The implication given from the recognition of other livelihood options is that scarce labour must be divided across or between different livelihood alternatives -not to mention household activities. This thinning out of labour makes it difficult to allocate limited labour supply to one specific activity. Resultantly and within this context, it is hardly surprising that farmers resort to employing some aspects of CA as a way of spreading out their labour over numerous activities which sustain household livelihoods.

POLICY AND THE ADOPTION OF CONSERVATION

As stated in the introduction of this paper, land is a resource and a construct which is replete with political, social and economic connotations. The intertwined issues which shape and have been shaped by land ownership, land tenure and land use (of which conservation is a part) have significant implications both in terms of policy and practice. The findings and discussion in this section place particular emphasis on the policy dimension with CA at the centre. In the discussion with key informants as well as part of in-depth interview with household heads, the study sought to gauge perceptions of policy approaches in agriculture, implications for CA and practicability. When it comes to policy in agriculture, the colonial and post-colonial governments have largely maintained a centralised and undemocratic system in the management of rural resources (Mandondo, 2000). Agriculture has particularly been designed to meet elitist interests, been largely corporatist and often apathetic to inclusivity regarding rural farmers. As a result, it is mostly the large scale commercial farmers who tended to benefit from policies in the sector both before and after independence (Gumbo, Snelder, Wuta, & Nyagumbo, 2012). After the land reform/appropriation exercise, policy tended to be politically driven and therefore failed to be effective. This is in line with Mukwereza (2013) who observes that while the government and western donors are promoting no-tillage conservation agriculture, it has also benefitted from the Brazilian funded tractors [which] certainly do not fit into that thrust.

Keyinformants who were quizzed about the government's agriculture policy with respect to conservation farming, were able to spell out its dictates effectively. These technical informants played a pivotal role in achieving the policy objectives as well as the policy position on sustainable agriculture. What appears consistent among responses from officials interviewed is that the state has since independence, factored in a smallholder farming policy document. The most prominent policies noted were the Zimbabwe Agenda for Sustainable Socio-economic Transformation commonly referred to as Zim-asset (100%), the Five Year Development Plans (80%) as well as the Zimbabwe Agricultural Policy Framework (73%). Conservation agriculture was identified by participants in Zim-asset (100%) as well as the Zimbabwe Agricultural Policy Framework (40%). It is in the most recent policies that CA appears to have found greater recognition. The policy roles that were identified from key informant interviews include information dissemination (80%), training (100%) as well as monitoring and evaluation (67%). Considering that the roles identified are largely supporting roles to smallholder farmers, it is perhaps no surprise that all AREX and NGO officers noted these and were conversant with them.

The last area of enquiry in relation to policy, focused on the factors that had to do with the fostering of sustainable agriculture. Some of the technical informants (60%) stated that the current policies did foster sustainable agriculture, while (40%) of these were more circumspect by offering conditional responses instead. However, a contrast emerged from the less optimistic participants who observed varying applications of CA by farmers as well as the state, and the persistent challenges that emanated from the land reform/appropriation exercise. An NGO agro-officer thus stated '*after land reform, many aspects of the agricultural policy have been affected because of changes in tenure, scale, as well as activities of farmers*'. While the explanations given were plausible in some respects, it is evident that despite perceptions of a positive relationship between CA and sustainability, policy implications specifically for rural smallholder farmers are uncertain. This is due to the continued reconfiguration of policies to suit the prevailing political situations.

CONCLUSIONS

The issue of adoption is a complex and largely subjective matter. Continuous assessment of factors drawing farmers to CA programmes may be required to ensure that those factors which threaten future sustainability do not become the primary attractions for farmers. If farmers join projects merely for benefits such as inputs, then sustainability of that project is jeopardised should the incentives be withdrawn. Taye (2013) echoes a warning for similar issues by pointing out that such areas of divergence do not serve to 'prove' a given position, but are pointers to areas that need future improvement for sustainability.

This study revealed that adoption of CA depends on farmers' choice which to a great extent is based on observation and trying out of the programme. The study also revealed that the use of crop residue as soil cover reveals complexities over priorities in smallholder farms, an aspect of CA which has also been discussed in other studies (Wall, 2007; Giller, Witter, Corbeels, & Tittonell, 2009). Ensuring that permanent soil cover of at least 30% as per the guidelines proves problematic in some cases, it is also worth noting that smallholder farmers have insufficient paddocks for their livestock which end up destroying the soil in the farmland. Farmers at Sivomo have painted a vivid picture of some of these complexities by revealing how adoption is not an *event* but constitutes a *process* which varies from agent to agent as a result of differing decision-making procedures.

The effectiveness of CA and its uncertainty, is largely as a result of historical agricultural inequalities. A new era of progressive policies, information dissemination and effective CA training strategies could help in dispelling this negative mental outlook of novel programmes in agriculture. Moreover, farmers at Sivomo have selective applications of CA which make it a challenge for researchers to determine explicitly the extent to which the application and output of the programme is measured. In spite of these challenges, yields per hectare appear to fall within the upper range of findings from other studies. Resultantly, some these farmers are using their adept experiences as well as knowledge of the local climate conditions and constraints to selectively use of CA method to their advantage.

RECOMMENDATIONS

In light of the findings and discussion above the following set of recommendations are made:-

For Researchers

Future studies ought to be embedded in inter-disciplinary as well as multi-disciplinary studies. Empirical studies in such an approach would offer an important conception of technological uptake and efficiency. These may also help to

probe deeper into complex localized social and political factors. Hence, studies using such a lens as decision-making models may have a lot to reveal in the adoption of agricultural technologies.

For Developmental Officers/Agricultural Practitioners

Less technocratic approaches to agriculture should be adopted. Emphasis should be on consultation as a way of soliciting for more diverse ideas, perceptions and experiences. A technocratic approach raises challenges in that it is top-down and therefore likely to be received with suspicion and in a lukewarm manner.

For Farming Groups

Increased or enhanced use of social capital to leverage farmers against the CA's demand on labour is of paramount importance. A more detailed analysis of the structure and functioning of *amalima* (*labour groups*) in different parts of Zimbabwe could reveal a lot on how best the farmers can harness the collective labour to their advantage.

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