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Women in Agriculture: Irrigation as Empowerment Tool

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ABSTRACT

Promoting women's empowerment in agriculture is very vital since efforts towards ensuring food security have identified women farmers as key role players in many contexts and set-ups. This study aims to identify and understand the significant factors responsible for empowering women in smallholder irrigation schemes as these may play a crucial role in poverty reduction among women farmers. The authors applied a simple random technique to select 174 women from 8 irrigation schemes across Vhembe and Sekhukhune districts of South Africa. Primary data were collected on their demographics and empowerment using a modified Women Empowerment Agriculture Index developed by IFPRI. This index concludes that women are disempowered. The determinants of empowerment were estimated using multiple linear regression analysis. The results show that there wasa strong correlation between socio-economic characteristics and empowerment; however, only four out of eleven independent variables were significant (i.e., age, marital status, number of dependants and expenditure). The study provides policy suggestions to maintain and improve where women are empowered and to correct where they are disempowered.

INTRODUCTION

Promoting women's empowerment in agriculture is very vital given that women comprise on average 43 percent of the agricultural labour force in the least developed countries, and that approximately 75 percent of people suffering hunger live in rural areas which a significant number of them are women and children (Bizikova 2020). According to Tekana and Oladele (2014) women play a significant role in agriculture since they manage households and pursue multiple livelihood strategies. Efforts towards ensuring food security have identified women farmers as key role players in many contexts and set-ups.

Various governments, companies and development actors agree on the importance of the agenda for women's economic empowerment, based on compelling evidence on both equality and economic development. When women have income and assets, this contributes to increased productivity and national development. It also leads to better human development and poverty reduction outcomes, as women's control over assets and income is linked to improvements in family welfare and child nutrition.2 Women's economic empowerment offers an entry point into full women's empowerment, including social and political dimensions. Achieving gender equality and women's rights is an end in itself, as enshrined in numerous human rights frameworks (Oxfam International 2013).

Understanding the extent to which women's empowerment interventions can reduce households' probability of being vulnerable to food insecurity could be of great value to the government, non-governmental organisations and development agencies in the design of effective food security strategies. In most rural areas where subsistence agriculture is a predominant source of livelihood, women play multiple roles throughout the processes of production, handling and preparation of food (Sharaunga *et al.* 2015). As a result, women's empowerment has become a frequently cited goal of rural development to reduce household vulnerability to poverty and food insecurity. It is considered an essential way to provide the most vulnerable households with the means to their livelihood strategies and food security (Sharaunga *et al.* 2015).

The South African Constitution supports gender equality, however, women in rural areas, continue to experience limited use of water and limited knowledge to achieve food security (Tekana and Oladele 2014). Empowerment of women through secure access to water and land and by obtaining knowledge and developing skills may contribute significantly to improved livelihoods and poverty reduction among women. This study aims to identify and understand the significant factors responsible for empowering women in smallholder irrigation schemes as these may play a crucial role in poverty reduction among women farmers. This is done through the application of a Women Empowerment in Agricultural Index which helps evaluate if women are empowered or disempowered.

LITERATURE REVIEW

Women`s role is significant in agriculture. Women comprise 43% of the agricultural labour force globally and in least developed countries, 64.3% of women were employed in agriculture in 2015. (FAO 2015). In least developed countries, at the community level, women are more likely than men to manage natural resources for agriculture, including soil and water conservation, afforestation, and crop domestication. Despite their role in agriculture, women are often ignored or excluded from agricultural services and systems. Generally, women face legal and cultural barriers in accessing inputs, including credit, rights to tenure, and in obtaining support from extension services. This affects

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women's productivity hence female farmers' productivity is lower on average than their male counterparts, both in terms of produced yields and earnings (FAO 2015).

According to the FAO (2015), if women had the same access to productive resources as men, they could increase yields on their farms by 20–30 percent. This could raise total agricultural output in the least developed countries by 2.5–4 percent, reducing hunger by 12–17 percent in the world. The potential gains would vary by region depending on how many women are currently engaged in agriculture, how much production or land they control, and how wide a gender gap they face. Women's 'empowerment in agriculture' is one of the most important dimensions of empowerment for rural women as rural households are largely dependent on agriculture for their livelihoods which, in turn, is crucial for reducing household vulnerability to food insecurity (IFAD, 2012). According to Sharaunga *et al.* (2015), empowerment is a multidimensional and complex process that different people can interpret differently. The different dimensions of women's empowerment, which can overlap include financial, human capital, material/physical, socio-cultural, familial/interpersonal, legal, political, psychological and agricultural. Women's empowerment is the ability to make or express strategic and meaningful choices and decisions related to one's own life (Anderson *et al.* 2021). Generally, the literature suggests at least two ways in which net economic benefits from investing in women's empowerment in agriculture might arise. The first is by equalising access to productive resources (i.e., access to and control over land, labour, and other inputs) between women and men. The second is by addressing the challenge of differences between women and men that might lead to improved household outcomes. It is believed that equalising access to productive resources and assuming that both are given the same access to and control over agricultural inputs and technologies, on average female and male farmers would be equally productive. (Anderson *et al.* 2021). There is also a common assumption that women and men, on average, differentially prioritise resource expenditures, therefore, increasing a women's share of household decision-making authority would be expected to change household economic outcomes (Pandey *et al.* 2016). According to IFPRI (2012), Women Empowerment in Agricultural Index (WEAI) is a composite measurement tool that indicates women's control over critical parts of their lives in the house-hold, community, and economy. It helps identify women who are disempowered and understand how these women can be assisted to increase their autonomy and decision-making both in their households and on the farms.

MATERIALS AND METHODS

Methodology

In order to establish and understand women empowerment indices together with their determinants a modified Women Empowerment Agriculture Index developed by IFPRI (2012) was used. The indices covered women's access and control to physical, natural, social, financial, and human livelihood capital. This was done to examine empowerment indices which shows the different areas where women are empowered and disempowered. It also shows the significant determinants of empowerment.

Study Area

The study was conducted in the Vhembe and Sekhukhune districts of Limpopo Province in South Africa (See Figure 1). These districts have high numbers of irrigation schemes compared to their counterparts. Within the research sites, the selected research areas bear similar contextual factors, such as agro-ecological factors, distance to markets, economic opportunities other than agriculture, farming practices and traditions, language and other cultural attributes. Great care was taken to select an operational irrigation scheme in each site, which does not face severe constraints like limited water supply, serious social conflict, highly dilapidated infrastructure or any other disabling factors. According to Van Koppen *et al.* (2017), operational irrigation schemes refer to moderate utilisation and full utilisation of schemes with 50-89 % and 90-100% of area equipped for irrigation.

Data Collection

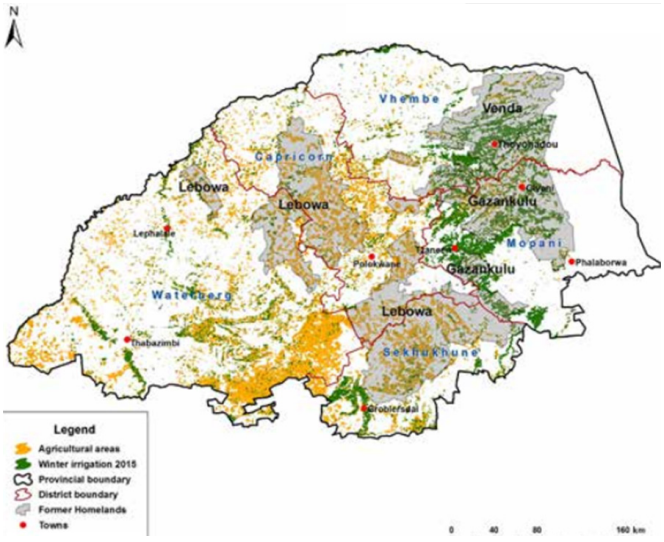

Figure 1: Map of Limpopo Province irrigated areas
Source: Van Koppen et al. (2017)

A stratified and simple random sampling technique was used to select 174 women in 8 irrigation schemes across Vhembe and Sekhukhune districts. Data were collected on their demographics and empowerment using a modified Women Empowerment Agriculture Index developed by IFPRI. The primary data was collected in two periods due to the prevalence of Covid-19 and the national lockdown that started in March 2020. The first period of data collection was in December 2019 to February 2020, and the second period was from November 2020 to February 2021.

Data Analysis

The study used a modified Women Empowerment Agriculture Index to examine empowerment indices, showing the different areas where women are empowered and disempowered. According to IFPRI (2012), an individual is identified as empowered in 'five domains of empowerment (5DE)'; the domains are used as indices of empowerment if there are adequate achievements in four of the five domains or if they enjoy adequacy in some combination of the weighted indicators that sum up to 80% or more, or if they have an adequacy score of 80 or above. The empowerment indices covered in this study include the use of income, access to productive capital, access to credit, leadership roles and decision making. From the scoring of the empowerment indices, the mean was calculated for each of the indices and used as the cut-off point. Women with scores below the mean depict disempowerment while those above the mean indicate empowerment.

A linear regression model with multiple independent variables was used in order to seek relevant factors that affect women`s empowerment. Linear regression is a statistical analysis that depends on modelling a relationship between two kinds of variables, dependent (response) and independent (predictor). The main purpose of regression is to examine if the independent variables are successful in predicting the outcome variable and which independent variables are significant predictors of the outcome. In this study, women`s empowerment was predicted using the socio-economic characteristics of the smallholder irrigation farmers (i.e., women).

RESULTS AND DISCUSSIONS

Women Empowerment Indices and their Determinants

Table 1 shows the results of farmers` (women) characteristics for the two districts considered in this study. The results show that 71% of the women in Sekhukhune district fall within the age group of 41 to 60 years. This is 6%

higher than the number of women in the Vhembe district. Women who are over 60 years of age constitute 19% and 18% of the population in Sekhukhune and Vhembe districts respectively. The lowest percentages from both

Table 1: Women farmers' characteristics

Age of the respondent %			Farm size %			Level of income %			Marital status %			Education %			Years of farming experience %			Dependents		
	S	V		S	V		S	V		S	V		S	V		S	V		S	V
21-40	10	17	0-0.9ha	45	42	R0-4999	26	21	Single	29	32	None	13	8	1-10	60	55	0-4	73	70
41-60	71	65	1-1.9ha	48	46	R5000-R9999	30	33	Married	49	50	Primary	42	40	11-20	20	24	5-9	26	30
60+	19	18	2-2.9ha	6	10	R10000-R14999	32	30	Widowed	22	18	Secondary /High	43	44	21-30	14	16	10+	1	0
			3ha +	1	2	Over R15000	12	16				Tertiary	2	8	31-40	5	5			
															41+	1	0			

Note: S = Sekhukhune district; V = Vhembe district.

Source: Research Survey, (2019/20)

districts were that of young women (i.e., between 21 and 40 years). This confirms the claims that the proportion of young people in agriculture is low, which is supported by Akinbile *et al.* (2006) who stated that active participants in farming activities are between the ages of 40 and 50 years. Table 1 also indicates that over 40% of women farmers in both districts have farm sizes of between 0-2ha. Only 1% and 2% of farmers in Sekhukhune and Vhembe respectively had farm sizes that are more than 3ha. The results in Table 1 show that most women farmers in both districts (about 68%) have income levels of between five thousand and fifteen thousand rands monthly, while those who get over fifteen thousand rands made up only 12% and 16% of the population in Sekhukhune and Vhembe respectively. The level of income can also be an important factor when evaluating the empowerment of women especially in rural areas. In terms of marital status, Table 1 also shows that approximately 50% of women in irrigation farming from both districts are married, followed by approximately 30% of those who were single and around 20% of those who were widowed. According to Becker *et al.* 2006, this may mean that women, especially married women, are more likely to be influenced by their husbands when making decisions, which could impact negatively on empowerment as decision making is an important measure of empowerment.

Tekana and Oladele (2014) also found that due to socio-cultural factors, women have little authority in decision making in agricultural production. Also, the results indicate that most (over 40% in both districts) women farmers have acquired primary and secondary education, 13% are without formal schooling in Sekhukhune and about 8% have tertiary education in Vhembe district. Education is an important factor to farming because of the rapid change in technology and the economic environment, which can be matched through the attainment of education.

The findings also indicated that 60% of women farmers in Sekhukhune have farming experience ranging from 1 to 10 years as compared to 55% in Vhembe district, indicating that most farmers are new entrants in farming, while only 1% in Sekhukhune indicates the experience of more than 40 years. The results further indicate that the dependency ratio is low in both districts since approximately 70% of the women have dependents within the range 0 to 4, while only 1% (only in Sekhukhune) have more than dependents.

Farmers' Access to Livelihood Assets

Table 2 shows women farmers' access to livelihood assets. With regard to financial capital, it shows that 45% of women in the Sekhukhune district obtained their credit from a relative followed by those that obtained their credit from cooperatives and money lenders (43% each). While most women in the Vhembe district got their credit from relatives (51%) followed by cooperatives (50%), commercial banks (49%), and money lenders (49%). However, from both districts; very few women believed that credit from commercial banks is adequate. This is because they claim not to be getting enough credit to sustain their capital needs. In all farm operations, credit is important because it helps farmers to secure production inputs and other technologies needed on the farm. According to FAO (2011), inadequate finance

Table 2: Livelihood assets endowment.

Capital category	**V**	**S**	**V**	**S**	**V**	**S**	**V**	**S**
Financial capital	**Yes**		**%**		**No**		**%**	
Access to credit from Banks	81	57	49	42	84	78	51	58
Relatives	84	61	51	45	81	74	49	55
Personal savings	79	55	48	41	86	80	52	59
Contractors	64	44	39	33	101	91	61	67
Government subsidies	64	43	39	32	101	92	61	68
Cooperatives	82	58	50	43	83	77	50	57
Money lenders	81	58	49	43	84	77	51	57
Skills training								
Soil management	64	43	39	32	101	92	61	68
Crop protection	59	39	36	29	106	96	64	71
Record keeping	44	28	27	21	121	107	73	79
Water management	59	39	36	29	106	96	64	71
Equipment handling	66	44	40	33	99	91	60	67
Financial management	43	26	26	19	122	109	74	81
Human capital								
Extension service	64	44	39	33	101	91	61	67
Training	71	49	43	36	94	86	57	64
Vocational training	30	15	18	11	135	120	82	89

Physical capital								
Water supply	69	47	42	35	96	88	58	65
Markets	44	28	27	21	121	107	73	79
Storage	64	44	39	33	101	91	61	67
Road accessibility	61	42	37	31	104	93	63	69
Transport	44	27	27	20	121	108	73	80
Electricity	74	51	45	38	91	84	55	62

Note: S = Sekhukhune district; V = Vhembe district.
Source: Research Survey, (2019/20)

can also prevent farmers from investing in new methods of crop production and irrigation. Lack of access to credit is one factor that reduces women's efficiency and productivity. Machete (2004) argued that one of the most critical problems threatening the viability of smallholder irrigation is the absence of credit. Access to the credit needs collateral mostly in the form of land rights, which some farmers, particularly women, do not possess.

According to Table 2, women farmers in both districts have received considerably very little extension services and vocational training as far as human capital is concerned. Extension service is important in boosting agricultural productivity. Only 39% of farmers in Vhembe reported having received extension services as compare with a low 33% in the Sekhukhune district. Both districts proved to be receiving very low levels of vocational training (i.e., 30% in Vhembe and 15% in Sekhukhune). With regard to skills training, 40% of women received training in equipment handling in Vhembe district, while soil management was at 39%. Other indicators of skills training were lower than 39% in the Vhembe district. Sekhukhune had very low levels of skills training with none of the indicators exceeding 33%. Sekhukhune had received 33% skills training in equipment handling. Machete (2004) argues that an understanding of financial management will generate a continuous flow of irrigation scheme profitability, liquidity and reducing risks, which will provide a basis of forward planning for farmers. With regard to access to physical capital, Table 2 indicates that farmers in both districts had challenges when it came to physical capital, with water supply and electricity availability standing at 42% and 45% in Vhembe respectively; as compared with only 35% and 38% in Sekhukhune respectively.

Access to markets and transport proved to be a serious challenge in both districts with farmers having only less than 28%. Therefore, the two districts generally had low livelihood assets endowment which may impact negatively on the success of these farmers in their irrigation schemes.

Empowerment Indices among Women on Smallholder Irrigation Schemes

The empowerment indices covered in this study include the use of income, access to productive capital, access to credit, leadership roles and decision making. From the scoring of the empowerment indices, the mean was calculated for each of the indices and used as the cut-off point. Women with scores below the mean depict disempowerment while those above the mean indicate empowerment. Use of Income in Table 3 indicates that 56% of women in terms of the control over the use of income are below the mean score of 16.80, which implies that they are disempowered in the control of the use of income as an index of empowerment.

According to FAO (2014), women tend to spend most of their income on basic household needs, such as household essentials, while men tend to retain more of the income they control for their personal use, such as buying alcohol, drinking and leisure. The study also indicated that husbands are more likely than elsewhere to entrust the income to their wives, to prevent its misuse. But some men are afraid to do so, in case the women might be tempted to leave them. Access to productive capital in Table 3 indicates that the proportion of women below the mean (78.99) for access to productive capital as an index of empowerment is 60%. This shows that women are disempowered in terms of their access to productive resources as an index of empowerment. Jiyane (2011) argued that, although policies aimed at creating enabling environments have been established in nearly all countries for women to access, own, control, use and manage land for productive use, the actualisation

Table 3: Empowerment indices among women on smallholder irrigation schemes.

	Use of income	Productive capital	Access to credit	Leadership	Decision making	Total empowerment score
x	16.80	78.99	113.56	43.98	38.29	291.61
SD	8.55	35.41	38.24	10.85	10.64	84.48
low	98 (56)	104 (60)	104 (60)	90 (52)	92 (47)	104 (60)
high	76 (44)	70 (40)	70 (40)	84 (48)	82 (53)	70 (40)

Source: Research Survey, (2019/20)

of such still remains a challenge.

The gender approach of agencies and projects, as well as the local class and gender hierarchies, is also one of the causes of gender-related inequities in access to water resources in Sub-Saharan Africa (Van Koppen 2015). Access to credit in Table 3 indicates that 60.2% of women's access to credit is below the mean score of 113.56, showing that women are disempowered in terms of access to credit as an index of empowerment. The IFPRI (2012) ascertained that lack of collateral, low levels of education with a resultant lack of numeracy and access to information are factors contributing to the fact that 10% of agricultural credit in the Southern African Development Community (SADC) region is accessed by women.

In some instances, women need the consent of their spouses to access credit and this makes them lose confidence in themselves and become disempowered. It is thus important for women to have not only access to credit, but also control over the use of the credit so that it is not diverted to male dominated production systems, at the expense of women's productive activities. The leadership role in Table 3 indicates that 52% of women in terms of leadership roles are below the mean score of 43.98. This indicates that in terms of women engagement in leadership roles the difference is quite marginal when compared with the mean score. This could be because of the fact that, due to unequal gender norms and relations, women have a lower socio-economic status, compared to their male counterparts, which limits their opportunities to access and participate in formal groups.

World Bank Blog (2020) justifies the fact that women's freedom is constrained by men's control over their mobility, by sociocultural expectations that they are primarily responsible for all domestic work, and, in relation to this, by their uneven reproductive, productive, and community work burdens. Their restricted access to, control over, and ownership of land, credit, and information, as compared to men, gives them a disadvantage in meeting the conditions of formal group membership and leadership. However, Gizachew (2011) stated that, when women gain leadership positions, it helps them to build their self-confidence, exercise their political leadership, and gain respect from their male and female peers. There is also some evidence that, when there are women in leadership roles, there is a greater likelihood of other women participating in the organisation (Oxfam International 2013).

Decision Making in Table 3 indicates that the proportion of women above the mean (38.29) for decision making as an index of empowerment is 53%, implying that they are empowered in decision making. Most women are not married and this could be the reason why they are actively involved in decision making. Women have been facing huge challenges in the area of decision making, firstly because of tradition and internal lowliness complex where they are not even sure if the decisions that they want to take will bear fruit or will make them aversive.

Table 3 indicates that 60% of women were below the mean of 291.61, which implies that women are disempowered. According to IFPRI (2012), an individual is identified as empowered in 'five domains of empowerment (5DE)'; the domains are used as indices of empowerment if there are adequate achievements in four of the five domains or if they enjoy adequacy in some combination of the weighted indicators that sum up to 80% or more, or if they have an adequacy score of 80 or above. Following the results in this study, women are reflecting empowerment adequacy in only one indicator, decision making, and disempowerment in the other four indicators. This concludes that women are disempowered.

Factors Influencing Women's Empowerment

The influence of the socio-economic characteristics and empowerment model was estimated using a linear regression (Table 4). The independent variables were significantly related with an F value of 2.129, $p < .05$. Also,

Table 4: Multiple regression analysis between socio-economic characteristics and empowerment.

Variables	B	Std error	t	sig
Constant	93.698	126.764	0.463	0.463
Age	–0.129	0.551	-2.193	0.092*
Marital status	–1.958	0.928	–2.11	0.094*
Number of dependants	3.198	2.721	2.246	0.028**
Household size	–0.157	2.118	–0.074	0.941
Education	–1.102	4.291	–0.257	0.798
Labour source	3.588	6.004	0.598	0.552
Non-farming activities	8.563	15.677	0.546	0.587
Level of income	–6.734	24.291	–0.277	0.783
Expenditure	–37.368	18.547	-2.015	0.089*
Irrigation type	15.489	7.062	0.233	0.816
Farm size	–3.718	17.197	–0.216	0.830
R	**0.616**	**F**		**2.129**
R square	**0.379**	**p**		**0.036**

** Significant at 10% level ** significant at 5% level*

an R value of 0.616 showed that the independent variables explained about 62% of the variations in empowerment and that there was a strong correlation between socio-economic characteristics and empowerment.

Four out of eleven independent variables were significant; with three variables being significant at 10% (expenditure, marital status and the age); while only one variable was significant at 5% (number of dependents). All these variables are negatively significant. These findings imply that, the lower the household expenditure the more empowered are the women, the greater the age, the more empowered are the widowed women and unmarried women are more empowered than married women.

This supports the results of World Bank Blog (2020) that women's freedom is constrained by men's control over their mobility, by sociocultural expectations that they are primarily responsible for all domestic work, and, in relation to this, by their uneven reproductive, productive, and community work burdens. Women's restricted access to, control over, and ownership of land, credit, and information, as compared to men, puts them at a disadvantage in meeting the conditions of formal group membership and leadership.

The results also show that women with more dependents are empowered as compared to their counterparts. This finding was not expected since it is generally assumed that dependency burden may disempower women. This assumption is supported by the findings of Atake and Gnakou (2019), who found that regardless of the country, more empowered women desire significantly fewer children compared with their less empowered counterparts. The results of this study could be attributed to the low dependency ratio faced by women.

With regard to age, the results show that as women grow older, they tend to be disempowered. However, this differs with the results from Sell and Minot (2018) who found that older couples are associated with higher levels of empowerment. The results of this study were expected since it is generally assumed that younger people are more likely to be open to ideas of empowerment. Sell and Minot (2018) further indicated that older women have more "seniority" and, thus decision-making responsibility. The rest of the other independent variables do not have any correlation with the empowerment of women farmers in irrigation farming.

CONCLUSIONS

Following the results in this study, women are reflecting empowerment adequacy in only one indicator (i.e., decision making) and disempowerment in the other four indicators. This concludes that women in Vhembe and Sekhukhune districts are disempowered. This high level of empowerment could be attributed to fact that women`s livelihood asset endowment is very low, which makes it difficult for these women farmers to get empowered. This calls for a great deal of intervention from the government with regard to the way women are positioned and treated in the agricultural sector.

Therefore, there is a need to foster and facilitate an agricultural extension approach that prioritises women farmers in input decisions, vocational training, access to credit and public speaking related to agricultural development. This can be done through a sustainable livelihood asset framework approach with rural farming extension services with a focus on human and social assets development alongside the other assets with a key aim of capacitating women farmers in using and managing natural and physical assets to transform their livelihoods.

LIMITATIONS

Data from this study were collected in two different periods, before the Covid19 pandemic and during the pandemic. This could have had an impact on how farmers responded to some questions. Again, the impact that women`s empowerment has on poverty reduction was not incorporated in this study, which could have emphasized the importance of women`s empowerment.

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