Analysis of the factors affecting the adoption of farmer led irrigation iniatives in the model a1 schemes of Zimbabwe: A case of Mazowe district.

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Abstract- Farmer led irrigation is a new phenomenon that is fast gradually take shape in the redistributed lands of Zimbabwe under the Fast Track Land Reform. This type of irrigation is taking place without much knowledge of the policy makers and irrigation planners. This study focusses on those factors that influence A1 model farmers in the adoption of this type of irrigation and Mazowe District was used as a case study. The current study utilized a mixed method research design with a target population of 3441 Smallholder A1 irrigating farmers in Mazowe District. The sample size for the study for quantitative data was 310 while 5 public officers were for qualitative data. For purposes of quantitative data stratified random sampling and convenience sampling were used while purposive sampling was employed for the 5 key informants (qualitative data). Data collection instruments used were a questionnaire for quantitative data, an interview guide for key informant interviews and focus group discussions while participatory observation was applied on transect walks. Processing of data was done using iNvivo version 12, SPSS version 20 and Amos version 22.5 before being analyzed by the researcher in line with the research objectives. The study found out that there were thirteen factors that affected the adoption of farmer led irrigation. The highest factor influencing the adoption of FLI was access to finance and the factor with the lowest influence was soil fertility. The study recommended government subsidies to farmer led initiatives, use of ICT and training to both smallholder farmers and extension officers. This study further called for more research in the future to include other variants of farmer led irrigation besides the one hinged on the use of water pumps. Further to this need, this study also calls for incorporation of market information and other stakeholder views to validate the views of interviewed A1 farmers.

Index Terms- farmer led farming, Fast track land reform, A1 model, livelihoods, A1 farmers

I. INTRODUCTION

Academic debates on land reform in the region focus on the political and social rationality of land redistribution as an approach to redressing inequalities in access to productive resources including land ownership and access during the colonial era (Mandizadza, 2011). Land reform according to Boyce et al. (2005) describes the reallocation of rights to establish a more equitable distribution of farmland. At independence in 1980, Zimbabwe had inherited a skewed land ownership structure where 80 percent of all the arable land was owned by only a minority of white commercial farmers who only constituted less than 2 percent of the population (Marongwe, 2009). As a result, the new government of Comrade R.G Mugabe embarked on the first land reform programme to re allocate land rights from the few minority white farmers to the majority previously marginalized black indigenous settlers in both the communal and urban areas. They claimed that the reallocation could be a very powerful strategy in promotion and transformation of the economy and livelihoods of the farmers (Mukodzongi et al., 2017). This narrative of economic transformation and improvements has become more pronounced now against the backdrop of climate change, COVID 19 global pandemic and the war between Russia and Ukraine which has shown that over reliance of foreign aid for food is more likely to expose African economies to food insecurity. Zimbabwe with a massive land transfer reform should not be part of such statistics with abundance of land and water, the two most important resources (Rukuni, 2011). In this regard, Scoones et al. (2019) posit that in the rural and resettlement areas of Zimbabwe, smallholder farmers are now engaging into farmer led irrigation without the acknowledgement of the state and irrigation planners. This paper investigates the factors affecting the adoption of farmer led irrigation under the A1 model of the Fast Track Land Reform (FTLRP).

II. PROBLEM STATEMENT

The progress of Zimbabwe's Fast Track Land Reform Programme (FTLRP) of 2000 has been varied in terms of progress (Njaya, 2015). The initial causes and the resultant consequences of the FTLRP have been debated widely and now significant body of literature of the FTLRP exists (Masiiwa, 2004; Moyo, 2000, 2004; Njaya, 2016; Richardson, 2004; Sachikonye, 2003; Scoones, et al., 2010, 2019; Zikhali, 2008). The programme is credited with addressing the historical land imbalances and the same time broadening the base of black economic participation

(Mukodzongi, 2017). Despite being credited with the overhauling the racial inequalities in land ownership in Zimbabwe, the program is associated with losses in agriculture production and economic collapse (Richardson, 2004). The negative impacts often highlighted create a negative picture of the FTLRP. However, there has been lack of solid empirical research on how such an extensive land redistributive programme has impacted on the livelihoods of smallholder farmers especially those that have gone on to engage in farmer-led irrigation farming (Njaya, 2016). In this regards A1 model settlement farmers who have ventured into farmer led irrigation or those intending to practices farmer led irrigation need to make sound decisions before engaging in farmer led initiatives and there is need for pertinent information on factors that affect adoption smallholder farmer led irrigation. Furthermore agricultural financiers require information in order to make sound decisions regarding the funding of small holder farmer led irrigation initiatives in terms of economic viability concerns which would more likely improve the livelihoods of resettled farmers especially A1 model farmers. This paper undertook to analyse the factors that influence the adoption of farmer led irrigation under the A1 model of the FTLRP in Mazowe District in Mashonaland Central Province of Zimbabwe.

III. REVIEW OF RELATED LITERATURE

A. Farmer led irrigation

Woodhouse et al. (2017: 13) define farmer led irrigation development as a process where smallholder farmers assume a driving role in improving their water use for agriculture in so doing bring about changes in knowledge production, technology use, investment patterns, market linkages and governance over land and water resources. The development of smallholder farmer led irrigation has been noted across developing nations as being of highly significant value in mitigating the effects of climate change and being a catalyst to sustainable long term agricultural and national development (Chisango and Maphosa, 2016). Farmer-led irrigation is also further defined as an irrigation practice initiated, managed and financed by farmers themselves (Lefore, et al., 2019), mostly by individuals (de Fraiture and Giordano, 2014), but sometimes in small groups (Beekman et al., 2014). The irrigated areas are typically small (less than 2 ha), the technologies are generally low-cost (Lefore, et al., 2019), and the farmers produce both high-value horticultural crops and staple crops (Otoo et al., 2018).

B. Fast track Land Reform

Zimbabwe undertook a massive second land reform programme of 2000 which undertook to transfer over 10 million hectares from 6400 former commercial white farmers to indigenous black farmers. Due to its accelerated nature of implementation it was code named Fast Track land Reform (FTLRP) and was initially spearheaded by veterans of Zimbabwe's armed struggle (Mukodzongi, 2017)

Model variants under the FTLRP

Under the FTLRP, the government of Zimbabwe implemented two model variants, the A1 model and the A2 model (GoZ, 2003). According to Zikhali (2008), the A1 model just like the other earlier (A) model in phase 1 was undertaken on a villagized model or self-contained model. The same author further notes that under the villagized model, a beneficiary is allocated 3 – 6 hectares of arable land, half a hectare for residential space and 16 – 30 hectares for communal grazing (Mukodzongi and Lawrence, 2019). The design of the A2 model variant was to accommodate medium to large-scale commercial farmers with the ability to mobilize own resources (Mukodzongi, 2017). In all the resettlement models, the government's purpose was that of improving production of food to ensure food security in the country by allocating, the peasants, larger pieces of land than the previously owned (Scoones and Warmer, 2002).

Smallholder farmer led irrigation and farmers' livelihoods

The study as a result, explored the role that smallholder irrigation farming plays on A1 resettled farmers' livelihoods. The FTLRP was implemented in an accelerated manner and radically transformed the county's land ownership and agrarian structure (Zikhali, 2008). The FTLRP drastically reduced the land within the white dominated large-scale commercial sector and expanded the black dominated small-scale farming sector (Njaya, 2015).

In general, there has been progress of the FTLRP from 2000 to date in terms improving farming methods, decongestion of rural areas and redressing of land inequality. The causes and the subsequent consequences of the FTLRP have been widely debated and there is a significant contribution to academic literature regarding this program (Deininger et al., 2002; Matondi, 2012; Masiiwa, 2004; Moyo, 2004; Mukodzongi, 2019; Richardson, 2004; Rukuni et al., 2006; Sachikonye, 2003; Scoones, et al., 2019; Zikhali, 2008). To its credit, FTLRP addressed the Zimbabwean land question. The land ownership dispute as noted by Munyoro et al. (2018) centers on colonial policies (land husbandry act of 1930 and the land apportionment acts of 1951) that allocated most of agricultural prime land to the white minority while depriving land ownership to the black majority making them landless or crowding them in the less productive areas of the country. This has positioned a significant sector of the population of the indigenous Zimbabweans to contribute more meaningfully to the national growth agenda. The FTLRP has been associated with loss in agricultural productivity and economic collapse and violence in the manner in which it was implemented (Sadomba, 2008). These narratives have created a picture of pessimism about the FTLRP. These negative impacts, often overly highlighted, overlook the positives that such a massive programme can have on the livelihoods of the resettled small-scale farmers. Some pertinent questions that arise are: Have there been any welfare and income gains for smallholder farmers under the A1 scheme of the FTLRP? What are the perceptions of A1 farmers with regards to productivity under the FTLRP?; What then are the factors that have influenced the adoption of farmer led irrigation iniatives by A1 model farmers?

Previous studies on smallholder irrigation in Zimbabwe focused on examining the association between smallholder irrigation and livelihoods but did not deal with the factors affecting the adoption of this new type of irrigation system under the redistributed lands. (Kabongo, 2020; Mhembwe and Dube, 2017; Tshuma, 2015). Therefore this paper notes that the level of farmer led irrigation adoption under A1 schemes under the FTLRP is not well documented.

Studies of smallholder irrigation schemes have mainly been focused on communal areas where irrigation schemes were

developed by either the pre-independence or post-independence governments (Chazovachii, 2012; Manzungu, 1999; Mombeshora, 2003; Rukuni and Eicher, 1994). In such schemes Makadho (2008) notes that , the land is state-owned but managed by groups of farmers who share water resources, infrastructure, and each family has an area of not more than 0.5 hectares. This is supported by other studies in smallholder irrigation schemes in Zimbabwe (Chazovachii, 2016; Manzungu, 1999; Mombeshora, 2003; Rukuni, 2006). Historically, small-scale irrigation schemes were regarded as insurance against crop failure that leads to famine in the absence of other means to access food (Makadho, 1994).

The beginning of the FTLRP redefined the dynamics of smallholder irrigation. According to Scoones et al. (2019). The land reform of 2000 in Zimbabwe redistributed about 10 million hectares once owned by approximately 6400 white commercial farmers. This, according to Ministry of Lands (2022), has resulted in establishment of around 146 000 A1 and 16 000 A2 scheme units. Land allocations to smallholder farmers under A1 scheme were in the range of 3-6 hectares of arable land and the majority of these plots can be deemed to be having access to irrigation water from both old and new sources on the farms (Scoones et al., 2019). Some of the plots are located in areas where there exist irrigation infrastructure like water pipes, water reticulation and water pumps left by former commercial farmers. This land is mostly fertile land and in most cases there is access to water sources previously used for irrigation by the former white commercial farmers under the previous agricultural land dualistic setup before the onset of the FTLRP (Tshuma, 2007). This radical reconfiguration of the agrarian structure according to Scoones et al. (2019), has given rise to the need to reestablish different agricultural production scales particularly under irrigation. The resettlement models implemented to date are a useful starting point in understanding the present models of A1 and A2 under the FTLRP.

C. Factors influencing the adoption of farmer led irrigation in Africa

The issues of crop productivity are naturally preceded by the question; do A1 farmers invest in irrigation? The general view is one that it is only the more secure commercial farmers that invest in irrigation is at variance with studies from the region. According to Woodhouse et al. (2017), there is evidence that, contrary to the belief that is generally held, A1 farmers invest in irrigation.

There is evidence of farmer investment in agriculture according to studies carried out on the continent (Woodhouse et al., 2017). Farmers invest in irrigation at both household and aggregate level (Woodhouse, et. al., 2017). The small investments at household level have a significant cumulative effect on overall irrigation development. Wamara et al. (2014) report that in Ghana the official import data show that over USD8 million was used to import over 65000 pumps and accessories between 2003 and 2010. This investment figure was at par with the official figure in large scale irrigation investment. Wamara et al. (2014) further posit that irrigation farming is done on vast tracts of land by using water lifting technologies.

Approximately 115 000 hectares of undocumented farmer-led irrigation may exist in Mozambique (Beckman, et al., 2014). This figure would officially double the recorded national statistics on developed irrigable land in use which in 2012 stood at 118 000 hectares in Mozambique (Beekman, et al., 2014). The same pattern of use also obtains in Tanzania and Zimbabwe. Scoones et al. (2019) in a study in Masvingo District, Zimbabwe found out in their study of FTLRP farms that farmer-led irrigation development was three times more than the official irrigation statistics thereby challenging the national figures for the same presented by Manzungu et al. (1999).

Smallholder irrigation farmers are also known to interact with external actors and this influences the rural economies (Scoones, et al., 2019). In this regard, Woodhouse et al. (2017) noted that investments in small holder farmer led irrigation initiatives are influenced by the broader socio-economic environment. Financial investments by farmers on farmer led irrigation initiatives are not guided by what Woodhouse et al. (2017) term agro-ecological potential or irrigation potential but by economic factors.

Labour mobility is an additional critical aspect of rural economies. According to Hill (1963) and Swindell (1978), migrant labour plays a key role in the intensification of agriculture in Africa. This has been noted in schemes like Gezira in Sudan (Robertson, 1987), the Senegal River Delta (Woodhouse et al., 2017). A large number of immigrants made irrigation construction in farmer-led irrigation development possible for instance, Zimbabwe immigrants in Penhalonga in Mozambique (Beekman, 2014). Use of shallow wells for irrigation has caused reversal of rural-urban migration in Ghana as youths got involved in horticultural production given the attractiveness of horticultural products in attracting market and good competitive markets (Wamara, et al., 2014).

The third factor influencing how farmers invest in irrigation development is that of land tenure. Land has always been a subject of intense debate in Zimbabwe. These issues have been mostly directed at the A2 commercial model scheme leaving out the A1 model scheme. According to World Bank (2010) the prevailing paradigm is one that formalized land rights constitute a pre-condition to investment in agriculture. On the contrary, agricultural intensification was not inhibited by customary land holding systems in many countries and this is supported by studies on farmer-led irrigation development across SSA (Beekman et al., 2014). In Ghana peri-urban agriculture is expanding owing to increase of dam constructions around towns. This is despite lack of secure land rights for the cultivated land. The same farmers continue to expand their cultivation areas despite threats of housing construction projects in these areas. In countries such as Mozambique, farmers acquire land outside of traditional land tenure governance through seasonal land lease arrangements (Beekman et al., 2014). This is also done in the framework of customary authority, consistent with what Chimowa and Woodhouse et al. (2017) termed the vernacular land markets. These farmers make entrepreneurial decisions that are highly influenced by existing customary land tenure authority and national state governance institutions.

The widely held belief that irrigation can only be feasible with state or donor support is highly disapproved by events on the ground in most of SSA (Woodhouse et al., 2017). Farmers are

investing even in areas where there is no security of land tenure. This may be explained in part by the high returns from irrigation agriculture compared to dry land farming. Irrigation conditions allow households to cultivate during the wet and dry seasons, giving the land a high augmentation effect (Dube, 2019).

Efficacious irrigation schemes allow for intensive crop production and increases in land productivity. As a result smallholder irrigation schemes allow for a certain degree of crop diversification which is not possible with rain fed agriculture (Liao, et al., 2008; Tan, et al., 2009). In studies to assess the impact of irrigation in Asia, Lipton et al. (2003) note the direct impact of irrigation on output levels. In the same studies it was found that irrigation enhances crop yield through mitigating against mid-season droughts. Secondly, irrigation permits multiple cropping and as a result increases annual outputs. Thirdly, irrigation allows for the greater use of land for crop production where rain fed production is minimal or marginal.

IV. METHODOLOGY

The current study utilized a mixed method research design with a target population of 3441 Smallholder A1 irrigation farmers in Mazowe District. The sample size for the study for quantitative data was 310 smallholder farmer practicing farmer led irrigation while 5 public officers were for qualitative data. For purposes of quantitative data stratified random sampling and convenience sampling were used while purposive sampling was employed for the 5 key informants (qualitative data). Data collection instruments used were a questionnaire for quantitative data, interview guide for key informant interviews and focus group discussions while observation was applied on transect walks. Processing of data was done using iNvivo version 12, SPSS version 20 before being analyzed by the researcher in line with the research objective.

V. RESULTS

A. Demographic profile

The demographic characteristics considered were gender, age, level of formal education, religion, and marital status, and household size, position in home and type of occupation.

Table 1. Frequency and validity percentages of the demographic characteristics, gender, age, level of education, religion, marital status, household size, position in home and occupation of the A1 farmers sampled in the Mazowe District in Zimbabwe during the month of February 2021.

		Frequency	%	Valid %	Cumulative %
GENDER	Male	189	61.0	61.0	61.0
	Female	121	39.0	39.0	100.0
AGE	18 – 30 years	70	22.6	22.6	22.6
	31 – 40 years	101	32.6	32.6	55.2
	41 – 50 years	89	28.7	28.7	83.9
	51 – 60 years	38	12.3	12.3	96.1
	61+ years	12	3.9	3.9	100.0
LEVEL OF EDUCATION	No formal education	32	10.3	10.3	10.3
	Primary Education	51	16.5	16.5	26.8
	Secondary Education	143	46.1	46.1	72.9
	Diploma	37	11.9	11.9	84.8
	Degree	47	15.2	15.2	100.0
RELIGION	Christian	215	69.4	69.4	69.4
	Muslim	31	10.0	10.0	79.4
	Traditional	42	13.5	13.5	92.9
	Others	22	7.1	7.1	100.0
MARITAL STATUS	Single	80	25.8	25.8	25.8
	Married	103	33.2	33.2	59.0
	Divorced	56	18.1	18.1	77.1
	Separated	9	2.9	2.9	80.0
	Widowed	62	20.0	20.0	100.0
HOUSEHOLD SIZE	1 – 3 members	62	20.0	20.0	20.0
	3 – 5 members	151	48.7	48.7	68.7
	6 – 9 members	66	21.3	21.3	90.0
	10+ members	31	10.0	10.0	100.0
POSITION IN HOME	Husband	122	39.4	39.4	39.4
	Wife	72	23.2	23.2	62.6
	Child	87	28.1	28.1	90.6
	Others	29	9.4	9.4	100.0
OCCUPATION	Farmer	140	45.2	45.2	45.2

	Farmer	108	34.8	34.8	34.8
	Farm worker	34	11.0	11.0	45.8
	Trader	40	12.9	12.9	58.7
	Casual	22	7.1	7.1	65.8
	Civil servant	92	29.7	29.7	95.5
	Private firm	5	1.6	1.6	97.1

Zikmund and Babin (2013) exemplifies that if farmers are the respondents in a research, their demographic characteristics need also be considered, rather than it be covertly presumed that they are a homogenous group with similar qualities.

Gender: The gender of respondents was included because of its importance in shaping the power of making decisions in the farming industry particularly under farmer led irrigation initiatives. More than 50% of the respondents within the final sample were males (61.0%) while 39.0% were females. This is a reflection of the historical disparities which elevated the male child ahead of the female in terms of ownership of assets like land as a result of patriarchal nature of the culture of Zimbabwe as noted by Chitongo (2017).

Age: The age of respondents was also determined in order to assess whether the responses varied with age. The respondents' age was as follows: 18 – 30 years (22.6%) of the sample, 31 – 40 years, (32.6%) 41-50 (28.7%) 51-60 years (12.3%) and 50 years and above constituted 3.9%. The proportion of the different age groups is consistent with results reflected by the national census of 2012 which shows that Zimbabwe has a young population where 67 % is below the age of 40 years.

Level of Education: In the sample, 10.3% had no formal education, 16.5% of the respondents had completed primary education, (46.1%) of the respondents had completed secondary education, 11.9% were holders of diplomas in various fields that included finance, education, administration and agriculture and 15.2% were holders of degrees in areas that also include education, agriculture and administration.

Religion: Religion may affect the response of an individual to certain questions and was therefore considered as a demographic characteristic. The majority were Christians (69.4%), followed by Traditional (13.5%), Muslim (10.0%) and finally other minority religious practices constituted the remaining 7.1%.

Marital Status: The majority were married and constituting 33.2%, followed by those who were single constituting 25.8%, those who were widowed constituted 20.0%, then those who were divorced were 18.1% and finally respondents who were separated from their spouses were 2.9%.

Household Size: The majority of families had 3 – 5 members with 48.7%, followed by those with 6-9 members constituting 21.3%, those household with 1 – 3 members were third with 20.0% and lastly those with 10 or more members had 10.0%.

Position in Home: Of those interviewed from the families sampled, 39.4% of the respondents comprised of husbands, 23.2% were wives, 28.1% were children and 9.4% were others.

Occupation: The majority of respondents were farmers (34.8%), followed by civil servants with 29.7%, those who were traders constituted 12.9%, Farm workers had 11.0%, those who performed casual work were 7.1% and finally private firms had 1.6%. Civil servants were mainly from Mazowe district were also involved in the FTLRP in Mazowe under their different departments.

The next section dealt with opinions of the sample farmers on their views on the adoption of farmer led initiatives under the A1 schemes of the FTLRP in Mazowe District, Zimbabwe.

B. The opinion of the sample on factors influencing adoption of farmer led irrigation

Thirteen items that influence the adoption of farmer led irrigation were identified and the ranking of the factors is presented in Table 2.

Table 2 Ranking of factors influencing adoption of farmer led irrigation among resettled farmers in the A1 model in the Mazowe District, Zimbabwe in 2021.

Code	Factor	RII [a]	Degree of rating	Rank [b]
AFLI1	Access to capital	78.10	high influence	1
AFLI9	Access to technology	66.06	high influence	2
AFLI3	Irrigation knowhow	65.03	high influence	3
AFLI8	Support programs	63.48	high influence	4
AFLI7	Agricultural policy	63.68	high influence	5
AFLI12	Rainfall to fill rivers and dams	63.42	high influence	6
AFLI10	Extension support services	62.06	high influence	7
AFLI5	Access to markets	61.87	high influence	8
AFLI4	Knowledge of agronomic practices	61.61	high influence	9
AFLI6	Supportive institutions	60.84	high influence	10
AFLI11	Soil fertility	58.06	average influence	11
AFLI2	Diversity among schemes	57.35	average influence	12
AFLI	Adoption of farmer led irrigation	63.78	high influence	-

a RII-Relative Importance Index is an index used in ranking factors whose scores derived from

b Rank - five point Likert scale: Little influence (1), Some influence (2), Average influence (3), High influence (4) and Very high influence (5)

The factor that ranked highest at influencing the adoption of farmer led irrigation was access capital with an RII factor of 78.1% (Table 4.9). In contrast, "Soil fertility" and diversity among schemes were the least important factors at influencing the adoption of farmer led irrigation with a RII of 58.06 % and 57.35 % respectively (Tabled 1).

Access to capital ranked first with an RII of 78.10% in influencing adoption of farmer led irrigation. Access to technology ranked second (RII=66.06%) (Table 4.7) in influencing adoption of farmer led irrigation. Irrigation knowhow ranked third with an RII of 65.03% in influencing adoption of farmer led irrigation. Support programs ranked fourth with an RII of 63.48% in influencing adoption of farmer led irrigation.

Furthermore, agricultural policy ranked fifth with an RII of 63.68% in influencing adoption of farmer led irrigation. Rainfall to fill rivers and dams ranked sixth with an RII of 63.42% in influencing adoption of farmer led irrigation. Extension support services ranked seventh with an RII of 62.06% in influencing adoption of farmer led irrigation. Access to markets ranked eight with an RII of 61.87% in influencing adoption of farmer led irrigation. Knowledge of agronomic practices ranked ninth with an RII of 61.61% in influencing adoption of farmer led irrigation. Moreover, supportive institutions ranked tenth with an RII of 60.84% in influencing adoption of farmer led irrigation. Soil fertility ranked eleventh with an RII of 58.06% in influencing adoption of farmer led irrigation. Diversity among schemes ranked twelfth (last) with an RII of 57.35% in influencing adoption of farmer led irrigation.

C. Presentation and analysis of the qualitative data for objective one- key informants

Key informant interviews, in this study, were undertaken to get several viewpoints. As noted by Braun and Clarke (2006), thematic analysis is employed in such circumstances in identifying and analysing themes in a dataset. The data collected from key informant interviews were analysed through transcribing, reduction and coding as suggested by Creswell (2018).

A question was posed to the participants on Factors influencing adoption of farmer led irrigation and the themes are shown in Table 4.10 below

Table 3: Summary of codes and themes for factors influencing the adoption of farmer led irrigation model interviews under the A1 model in Mazowe District in 2021.

OPEN CODES	AXIAL CODES	SELECTIVE THEMES
1. Poor cropping		
2. Lack of capital		
3. Lack of genuine support	1. Own capital	
4. Transport	2. Diversity among schemes	1. Political
5. lack of knowledge	3. Knowledge of agronomic practices	2. Economic
6. Poor Rainfall	4. Rainfall to fill rivers and dams	3. Social
7. Poor lending	5. Weak institutions	4. Natural
8. Poor technology	6. Access to technology	
9. Lack of interest in farming	7. Lack of interest in farming	
10. Poor support from government		
11. Poor soil fertility		
12. Cash liquidity		

The analysis of key informant interviews reports on Factors influencing adoption of farmer led irrigation through open coding had twelve, axial coding seven and finally four main themes. Participants view the factors influencing adoption of farmer led irrigation in their contexts to be political, economic, social and natural aspects. Lack of Capital under the economic context still topped the view of sample farmers with regards to factors affecting adoption of farmer led irrigation iniatives. This was also noted under the quantitative analysis. Together with lack of support from government in areas of infrastructure development, these factors need attention to encourage adoption of farmer led irrigation in the A1 schemes under the FTLRP.

D. Presentation and analysis of the qualitative data for objective one – transect walks

During the transect walk in the study sites, it was observed that both new and old farm infrastructure was evident on A1 plots and examples are presented in Figure 4.1.

Figure 1: Existing old farm infrastructure

Old dams were part of the infrastructure that was left behind by former white farmers. A1 farmers had developed new irrigation infrastructure with Chinese pumps evident in most plots. The use of plastic tubing as conveyance pipes was common. In farmer led irrigation farming, Woodhouse et al. (2017) and Scoones et al. (2019) indicate that farmers utilise government infrastructure which would otherwise remain not utilised and act as dead capital to engage in farmer led irrigation initiatives. In a way infrastructure motivated the adoption of farmer led irrigation. New irrigation infrastructure, roads and new farm houses were common features in the infrastructure construction in addition to that for irrigation. This is shown in figure 2 below:

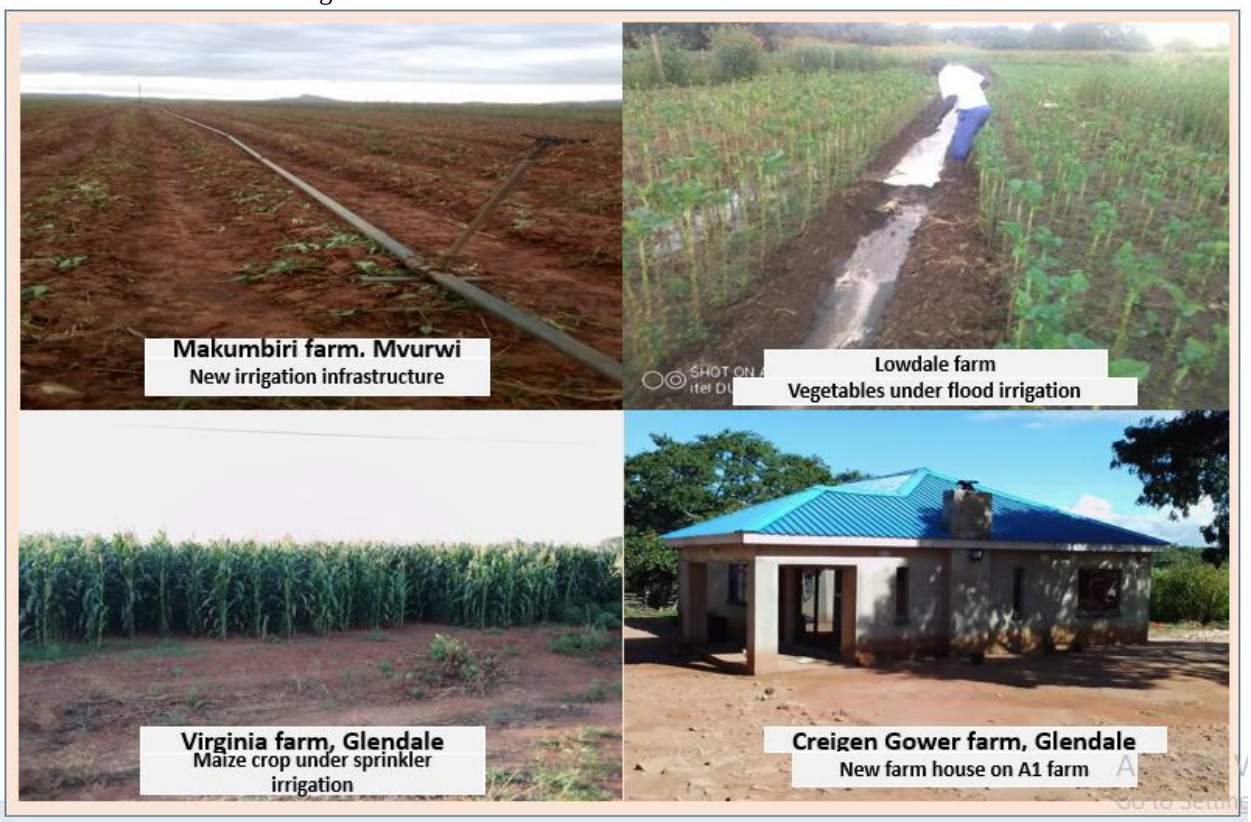

Figure 2: Irrigation infrastructure, roads and new farm house

Simple direct observation was used to compare and or compliment data collected through the questionnaires and other sources. Socio-economic activities observed were crop production which had a direct influence on the livelihoods of A1 resettled farmers in Mazowe District.in 2021 as shown in figure 1 and figure 2 whilst livestock was procured as a result of increased income realised from farmer led irrigation farming activities practised by A1 resettled farmers in Mazowe District.

Most of the irrigation infrastructure that had been left behind by the former white farmers had been vandalised and lying idle as the A1 farmers without the support of Government and NGOs did not afford the cost of irrigation rehabilitation. Farmer led irrigation calls for the initiation, funding and management of the irrigation infrastructure as compared to the Government schemes that have be shown to fail over the years due to group cohesion problems and failure to raise capital for operating the schemes. As a result group schemes have been vandalised and irrigation rendered in effective (figure 3 and figure 4). One of the initiatives that farmers have engaged in to continue irrigation farming outside the normal block irrigation schemes is the farmer led irrigation farming initiative.

Figure 3: Vandalised irrigation infrastructure
Source: primary data, (2021)

Figure 4: Vandalized irrigation infrastructure

The results from qualitative analysis and from transect walks confirmed the quantitative results which indicated that there were thirteen items that affected the adoption of farmer led irrigation in the A1 resettlement model in Mazowe District.

VI. RECOMMENDATIONS

Government support to A1 smallholder farmers

According to Munyoro et al. (2018), access to funding, markets, information and technology impact feasibility in terms of smallholder farming and this is supported by the current findings that established access to funding as one of the major challenges in smallholder farmer led irrigation farming ventures. Mobilizing and increasing rural credit lines to smallholder farmers including A1 irrigating farmers in Zimbabwe should be prioritized during policy formulation. As a result, the land bank (Agricultural Finance Cooperation) needs to be quickly operationalized to offer medium to long term capital borrowing to allow farmers to borrow for irrigation development. Irrigation accessories such as water pumps and engines, solar panels and piping should be exempt from paying duty on being imported into the country. These irrigation accessories form an important driver in the attainment of a viable smallholder farmer led irrigation development in the resettlement and the communal areas of Zimbabwe.

Information Communication Technology (ICT) development

Success of smallholder farmer led irrigation farming efforts largely depends on the information and new technology adoption like smallholder farmer led irrigation initiatives. In this regard the Government of Zimbabwe will need to develop well-equipped agricultural resource centers in all provinces of the country in order to demonstrate new technologies which assist smallholder farmers improve their crop productivity especially for those resettled under the A1 model of the FTLRP. The research findings of this study indicate this need for new information centres for A1 smallholder farmers in the areas of farmer led irrigation farmers as the study pointed out the need for new innovation, the ability to organize resources and sourcing for information at a cost.

ICT could accelerate productivity of Zimbabwean smallholder farmer led irrigation farming especially under the A1 scheme of the FTLRP in the areas of weather forecasting and irrigation scheduling. Knowledge backed by adequate technological infrastructure can transform development of A1 irrigation farmer productivity. Several studies have shown that agricultural extension is a major source of knowledge and information to farmers. This study has shown that there is a need to shift towards delivering knowledge and information.

Government interventions through extension and agricultural training

This study has shown that A1 smallholder irrigation farming has the potential to transform households through smallholder farmer led irrigation farming as noted in all the four objectives and the empirical findings therein. There is sufficient evidence on smallholder farmer led irrigation farming contribution to rural livelihoods through household income. Thus the implication of this research's findings is that A1 plot holders need to participate in smallholder farmer led irrigation farming. There is need for Government interventions through extension services which is provided by the department of Agritex and this study has noted from key informant interviews that Agritex field officers lack in up to date information in the areas of agricultural innovation, farmer led irrigation included.

Improving access to irrigation water

Access to water by A1 smallholder households helps them realize most benefits from smallholder irrigation farming. Improved irrigation water access is part of the strategy that enhances irrigation farming access in the NDS 1 in pursuit of Zimbabwe Vision 2030 which aims to improve the status of its citizens to the level of upper middle class status. This also suits well in the attainment of SDG (*No one is left behind*). Investment in agriculture water will also allow intensification and diversification of crop production by A1 farmers under farmer led irrigation farming and small scale gardens thus increasing farm output and household incomes.

Provision of security of tenure

In this study, security of tenure documents for A1 farmers is varied and a segment of A1 resettled farmers do not have land tenure documents. This process of land tenure documentation is slow thereby curtailing the will by A1 irrigating farmers to invest sustainably. Studies elsewhere show that smallholder farmers invest even in the absence of tenure documents but the Zimbabwe situation is different in that farmer evictions happen regularly especially after elections. Banks have also been reluctant to offer funding where there are no tenure documents.

VII. AREAS FOR FURTHER RESEARCH

Even though the study had meaningful results, there are other areas requiring further researches. Firstly, selection of irrigation practices was not exhaustive. Farmers interviewed had a bias towards farmer led irrigation which utilised small irrigation pumps at the expense of other forms of farmer led irrigation like use of buckets and utilisation of dambos.

Secondly, it is widely understood that in empirical research, the results are always based on self-reported data of the respondents. As much as it was assumed that the respondents were adequate for reliable and valid data. It could be useful to put together farmers' responses to questionnaires with views held by their customers, competitors and distributors. In fact there could be exaggerated positions given that secondary data was lacking for cross validation. Therefore future researches could put together the views of other major farming stakeholders with the results of farmers' self-assessment in order to get more valid conclusions.

VIII. CONCLUSION

Therefore the results of this study indicate that of the thirteen factors that influence the adoption of smallholder farmer led irrigation under the A1 model of resettlement under Mazowe District, access to finance had the highest influence in the adoption of farmer led irrigation farming. It will be important for Government to offer funding to A1 model farmers since most of the irrigation funding in the past has been tailored for A2 farmers who are considered to farm on commercial basis compared to their A1 counterparts. This study has also shown that technology

transfer is also an important factor to both A1 model farmers and extension officers in the adoption of farmer led irrigation. This therefore calls for more exposure for both smallholder A1 farmers and extension officers to be exposed to new smallholder technologies through continuous training and use of ICT for information gathering.

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