AN EVALUATION OF THE CONTRIBUTION OF CONSERVATION AGRICULTURE ON HOUSEHOLD INCOME OF SMALLHOLDER FARMERS IN CHEGUTU DISTRICT OF ZIMBABWE

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ABSTRACT

The study results indicated both negative and positive effects with variables such as maize output, conservation agriculture and education being statistically significant in impacting on per capita incomes of rural households. Conservation agriculture traits and demographic factors greatly impact on household per capita income as shown by the results. The results suggested that the education level of the farmer is strongly associated to the type of farming practised. The chisquare value and its corresponding probability value all point to a signficant association between market accesibility and the type of the farmer. The level of market access has a huge influence on the farmer's decision between conservation and conventional agriculture. In addition the null hypothesis of no association between gender and the type of farming was rejected at 5% indicating that the observed differences were indeed significant. The result also indicated a negative relationship between distance from the market and percapita income. This implies that a kilometer increase in the distance from the market will significantly reduce percapita income. Maize is the staple food in Zimbabwe which provides a source of livelihod for many rural farmers in remote areas of the country. Assuming favourable producer prices and a ready market, farmers can sell their maize output which consequently increases their income levels.The coefficient follows the fact that maize production plays a pivotal role in improving rural income in Chegutu district, Zimbabwe.

Keywords: agricultural technical and extension services, conservation agriculture

INTRODUCTION

Evidence has shown that rural communities face serious poverty prevalence and the sale of the produce that they obtain from the fields is still a crucial source of income for them (NBS, 2009 and Chuhan and Vinaya, 2016). Conservation Agriculture (CA) has been supported by government, research institutions and non-governmental organizations in an attempt to counter problems to do with declining yields which is acting negatively on the incomes of the rural household. Rural households commonly face sceptical and structural limitations which include high dependence on dry land production and lack of infrastructure such as irrigation schemes. Lack of market access, inputs unavailability and limited extension services are some of the major problems that are hindering the efforts to eradicate rural poverty. To improve the policy formulation process and interventions, this study investigated the impact of selected socio economic factors on household income of smallholder farmers.

CA has emerged as a mitigation strategy to a variety of problems since it increases food supply whilst offering a sustainable environmental protection (Hobbs, 2007 and Vinaya et al. 2017). Despite the implementation of many agricultural systems in trying to improve the wellbeing of the smallholder community, rural incomes have not changed considerably. Carney (2002) and Toner (2002) postulates that CA may possibly subsist as the answer to an enhanced way of living for rural households in countering social and economic instability, poverty and susceptibility. It is hoped that if these issues are addressed, smallholder farmers can improve their production levels, ensuring food security and effectively countering poverty. Before establishing the technicalities surrounding the principles of CA, it is equally imperative to initially appreciate its technicalities so as to understand the relevance and reasons for its application in rural Zimbabwe. Conservation agriculture consists of three basic principles namely (1) minimum soil disturbance (2) legume based cropping and (3) use of organic mulch. These principles improve infiltration, reduce evaporation and soil erosion and also build organic soil content (FAO 2001).

OBJECTIVE

(1) To determine the socio-economic characteristics of

smallholder farmers in Chegutu district

(2) To examine the contribution of conservation agriculture towards household per capita income

METHODOLOGY

A total of 51 households were selected as the total sample. The sample comprised of 51 households, farmers practicing CA and non adopters of CA. The group of farmers who were practising conventional farming were used as the control group. The respondents were geographically spread and the sample was done with a purpose in mind hence a purposive non probability technique was used. . Household questionnaires were used to extract valuable information concerning land areas and output estimates through recall. 51 household heads responded to the administered questionnaires by way of the alphabetic ordering of names approach.

A semi structured questionnaire was used as the

primary data instrument to collect cross sectional data for the 2013/2014 cropping season. The questionnaire was administered to 51 maize producing households in Mhondoro under Chegutu district, Zimbabwe. The questionnaire contained a methodical list of questions which were designed to extract information pertaining demographic information, farming systems, farm operations crop production coping and marketing strategies under the maize enterprise. Classification of CA farmers in their own stratum was achievable at 50% with the assistance of local Agritex officials while the remainder constituted of the other group. The questionnaire mainly constituted of mostly closed questions for the ease of simple capturing of statistical analysis while open ended questions were applied where relevant. STATA statistical software version 10 was used for analysis.

The main objective of the study was to evaluate the contribution of conservation agriculture on smallholder farmers' household income in Chegutu, Zimbabwe.

RESULTS AND DISCUSSION

Characteristics of the respondents and their association with type of farming

Table 1: Gender and type of farming   **n=100**

Gender	Conventional farming	Conservation farming	Percent
Female	31	16	47.00
Male	20	33	53.00
Pearson Chi²(2) = 4.4636	**		

** significant at 5%

According to the results presented in table 1, male farmers dominate the total sample as they constitute 53% while female farmers constitute 47%. From the 47%, majority of female farmers are found to engage more in conventional farming methods (31%) while only 16% of them practiced conservation agriculture. The converse situation holds for male farmers. Majority of male farmers (33%) were found

to engage in conservation agriculture and only 20% were conventional farmers. It can also be observed that within the total sample, majority the percentage of conventional farmers was slighlty higher (51%) than the percentage of farmers practising conservation agriculture (49%). According to the probability value of the pearson chisquare, the null hypothesis of no association between gender and the type of farming can be rejected at 5% indicating that the observed differences are indeed significant.

Table 2: Marital status and type of farming

Marital status	Conventional farming	Conservation farming	Percent
Single	00	06	06.00
Divorced	08	04	12.00
Widowed	12	10	22.00
Married	29	31	60.00
Pearson chi2(3) = 3.7717			

According to results reported in table 2, a greater percentage of farmers in the sample were married. A higher percentage was constituted by married farmers (60%) followed by widowed (22%), divorced (12%) and single farmers (6%) respectively. Majority of married farmers were found to be conservation farmers albeit with a slight margin,

31% relative to the 29% of conventional agriculure farmers. None of the single farmers was a conventional farmer in the sample while only 6% of them were conservation agriculture farmers.The results imply that the observed differences between conservation farmers and conventional farmers in table 2 are insignficant in statistical terms. This also implies

that marital status of the farmer has no relationship with the type of farming he/she practises as a livelihood strategy.Table 5 shows the association between the farmer's educational level and the type of farming.

The results presented in table 3 indicate that majority of the farmers in the sample were not educated. Farmers falling in this education category constituted a percentage as high as 30% followed by farmers who had tertiary education (26%). Farmers with at least primary level and secondary level constituted 22% each. With regards to the type of farming engaged, it was observed that majority of uneducated farmers (24%) surprisingly engaged in conventional farming while only 6% of them practised conservation farming. The opposite true for farmers with primary and tertiary education

respectively. Majority of the farmers with these qualifications were found to practise conservation agriculture (14% and 18%) relative to the 8% who engaged in conventional agriculture for each of the two educational levels respectively.

Conclusively it can be noted that the a null of no association between the two categorical variables (educationl level of the farmer and the type of farming practised) can be firmly rejected. The results suggests that the education level of the farmer is strongly associated to the type of farming practised. In similar terms, the observed differences in table 2 are statistically significant. Table 3 presents results on the association between the farmer's level of market access and the type of farming practised by the farmers in the study area.

Table 3: Level of education and type of farming   **n=100**

Levelof education	Conventional farming	Conservation farming	Percent
None	24	06	30.00
Primary	08	14	22.00
Secondary	11	11	22.00
Tertiary	08	18	26.00
Pearson chi2(3) =8.1248	**		

** significant at 5%

Table 4 indicates that majority of the farmers in Chegutu district had no market access. The percentage of farmers belonging to this group was as high as 63% relative to the 37% of farmers who had access to the market. Market accessibility is a fundamental factor which affects the farmer's decision in chosing between conservation and conventional farming because the latter type of farming is commonly practised for commercial purposes hence access to the market becomes fundamental. In most remote areas of the country, farmers practising conventional farming are

generally for commercial purposes meaning they tend to sell their produce to the market and this is explained by the result in table 4 in which majority of farmers with access to the market belong to conventional farming.The chisquare value points to a signficant association between market accesibility and the type of the farmer. The level of market access has a huge influence on the farmer's decision between conservation and conventional agriculture hence the result in table 3 is plausible.

Table 4 : Market access and type of farming   **n=100**

Acces t the market	Conventional farming	Conservation farming	Percent
No market access	12	25	37.00
Market access	39	24	63.00
Pearson chi2(3) =4.5611	**		

** significant at 5%

Table 5: The contribution of conservation agriculture towards household per capita income   **n=100**

Sr. No.	Variable	Coefficient	Standard error	t-statistic
X_1	Distance from the market	-4.460***	0.583	-7.65
X_2	Household head age	0.510	0.550	0.93
X_3	Household age-squared	-0.006	0.005	-1.08
X_4	Maize output	0.018***	0.002	7.55
X_5	Secondary education	0.059	2.287	0.03
X_6	Tertiary education	8.475**	3.711	2.28
X_7	Civil servants	1.009	2.479	0.41
X_8	Unemployed	-8.959***	3.191	-2.81

X$_9$	Conservation agriculture	6.410***	2.075	3.09
	Conservation agriculture x Tertiary education	-9.213*	4.668	-1.97
	Constant	26.946	13.036	2.07
	Adjusted r-squared	0.7834		
	Prob > F	0.0000		
	Number of observations	51		

*, **, *** denotes p < 0.1, p < 0.05 & p < 0.01 respectively

According to the results presented in the table 5, the adjusted coefficient of determination which measures the goodneds of fit is 0.78 indicating that 78% of variation in household income is explained by the explanatory variables included in the model

Distance from the market

The result indicates a negative relationship between distance from the market and percapita income. The intepretation of the result is that a kilometer increase in the distance from the market will significantly reduce percapita income by a margin of 4.4%. The coefficient is highly significant implying that distance from the market is a fundamental determinant that affects per capita income in the study area. In general terms, an increase in the distance from the market will mean farmers incurr high transport cost when transporting their farm produce to the market and this will resultantly compromise their financial position.

Household head age

Household head age was statistically insignificant because the probability value is above the 10% maximum significance level implying that age does not affect per capita income in Chegutu district.

Maize output

Maize output was statistically at 1% level of significance implying that a 10% increase in the maize output will significantly increase per capita income by a magnitude of 0.018% holding all other factors constant. Maize is the staple food in Zimbabwe which provides a source of livelihood for many rural farmers in remote areas of the country. Assuming favourable producer prices and a ready market, farmers can sell their maize output which consequently increases their income levels. Given that the coefficient was statistically significant, it follows that maize production plays a pivotal role in improving rural income in Chegutu district and presumably Zimbabwe at large.

Secondary education

The secondary education dummy was statistically insignificant implying that farmers who have secondary education are not statistically different from farmers who have primary education in terms of per capita income. This is plausible considering that tertiary educated households are more likely to be employed in a well paying job as compared to households with secondary and primary education.

Tertiary education

The dummy variable for tertiary education was categorised into three groups and those who had primary education were the control group. The results showed that the mean per capita income of households who have tertiary education was relatively higher by 8.4 dollars as compared to mean income of those who have primary education. The dummy was significant meaning to say that farmers who have tertiary education and those who have primary education are statistically different in terms of per capita income.

Unemployed households

Occupation had three categories namely self employed, civil servants and unemployed households. The result indicates that the mean income of unemployed respondents is 8.9 dollars lower than the mean income of self employed respondents. The coefficient is statistically significant at 1% meaning to say that self employed respondents are significantly better off in terms of per capita income.

Conservation agriculture

Turning to conservation agriculture dummy which took the value 1 for a farmer who engaged in conservation agriculture and 0 otherwise, the dummy is positive and highly significant. The result indicated that the mean income of farmers who practice conservation agriculture was higher by 6.4 dollars relative to the mean income of the the reference group. The coefficient was found to be statistically significant at 1% level of significance pointing to a fact that conservation agriculture farmers are statistically different from conventional agriculture farmers in terms of per capita income. This means that per capita income is dispropotionally distributed in favour of conservation agriculture farmers.

The interaction between conservation agriculture and tertiary education was surprisingly negative and statistically significant. The result showed that the mean income of conservation agriculture farmers who had tertiary education was relatively lower by a magnitude of 9.2 dollars

considering that when all variables in the model are equal to zero, a typical farmer in Chegutu district has a per capita income of 26.9 dollars as shown by constant term.

The results explains the fact that the impact of tertiary education on per capita income largley depends on the qualification held other than farming as a source of income. For instance, a farmer who holds a degree in accounting may not be the same as the farmer with a degree in agriculture. The former farmer may realise low output and income relative to the latter farmer.

CONCLUSION

Conclusively, gender, market access and level of education showed a positive association with the type of farming that the farmers were involved in. The t-test results indicated that per capita income is disproportionly distributed in favour of CA farmers.

Conservation agriculture proved to impart positively on increasing the income of rural households. Explanatory variables such as distance to the market, maize output, farming type and education attracted significant probabilities of 1%, 5%, 10% significant probabilities indicating either a positive or a negative relationship with per capita income of a household. Maize output and CA status proved to have a positive influence on income. The interaction of CA and tertiary education was negative and statistically significant implying highly educated farmers may not appreciate such technical strategies as they are not willing to adopt such a technology and having no knowhow of the basic principles of agriculture. They may resultantly opt to stick to their old ways of farming.CA as a variable of interest showed positive influence on income.

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