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An Analysis of the Viability of Winter Wheat Farming Under the A1 Land Resettlement Model in Zimbabwe: A Case Study of Mazowe District

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Abstract
The study analyses the viability of winter wheat production in Zimbabwe's A1 resettlement farming sector. This sector emerged from the implementation of the Fast Track Land Reform Programme (FTLRP), starting 2000, when a new farming structure with new farming communities emerged. In most sectors, and for the major crops grown, output seemed depressed as compared to pre 2000 levels. This study picked winter wheat, a strategic food crop in Zimbabwe and examined its production viability under the new dispensation and to understand the factors influencing its viability. A sample of 80 farmers from Mazowe district was used to assess viability over a season, typifying a single production cycle. The mean gross margin figure was calculated, and found to be –US$155.7, indicating qualified non-viability of the enterprise. Regression analyses identified fertiliser, working capital, area planted and education as the key factors affecting viability, with R^2 =0.725. The study recommended government to partner the private sector to address production side factors, key of which are input prices including water, energy, credit and extension; and then pricing on the marketing side to improve winter wheat viability.
Keywords: Fast track land resettlement programme(FTLRP), strategic food crop, wheat, viability, Mazowe.

1. Introduction

The history of wheat production dates back to the 1960s when the then Rhodesian government was placed under international economic sanctions by Britain, the Commonwealth and the United Nations, following the Unilateral Declaration of Independence by the white minority regime in 1965. The government embarked on an inward looking import substitution and food self-sufficiency strategy, reducing dependency on a single crop tobacco through implementing crop diversification schemes which involved the production of maize, wheat and cotton. Prior to 1965, Southern Rhodesia produced only 2 percent of its annual wheat requirements with the rest being imported. As part of the diversification strategy, the government in 1965 announced a support price for wheat, which was above the import parity. In 1966, the Farm Irrigation Fund (FIF) was launched to assist irrigation development through the provision of soft loans. Zimbabwe's wheat crop is best grown during the winter period (May-August) under irrigation, because the main rain season falls in the summer, and the summer crop is believed to be un-viable due to diseases and high temperatures. Recent findings by some researchers though indicate that summer wheat can be viable in Africa(Morris and Byerlee, 1991). The pricing policy during the UDI supported agricultural diversification from tobacco towards wheat, soyabeans, cotton and beef. (Rukuni, 1987) The high yielding varieties coupled with development of the Sabi-Limpopo irrigation schemes in the low-veld and guaranteed wheat prices resulted in a dramatic increase in wheat production in the late 1960s (Roberts, 1967 in Muir-Leresche, 1985). By 1971, the country was producing 75 percent of its domestic wheat requirements. In 1976, Zimbabwe for the first time, became self-sufficient in wheat and a modest exporter from 1976 to 1978.

During the first few years of independence, the government announced a minimum wage legislation which in turn increased consumer demand for manufactured food items including bread. (Rukuni, 1987) Self-sufficiency in wheat then declined following this sharp increase in demand for wheat and its products. Since then, local wheat production has not kept pace with local demand, which continued to outstrip supply(Shiferaw et al). Since independence, the government has attempted to set wheat producer prices to provide just enough incentive to encourage farmers to make full use of existing irrigation potential. (Jansen, 1982; Morris, 1988). Selling prices to local millers were above import parity prices during most of the 1980s. Millers in turn received subsidies in order to guarantee low bread prices for consumers. (Rukuni and Eicher, 1994). Wheat production in Zimbabwe grew from 4 000 tonnes in 1964 to 256 000 tonnes in 1988/89. Wheat is playing an increasingly important role in national food security as it is the second most important food cereal in Zimbabwe, and the sole winter cereal for direct consumption, accounting for about 11 percent of total cereal production of 2.3million tonnes (Kapuya et al 2010).

Throughout the 1990s, the gap between wheat supply and demand continued to grow thereby widening the import gap. Rukuni and Eicher(1994) noted that Zimbabwe continued to be a net importer of wheat although bread prices were no longer controlled, while wheat sales to millers continued to be rationed. The Fast Track

Land Reform Programme(FTLRP) commencing year 2000, saw the number of A1 farmers increasing to 145 775 farmers and A2 farmers to 16 386. Although the greater part of the FTLRP has since been completed, it remains to be seen if the increase in numbers of small-scale farmers will translate into increased agricultural productivity (Matondi and Chikulo, 2012).

The country lost 66 190 hectares of irrigation land between 1997 and 2003 partially due to the land reform programme which caused conflicts over new farmers' access to irrigation facilities including theft of movable irrigation equipment. The best agro-ecological zones for wheat production are located largely in the highlands of Mashonaland Central, Mashonaland East and Manicaland, and they have the largest irrigated area which stands at 13 820 hectares (69 percent of the irrigated areas under resettlement). The area under irrigation marginally improved in 2004 in all the provinces due to the subsidies provided by the state for winter wheat production. (Rukuni and Eicher, 1994).

Irrigation is expensive and the profitability of irrigated production is critical in justifying both short-term and long-term viability of an enterprise. Strong management is needed to enhance efficiency, recover costs and to be able to sustain the whole system. Small-scale irrigation has historically received only erratic and insignificant support from state funding and very little from the private sector.(Rukuni, 1988). Analysts suggest the need to increase producer prices in order to provide adequate incentives for farmers (Headicar, 1987, Jayn et al, 2006), whilst others regard winter wheat production as being inherently unprofitable in Zimbabwe. Hence the country would be better off concentrating on traditional export crops like cotton and tobacco to generate the foreign exchange with which to purchase wheat in global markets (Muir-Leresche, 1987). In the proposed study, the researcher seeks to examine the viability factors affecting the production of winter wheat farmers under the A1 land resettlement model.

Despite the noted earlier achievements in the wheat sector, the advent of independence in 1980 saw investments in the sub-sector declining, government budgetary constraints increasing, and wheat production levels in the country declining over the years. Total annual output was on a declining trend from 325 000MT in 1990 to a record low of 18 500MT in 2008 against a consumption requirement of about 450 000MT/year(Mason et al 2012). Currently, the economy is heavily dependent on imports averaging 250 000MT/year. (Mutambara et al, 2013).

Yet Zimbabwe is regarded as one of the most productive of the wheat growing nations in Africa, with wheat farmers being heavily dependent on irrigation (CIMMYT, 2012. Climatic conditions in Zimbabwe are generally highly favourable for irrigated wheat production(Morris, 1988). The declining wheat output is counterpoised with dramatically increasing consumption demand due to the increasing urban population and changing tastes thereby projecting the sad picture of an unmanageable and worsening deficit situation for the nation. This has also widened the import demand of other wheat products. (Mutambara et al, 2013). Dependency on imports exposes a nation to the vagaries of global market and supply shocks which are characterised by wide price fluctuations, exacerbated by fluctuating and unstable foreign exchange rates(CIMMYT, 2012). This situation rings alarm bells in the policy making corridors and academia cannot comfortably continue to ignore. It is in this realisation that the current research effort has been planned with the general objective of investigating viability of the wheat enterprise as currently undertaken by A1 smallholder farmers under irrigation together with those factors that influence viability. There is therefore a need to address and investigate the key factors contributing to the decline in winter wheat production which have prompted the country to depend solely on wheat imports to fill up the shortfall whilst widening the trade gap, and to propose suitable solutions. It is key for this study to identify the weaknesses in winter wheat production to understand the reasons behind production decline in recent years in order to improve production in the near future Hence it is imperative to carry out an in-depth study of the production challenges being faced by farmers. A need has also arisen to establish whether these challenges have stemmed from regulatory issues, the operating environment or transitory circumstances.

The main objective of the study is to investigate the benchmark for viability of winter wheat production under the A1 land resettlement model in Zimbabwe. The study will also reveal the socio-economic factors affecting A1 wheat farmers and raise policy recommendations aimed at boosting local winter wheat production under the A1 land resettlement model. Most studies on wheat production in Zimbabwe are based on large scale commercial farmers with little attention being paid to the small scale newly resettled A1 farmers. The study aims to expose the calamities undermining growth in the small holder wheat sector.

2. Methodology

2.1 Study Area

The study was carried out in Mazowe District, one of the seven districts in Mashonaland Central province, 60km out of Harare. Mazowe lies in agro ecological zone IIa, which supports a diverse form of agriculture. It has fertile soils, reliable rainfall (750-1000mm per annum). It has a total surface area of almost 453,892 hectares. Mazowe District has a diverse agrarian structure, which emerged out of the FTLRP. The area is best known for producing maize, cotton, burley tobacco, horticultural products and wheat. The district has a number of water

sources, which include the Mazowe dam, Ruye River amongst others, which make irrigation possible. The A1 farmers have a communal setup, with plot sizes averaging six hectares

2.2 Sampling Methods and Sampling Size

A multi-stage sampling procedure was employed, with the first stage purposively selecting 5 villages, among them those with the highest numbers of wheat farmers. A total of 16 households were then selected in the second stage, from among wheat producers in each of the chosen villages, all being wheat farmers having been in the sector for more than ten years including those who planted for the 2014/15 season. Altogether 80 farmers were covered by the survey. Agritex officers were also included in the survey as key informants who provided a source of triangulation for verification of results obtained. They also provided secondary data in the form of records on wheat production trends and total area under winter wheat production. Secondary data was also collected on consumption and imports which were used for analysis.

2.3 Data Collection and Sources of Data

A combination of quantitative and qualitative methods of data collection were employed in the study. Quantitative data was collected from the semi-structured questionnaires administered to the farmers, while qualitative primary data was collected through key informant interviews. Household heads were interviewed, whilst in their absence any individual involved in the farming activities of the household was interviewed. Data collected covered the socio-economic characteristics of farmers, patterns and costs of production, existing marketing channels as well as the constraints which are affecting them.

2.4 Data Analysis and processing

Data coding, processing and analysis was done using MS Excel to summarize the data and to generate all descriptive patterns of the sample data which were displayed in graphs, tables, pie charts and other visuals to describe the data, while the Statistical Package for Social Sciences (SPSS v16.0) was used for assessing factors affecting viability. The main descriptive indicators which were employed in the study were the measures of central tendency values for all the variables which are useful in analyzing household characteristics and establishing relationship variables. MS Excel was also used to compute costs and expenses used to calculate the mean gross margin figures.

2.4.1 Multiple Regression Analysis

Multiple regression analysis was done to determine whether the various independent factors were statistically significant in explaining the variations of wheat productivity of the households. Regression analysis is a tool for evaluating the relationship between one or more variables(Gujarati, 2004). The dependent variable is wheat output which is measured in tonnes per hectare. Extant literature postulates a multiplicity of likely regressor variables which explains the recourse to the multiple regression format.

The general form of the multiple regression model employed is as follows:

$$\mathbf{Q = \alpha + \alpha_1 X_1 + \ldots + \alpha_n X_n}$$

Where Q = output in tonnes per ha, α = intercept, X_1 ….X_n are the variables of influence, and α_1 to α_n are the elasticities.

The specific form of the model assumed in this study is specified as follows:

Model specification:

$$\mathbf{Q = \alpha + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \alpha_5 X_5 + \alpha_6 X_6 + \alpha_7 X_7 + \alpha_8 X_8 + \mu}$$

Where, α = constant

α_0 , $\alpha_{1\text{-}8}$ = factor elasticity estimating the relationship between output and variable.

Q = wheat output (tons per hectare)

X_1 = area cultivated under wheat (hectares)

X_2 = working capital invested (US$)

X_3 = Seed quantity (kg)

X_4 = quantity of fertilizer (kg)

X_5 = market distance from the depots (km)

X_6 = education level

X_7 = access to credit

X_8 = marital status

μ = random error term

The production function in this analysis is a multivariate function which seeks to find out the effect of changes in the amounts of more than one input (Gujarati 2004).

The a-priori model expectations are summarized in Table 1 below.

Table 1: Expected Signs of Explanatory Variables

Explanatory variables	Expected signs	Explanation of the relationship
Area under wheat	+	There is a positive/ direct relationship between output and the total land area under winter wheat. Hence an increase in the area should lead to an increase in the level of output achieved.
Distance to the market	-	An inverse relationship exists between output and the distance to the market. The greater the distance the more transport costs the producer incurs thereby discouraging production and reducing output levels.
Fertilizer Quantity	+	A positive relationship exists between the quantity of fertilizer applied and output level. Hence increasing fertilizers should result in an increase in output levels.
Credit	+	Credit allows farmer to plan production and put sufficient acreage under cultivation thereby increasing his harvest and output.
Seed quantity	+	Access to good seed varieties improves the overall yield and level of output.
Working capital	+	Increasing available working capital facilitates easy production management and financing of operations thus directly increasing the output level.
Marital status	+	It is believed that married couples plan together and help each other with decisions thus improving the quality of decisions made hence output.
Education level	+	Output is positively related to farmer's educational level, hence improving the level of education will assist in increasing the level of output.

2.4.2 Gross Margin Analysis

Gross margin analysis was used to determine the viability of winter wheat. It is the difference between gross output value, and total variable costs for a particular enterprise per land area (Ngunguzala, 2011).

Gross Margin = Gross Income – Variable Costs

Where Gross Income is derived from the product of total volume of output produced (Q) and producer price (P), whilst the variable costs are derived from the costs of inputs like fertilizer, seed, land preparation, weeding, crop chemicals, harvest labour, transport and marketing costs, which have been incurred per hectare of crop cultivated.

According to researchers, Barnard(1979), and Nhundu and Mushunje(2010), whilst assuming that fixed costs remain constant, the gross margin is the amount at the households' disposal. In addition, Taj-Uddin and Talukder(1997) define gross margin as the difference between the gross income derived from an enterprise and the total variable costs. Hence an increase in Gross Margin will raise the profit by exactly the same amount. In the Short Run, an enterprise will be worth keeping and investing in as long as the GM is positive.

Sensitivity analysis will be carried out to determine the level of sensitivity of the Gross Margin to changes in price, yield and variable costs.

3 Results and Discussion

3.1 Household socio-demographic characteristics

According to Ashraf Ragab El-Ghannam (2005), demographic characteristics of households are critical in analyzing socio-economic data as they manipulate the household's economic behaviour. The decisions made have an influence on the level of output produced. It has been established by Chiweshe (2015) that A1 farmers in the Mazowe area consist of people from diverse backgrounds in terms of age, wealth, status, profession, gender, and educational and farming qualifications.

Gender of household head

The majority wheat growing households (81.8%) were headed by men, while those headed by women constituted 18.2%., which nearly replicates the national resettlement land distribution by gender which puts the figures at 82% males and 18% for females (Utete Land Report, 2003). The dominance of male-headed households is explained by the fact that the land reform programme was for families and most households are male headed (Mazuru et al, 2007). It was established that men take a leading role in the organizational activities at farm level, while women and the rest of the family provide support in the form of labour.

Age of Household

The youngest householder in the survey was 25years old, with the oldest being 76years old. The average age was 47.7years, which means that those within the upper middle age range (46-55years) are growing wheat. Chiweshe (2015) established that age not only influences access to physical resources but also engagement in social networks which play a key role in the decision-making process. The age distribution also indicates that the majority of land beneficiaries under the A1 resettlement scheme are the younger and lower middle age groups (<50 years).

Household size

The average household size on A1 farms in Mazowe is 8 persons with the smallest household having 2 members and the largest having 15. With the national average at 5 persons per household(Zimstat, 2012), this means that households in this sector are much bigger. On average, households have 5 children under the range of 15-less years and less than 1 person over 65years, implying a high dependency ratio as such age groups are greatly dependent on the (15-65) age range. They form a significant part of the agricultural workforce such that those households with no children are disadvantaged as compared with those with many in terms of labour supply. Most small-scale farmers are dependent on family labour for production purposes. Access to cheap labour is crucial for successful wheat farming especially for land preparation and manual harvesting.

Wheat farming experience

About 63.2% of sampled farmers had been in the wheat sector (>10years) since settling on the land followed by those who ventured into the sector in the last five years(26.3%) indicating that over 90 % of the farmers had not less than 5 years experience in wheat farming. This is important since experience contributes significantly to the proper management of production activities, thus improving enterprise viability.

Marital status

This vote showed 77,5% of the sampled farmers being married, followed by the divorced 15%, the widowed 5% and 2.5% being single. Mazhawidza and Manjengwa (2009) indicated that the government policy stipulated that a settler had to be either married or widowed, thereby having a discriminatory approach towards single unmarried women who wanted land in their own names. Married couples however, usually make better production management decisions due to combined hence balanced decision making leading to improved viability.

Education level of household head

Education helps farmers understand the decision environment thus influencing the quality of decisions being made by the household. The survey in Mazowe established that 75.5% of the plot holders have attended secondary school, and 19.1% have primary education, which left a mere 5.4% with no education. Thus 94.6% of the interviewed households have the basic tools to be considered literate. High literacy levels have a positive influence on improving production capacity and viability of enterprises undertaken.

Source of Income

Most farmers (48%), recorded crop sales as their main source of income, followed by livestock(29%) horticultural activities (18%), and business (8%). The primary crops mainly focused on are maize, tobacco and horticulture. Wheat is not being considered an important crop for cash generation in Mazowe. Cattle, goats and poultry are the primary livestock used as a tool to finance or supplement their expenditures. Due to the presence of small industries in the urban centres, some of the interviewed respondents are formally employed and engaged in their local business within these vicinities to supplement their incomes. Some 2.4% of the interviewed farmers are involved in other occupational activities like bee-keeping to supplement their incomes (casual labour, flea market operations). Most of the interviewed, newly resettled A1 wheat farmers in Mazowe (73.8%) are full-time farmers whilst 40% are part-time farmers.

Agricultural training level

55.6% don't have any form of agricultural qualification, whilst 25.4% have a master farmer's training certificate. 10.9% hold a certificate in agriculture, 4.6% have a diploma, whilst 0.7% have a degree. Agricultural skills with an emphasis on farm management help in improving the production capacity of farmers. A mindset of viewing farming as a business was dependent on the nature of agricultural training which builds capability of effective planning and management (Chiweshe, 2015:).

Asset base

Study findings revealed a relatively weak asset base for most farmers, which makes it difficult for them to finance meaningful agricultural enterprise. 95.4% own a hoe, 85% axes, 77.3% shovels, 62% knapsack sprayers, 52% mouldboard ploughs and 40% an ox-drawn cultivator. A few farmers own bigger productive assets; that is 8% own a tractor drawn cultivator, 15% water pump, 9% planter, 4% scotch carts and 15.2% a tractor. Most of these farmers inherited an assortment of infrastructure and assets from the former white farmers which included paddock fencing, dip tanks, irrigation pipes, houses and farm sheds. Only 34.4% own cattle which provides draught power for planting purposes. This becomes a major challenge for those who do not own cattle. The main implication here is that farmers in Mazowe cannot be expected to finance proper wheat growing since they lack the threshold resources to enable them to participate effectively in commercial whet production. They need to be empowered through financing arrangements that enable them to borrow funds.

Technical support

A1 producers have access to the services of the local Agricultural Extension services department who provide information related to the production and management of their produce. However, some respondents highlighted the need for increased consultation and engagement with the extension officers. The main reason for this is the shortage of transportation means for extension officers to reach all farmers spread across the district. Some

reported that the extension officers needed training in modern and new methods of farming so that they offer relevant extension to farmers.

3.2 Gross Margin Analysis

Study findings revealed the following cost and price data which were factored into GM calculations.

Table 2: Gross margin budget

Margins	Production performance
Average yield (t/ha)	4.4
Average price ($/ton)	US$466
Average gross income	US$2050.4
Average variable cost*	US$2206.10
Gross margin	**-US$155.7**
Return/$TVC	**-0.071**

Source: Survey Data (2014)

*Variable costs are costs for seed, land preparation and weeding, irrigation water charge, fertilisers, chemicals, harvest labour, transport and marketing costs.

Results reflect that A1 wheat farmers in Mazowe district face a negative gross margin($155.7) which makes this enterprise not viable under current economic environment. For each hectare of wheat planted and harvested, the farmer loses US$155.70. It therefore does not make economic sense for farmers to produce wheat. This agrees to some extent with findings by other researchers on wheat production(Shiferaw-not dated, Mutambara et al 2013)

Sensitivity analysis and implications

Yield perspective: an improvement in yield of 0.3tonnes or 6.8% from the current 4.4 tonnes/ha to 4.7 tonnes/ha will reduce losses to zero, that is farmers will break even. Improvement in yield beyond 4.7tonnes/ha will result in a profit being made by the farmer. The implication is that farmers should improve efficiency in their operations to improve yield level to above 5 tonnes per hectare.

Price perspective: a rise in the current wheat price by $35 or 7.5% ($466 to $501) will see farmers eliminating their losses, but not profiting, only breaking even.

Implications: The margins needed for breaking even are slim on both sides (price improvement(6.8%) or yield improvement(7.5%). This indicates that the current loss making situation by the farmers in Mazowe is not as bad as at face value. Efforts via appropriate policy instruments on either side can "easily" bring viability to the operations of the farmers. The price side would pose more challenges (budgetary) since the prevailing world market price of wheat is the benchmark, and is already below $466/tonne. The relatively easier side to address, and for which it also makes better economic sense is the yield and cost. Farmers can work on improving yield through an improved management regimen that aims at optimum resource use in production, reduction of wastages through cost control. A 7% reduction in variable costs can result in farmers breaking even. This is the better toute since it calls for efficiency at all levels – technical, allocative and pricing.

Production constraints

For the A1 producers who participated in this study, the main constraints in winter wheat production included high costs of inputs and utilities, lack of finance, the outbreak of quelea birds amongst others. Regarding high costs of purchasing inputs, farmers resort to using indigenous varieties of seed and reduce on other important inputs such as pesticides. This affects the quality of their produce which becomes susceptible to pests and disease. Further, the high costs of utilities such as electricity for irrigation pump systems often results in power supply disconnections over non-payment and coupled with regular power outages.

Most interviewed farmers stated that the situation is compounded by the lack of funding for the sector as financial institutions are demanding immovable collateral before they release loans, a prerequisite which most farmer's lack. Farmers say the high cost of locally produced inputs such as fertilizer, seeds, pesticides, and farming machinery is making farming expensive.

3.3 Regression analysis

A linear regression model with 8 predictor variables was regressed against a dependent variable, wheat output. It was done to identify the significant variables which influence wheat production in Mazowe.

Table 3 Coefficients of the regression model

	Un-standardized coefficients		**Standardized coefficients**		**Sig.** (95% con interval	
	Beta	Std. Error	p-value	Beta	p-value	Part correlation
(Constant)	-134.188	46.637		0.006	-2877	
Area under wheat	70.548	10.363	0.622	0.000**	6.808	0.532
Distance to the market	19.283	9.225	0.168	0.042	2.090	0.154
Quantity of fertilizer used	1,285	0.628	0.179	0.047***	2.045	0.451
Access to credit	-747	0.451	-1.72	0.104	-1.659	-0.123
Quantity of seed used	11.077	1.323	0.806	0.000*	8.371	0.618
Working Capital	12.749	8.334	0.158	0.043**	2.075	0.155
Marital status	0.991	0.492	0.229	0.050	2.015	0.209
Education	17.340	11.476	0.476	0.043*	2.045	0.238

***Significance at 1%, **Significance at 5%, *Significance at 10%, $R^2 = 0.725$;

Model predictive power with $R^2 = 0.725$, is considered adequate, meaning that 72.5% of the variation in wheat yield is explained by the variables included in the model. The other 27.5% of the variation is explained by other factors not included in the model.

Quantity of fertilizer applied was the most significant factor (Part correlation=0.451, $p < 0.01$, B=0.047). This is an input elasticity of yield which means that increasing the amount of fertiliser applied by one unit would increase the gross margin by 45%. This is in line with production economics theory typifying the functional relationships underlying the traditional production function. In this instance it explains the positive relationship between fertiliser use and changes in output. Water and fertiliser combination in sufficient amounts contribute significantly to increased crop output, and this is the case for wheat farming in Mazowe where farmers maybe using less than the recommended application rates for wheat production. This is in agreement with the a-priori model prediction which attributed a positive relationship between fertiliser quantity and viability. This agrees also with other researchers (Katema 1998, Mutari et al 2012, Nathaniel et al 2014, Shiferaw not dated) who in their different studies also found a similar positive relationship between fertiliser intensity and yield.

Area under wheat and **working capital** were significant in positively influencing wheat output (B = 0.00 ; and B = 0.043 respectively, $p < 0.05$ for both) with respective part correlations of 0.53 and 0.155. The positive relationship found for both agrees with the a-priori prediction which also postulated the same relationship. More land put under a crop, ceteris paribus, results in a larger harvest, while more working capital broadens the options available to the farmer with respect to his/her production planning and financing which helps in improving output.

Quantity of seed used had a positive effect on wheat output (part correlation = 0.618, B = 0.000, $p < 0.1$.) The effect of seed used is positive at 10% level of significance indicating a direct and positive relationship between certified seed use and output achieved. This has the largest part correlation at o.618 meaning that it explains 62 % of the variation in wheat output.

Access to credit and **marital status** both had a positive but insignificant influence of wheat output, hence no effect on the gross margin. Access to credit has the effect of avalling funds required to to enable and smoothen production operations. It is related to working capital which was found to have a positive and significant effect on output. These should therefore move strongly in the same direction. The directional trend is therefore correct though the strength of association is inexplicably weak.

Education had a positive and significant effect of wheat output (Part correlation = 0,238 ,B=0.043, $p < 0.1$).This means that education explains or is responsible for 23,8% of the variation in wheat output, being significant at 10%. With increased education, one understands better how to manage the production of a crop enterprise. Educated farmers are usually aware of new technologies and open to new ideas which can help improve their operations. This relationship is also positive according to prior expectations (Table 1)

Distance from the market had a positive but insignificant effect on wheat output. This is probably because Mazowe district is not far from Harare (40km)the capital city where wheat is sold. The producers in the district do not therefore feel the effect of transport charges on their produce since it is minimal. A-priori model expectations for this variable had indicated a negative relationship implying reduced output as distance increased to reflect the negative impact of increased transport charges on farmers profits hence and inclination to reduce output as costs increased.

4. Conclusion

It has been established that winter wheat farming is a male dominated sector, with 71.25% of the sampled households being male-headed. The dominant age range of wheat farmers currently stands between 46-55 years. The average household size was 8 persons, which is higher than the national average. Most of the farmers' income was reported from cultivation of other crops, not wheat, while some indicated horticultural production and livestock production as their principal sources. It can therefore be concluded that the farmers in Mazowe exude no trait that would impede them from producing wheat viably. The status of households with respect to age, marital status, gender and family size, in general conform with the normal Zimbabwean populace, with Mazowe households being slightly larger than average, indicating easy labour availability for wheat production. The fact that wheat farming has not been included among the veritable sources of income for farmers, simply points to its un-viability as an enterprise under current conditions. It has already been established that winter wheat production is not viable under the current economic environment, as the average gross margin stands at –US$155.7. However, sensitivity analysis revealed that only marginal increments and decrements (not more than 8% either way) in wheat prices and yields on one hand, and in costs of production on the other; would easily change the scenario with farmers managing to break-even. For as long as the case for self-sufficiency in wheat production in Zimbabwe stands, the A1 irrigation farmers of Mazowe can be assisted through proper policies by government and other relevant stakeholders to get them to produce wheat on a commercial level given the suitability of the area for wheat growing.

Fertiliser intensity, area planted to wheat, working capital availability, quantity and quality of seed used and farmer's level of education, all have positive relationship with the wheat output. It is these factors that policy makers should seek to influence in order to help promote winter wheat production in Mazowe district in particular, and in Zimbabwe overally. Policies that would reduce the cost of inputs like fertilisers, credit and energy would go a long way in boosting the wheat enterprise in Mazowe district and the nation at large. Seed policy should aim at ensuring that suitable seed varieties for our agronomic conditions are developed and made available to farmers at affordable cost. Their availability in easily accessible points to farmers should be ubiquitous. A sensible pricing policy should be put in place to guide (as opposed to controlling) price discovery in both the input and commodities markets aimed at encouraging the farmer to profitably produce, and ultimately reducing the nation's dependence on imported wheat.

The prevailing environment where climate change has become reality, with adverse implications on the production of food grains like wheat, calls for investment in irrigation infrastructure as an essential mitigatory response to ensure improved productivity. There is need therefore, to improve operations in existing irrigation schemes, revamp and restore the old irrigation schemes and supporting infrastructure to positively contribute towards maintenance of winter wheat sustainability. The government should put policies that facilitate input suppliers' access to credit lines thereby supporting their recapitalization ability. Credit facilities should work on providing bankable loans with low interest rates to improve working capital availability. The need to build effectively on the existing agricultural research and extension services in support of capacitating farmers. This is key in increasing productivity, whilst motivating extension officers through worker remittances and improving their knowledge base.

It is desirable even if domestic production is more costly than importing subsidized products, to promote and develop domestic production against cheap imports and provide domestic support to the production.

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