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Influence of Sunflower Value Chain Production Activities on the Smallholder Farmers' Livelihood in Tanzania: A Case of Mpwapwa District

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Abstract

In this research, the study focused on assessing how various production activities within the sunflower value chain impact the livelihoods of smallholder farmers in Mpwapwa District. The research employed a case study methodology and collected data from 147 participants using questionnaires, interviews with key informants, and document reviews. Qualitative analysis techniques, specifically an interpretive approach, were utilized alongside quantitative techniques, including logistic regression, to examine the connection between dependent and independent variables. The study's findings demonstrated that the predictor variables developed for this research significantly affected the livelihoods of smallholder farmers in Mpwapwa District. Notably, activities related to sunflower farm preparation and weeding were strongly associated with sunflower value creation, making a substantial contribution to the livelihoods of smallholder farmers (with B-values of 3.174 and 3.632). In conclusion, this study revealed a strong correlation between sunflower value chain production activities and the well-being of smallholder farmers in Mpwapwa District. The researcher suggests that the Mpwapwa District government should provide training to farmers in modern farming techniques, strengthen the capabilities of microfinance institutions, and conduct capacity-building programs for agricultural officers to better support smallholder farmers in all aspects of sunflower agriculture.

Keywords: Sunflower value chain, smallholder farmers, livelihood,

1. Introduction

The United Nations Industrial Development Organization (UNIDO, 2017) noted that Tanzania has secured a prominent role in the international sunflower oilseed production landscape, generating around 350,000 tons of sunflower oilseeds annually. This output corresponds to an estimated 90,000 tons of oil. While recognizing the significant role played by major sunflower-producing regions in the country, it is important to note that the Dodoma region, situated in the

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middle zone of the country, also makes a substantial contribution, amounting to more than 20 percent of the total national sunflower production.

According to Zhihua & Douglas, (2017) almost 50% of subsistence farmers in the region are involved in production of sunflower oil, thereby harnessing the complete potential of this industry, whether it be through enhanced product quality or increased output. The major producers of sunflower oilseed in various districts and wards within the Dodoma region are primarily smallholder farmers, accounting for around 95% of the total production (Ogutu, 2018; MMAL, 2010). Typically, these agricultural practitioners work on land plots that typically span from 1 to 3 acres in size. An observable trend indicates an increasing participation of small-scale farmers in sunflower cultivation. The sunflower value chain encompasses the people and procedures engaged in obtaining inputs, producing sunflower products, and subsequently delivering them to consumers. At each level of this chain, value is added to the sunflower products (Ugulumu & Inanga, 2013).

According to a research conducted Ugulumu & Inanga, (2013) in the central region of Tanzania, the implementation of robust and effectively coordinated activities within the sunflower value chain has the potential to enhance the income levels of smallholder farmers and mitigate expenses. Additionally, Larsson (2018) argues that upgrading extension services in a modern context could have the capacity to boost the efficiency of small-scale farmers and improve their success in the market. The research explored how value chain processes could enable individuals from rural communities with limited financial means to actively participate in local, regional, and global trade, ultimately improving their overall quality of life.

The value chain activities for sunflower are classified in the major three activities namely: sunflower production, processing, and marketing (Cuddeford, 2014). However, this study was interested on sunflower production value chain activities as the key area of focus. While some research findings generally recommend that sunflower value chain activities may contribute on improving the livelihood of both smallholder farmers and other key players in a business chain (Larsson, 2018).

Various researchers expressed reservations regarding the statement of majority. They raise a concern that sunflower value chain benefits tertiary value chain actors and not smallholder farmers as proposed by majority. For instance; the study of Salisali, (2012), Mchopa, et al. (2020) noted that, sunflower smallholder farmers acquire uneven benefits compared to their efforts and investments as the markets are normally not stabilized to their favors. Despite this, the study of done by Ogutu (2018); Mgeni, Muller and Sieber (2018); Mchopa, et al (2020), asserted that smallholder farmers still consider agriculture as their main income source and supports nearly all of the household necessities because they consume and sell part of it for income. A significant gap in sunflower production activities within the value chain in Tanzania pertains to the inadequate adoption of modern agricultural practices and technologies among smallholder farmers.

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Many farmers still rely on traditional and less efficient farming methods, leading to suboptimal yields and product quality (Mchopa et al., 2020). This knowledge and resource gap extends to aspects like pest and disease management, soil fertility improvement, and post-harvest handling practices. Furthermore, access to credit and affordable inputs, such as quality seeds and fertilizers, remains a challenge for small-scale sunflower producers, hindering their ability to invest in improved cultivation techniques. Researchers in this paper believe that a thorough analysis on the sunflower value chain production activities (such as; Farm preparation, Cultivation, Seeding, Weeding, Harvesting, Storage and others) and their influence in the smallholder farmers livelihood is of paramount importance.

This enables a significantly enhancement of cultivation techniques improvement leading to quality sunflower yield production, and improved quantity produced which in turn leads to increased revenue and improved livelihood. Furthermore, the analysis on the linkage between the sunflower value chain production activities on smallholder's livelihood is crucial for optimizing agricultural practices, enhancing income stability, and promoting sustainable development in rural communities. However, despite this the link between the sunflower value chain activities and smallholder's livelihood have little been discussed (Mchopa, et al. 2020; Mgeni, Muller and Sieber 2018; Ogutu 2018).

This has been causing the insufficient empirical evidence that leads to the improvement of the agricultural policy, sustainable development and the improvement of the smallholder farmers' livelihood. Thus, in order to contribute in the theoretically, practically implication and providing required implication to the body of knowledge, it was worth carrying out this study to examine the influence of sunflower value chain production activities on the smallholder farmers livelihood', Mpwapwa District being the area of interest.

2. Literature review

2.1 Theoretical Literature review

In assessing the influence of sunflower value chain production activities, the study used the following theories;

Production theory

Production theory explains the relationship between the inputs used to produce the certain level of output obtained by the production entity in a given period. The effective utilization of factors of production such as land, labour and capital will directly result in smooth processing and better output (Sickles and Zelenyuk, 2019). The function which is used to determine the relationship between the factors of production and the outputs produced in agricultural production is known as the Cobb Douglas Production function and it is calculated by;

$Q=f(C, L1, L2)$

Where by

Q=Quantity of output

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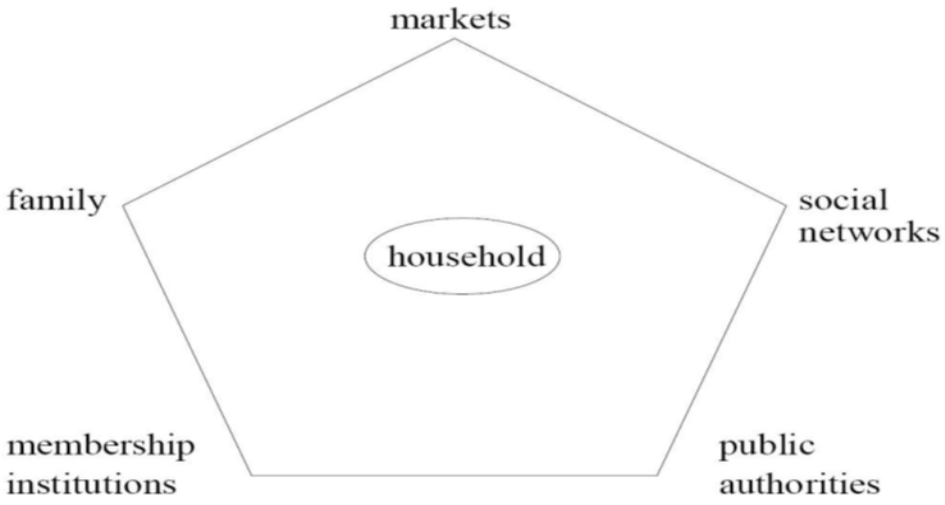
L1=Labour

L2=Land

In this case, the production output of farmers is determined by the functions of factors of production. For farmers to increase and sustain their livelihood, they will need to increase their output production. The higher the output the higher the income and livelihood gained. Considering the factors of production stipulated by the theory, sunflower smallholder farmers may increase their sunflower production through full utilization of land, and availability of capital which will enable farmers to acquire advanced machines and technology, increase land sizes as well as acquire skilled labourers who will simplify the work done and increase quality and volume to the total output.

Livelihood portfolio decisions within the welfare pentagon

Neubourg (2009) illustrates a concept known as the "welfare pentagon," which identifies five fundamental institutions that households utilize to meet their present and future needs within a given society. These institutions include the family, markets, social networks, membership organizations, and public authorities (refer to Figure 1). While the appearance and significance of these institutions may vary historically and geographically, they are consistently present in all societies throughout time and locations. However, the importance of each institution and the interactions between households and these institutions can vary across different societies and evolve over time. The underlying assumption is that households determine their income generation and consumption decisions by selecting a specific "production point" within the five-dimensional space defined by the welfare pentagon.



Source: Neubourg (2009)

Figure 1; Livelihood welfare pentagon

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Households employ the institutions outlined in the welfare pentagon as part of their overall livelihood strategy. These institutions serve the dual purpose of generating income and ensuring consistent consumption. Labor markets, product markets, and capital markets enable households to engage in trade and exchanges, thus securing the resources necessary to meet their primary needs at a given time. In the context of this study, within the labor market, smallholder sunflower farmers exchange their household's labor for present or future income. Within product markets, these farmers exchange their efforts, which involve producing sunflower crops, for current or potential profits. In the capital market, households engage in transactions that involve trading current income for future income through investments, savings, borrowings, and similar financial activities. Families, social networks, and membership institutions play a pivotal role in mitigating livelihood risks by employing various and diverse mechanisms of solidarity and exchange (Neubourg, 2009).

Membership institutions are organizations that individuals can become affiliated with as members, and they also have the option to withdraw their membership (households or individuals enter and exit these institutions). In the case of smallholder sunflower farmers in Mpwapwa district council, they typically become part of Agricultural Marketing and Cooperative Societies (AMCOS) and local community associations. As the fifth element in the welfare pentagon, public authorities can directly assist households by providing public social protection, which includes programs like pension schemes, child benefits, unemployment insurance, and various forms of social insurance. They can also offer indirect support by enforcing contracts through a judicial system, enacting legislation to address market failures (such as setting minimum reserve requirements for banks to ensure the security of households' savings), and implementing numerous other public initiatives (Neubourg, 2009).

In order to effectively pursue a specific strategy for generating income and ensuring consistent consumption, households and individuals must have access to the appropriate institutions within the welfare pentagon. This theory underscores the significance of social institutions and how individuals can establish connections with them. It posits that in order to access the welfare pentagon, individuals require both human and social capital (Neubourg, 2009). The objective of the study was to evaluate whether smallholder sunflower farmers have access to both human and social capital, which provides them with the opportunity to effectively utilize the welfare pentagon and enhance their livelihoods through their involvement in sunflower value chain activities.

2.2 Empirical Literature Review

Ogutu (2018) conducted a study on sunflower upgrading in Dodoma region using a participatory and multi-dimensional approach revealed that sunflower production is one of the value chain activities which is predominantly carried out by smallholder farmers (95%), followed by medium-scale farmers (4%) and a few (1%) large commercial farmers. The study concluded that Dodoma region having over 400 processors (micro enterprise, medium and large processors) is therefore estimated to host the largest number of processors compared to any other region in the country.

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Fernandez-Stark (2016) conducted a research on global value chain analysis which was carried out using a survey research design found out that sunflower production can be efficiently carried out through improving farming technology instead of continuing using hand hoes or oxen draught ploughs which leads to low earnings and inability of accessing credit to expand farmer's land size. The study concluded that when the farming technology is improved, smallholder farmers will get benefits in the sunflower value chain in terms of product and process upgrading.

Trienekens (2011) conducted a study on agricultural value chain in developing countries using a survey research design and found that strategies such as process upgrading (which involve a restructuring of the production system or introducing new technology), adding more activities to the already existing one (such as packaging the products value addition after production) as well as value chain-network structure upgrading. The key conclusion made from the theoretical review and supporting data in his work includes process, product, and functional upgrading have various implications as interventions in the value chain concerning their impact on increased food security and decreased poverty levels. Being a part of a value chain is expected to help smallholder farmers in developing nations improve their products and processes, but numerous reasons may be impeding their ability to profit from expanded market options, higher incomes, and better food security.

The URT (2015) report on sunflower sector development strategies identified three value chain activities involved in the agricultural crop sub-sector. The study findings mentioned production as one of the value chain activities involving all farming processes of the crop such as farm preparation, cultivation, seeding, weeding and harvesting. The findings revealed that sunflower production is largely small-scale, rain-fed-based and commonly intercropped with staple food crops.

2.3 Conceptual framework

Figure 2 below describes the relationship between variables. As proposed by Kombo and Tromp (2006), the conceptual framework is a logically developed, described and elaborated network of associations among the variables deemed relevant to the problem situation. According to the findings from the empirical review, it was established that the smallholder farmers' livelihood is influenced by the value chain production activities.

For this study, the value chain production activities include; farm preparation, cultivation, seeding, weeding and harvesting. The study examined the extent to which sunflower value chain activities influence the livelihood of smallholder farmers' at Mpwapwa. These may have positive or negative effects in influencing the smallholder farmers' livelihood through the sunflower value chain.

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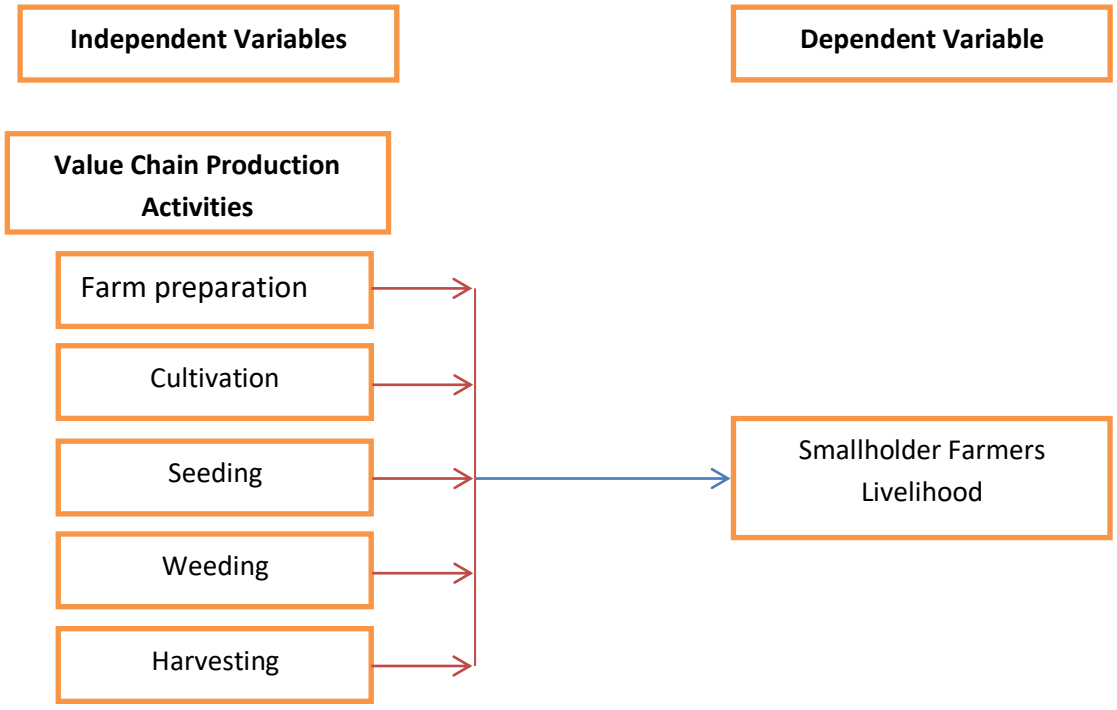

Figure 2: Conceptual Framework
Source: Field Data (2023)

Sunflower production involves all farming processes of the sunflower. The effective production process of the sunflower and help the plants reach their yield potential, the smallholder farmer needs to know and control the factors affecting the seed germination and crop establishment (Regitano, 2017). Sunflower production involves the activities such as farm preparation, cultivation, seeding, weeding and harvesting carried out by smallholder farmers in the value chain. It is established that when the sunflower production activities are carried out properly they contribute positively to the value creation of sunflower and leads to improved livelihood of the smallholder farmers in terms of increased household income, assets and improved food security (URT, 2015; Larsson 2018).

3. Methodology

The study was conducted using a cross-sectional research design because it allowed the researcher to make a comparison and measure different variables of data collected from the selected sample with varied characteristics, at the same time without manipulating the study environment. Hence this enabled researchers to conduct a relationship between the sunflower value chain production activities on the smallholder farmers' livelihood outcome. The study was conducted in Tanzania, at Dodoma region in Mpwapwa District. The study involved sunflower stakeholders from the two (2) selected wards namely Chunyu Ward and Ng'hambi Ward. Generally, the study expected to cover 270 respondents who include the sunflower stakeholders

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in the selected wards in Mpwapwa District. The sample size was reached through Cochran (1963) which states that;

$$\mathbf{N} = \frac{\mathbf{Z^2 P.q}}{\mathbf{E^2}}$$

Whereby;

N Sample size

Z Confidence level (1.645) which is corresponds to 90% confident interval

P Proportion of success (0.5)

q Proportion of failure (1-p)

E Margin of error (5%)

Therefore;

$$N = \frac{(1.645)^2 * 0.5(1-0.5)}{(0.05)^2}$$

N= 270 respondents

However, due to convenience of availability and willingness of respondents to participate in this study only 174 respondents were reached.

The primary data were collected from the sunflower smallholder farmers (household heads or their representatives), Extension Officers, supporters, AMCOS leaders, sunflower processors as well as traders in Chunyu and Nghambi wards in Mpwapwa district. The secondary data relating to the study were collected from important documents, and periodicals relevant to the study. In this respect, reports such as the Mpwapwa sunflower sector development strategy report (2016-2020), Mpwapwa District agricultural report for the year 2019/2020, and Mpwapwa DC sunflower processing report 2021 were reviewed to help find the existing gaps. The unit of analysis was therefore based on the group and individual levels sharing the same characteristics in the sunflower value chain activities in Mpwapwa district area. The systematic sampling technique was used to obtain sunflower producers (farmers) whereby the lists for selection were obtained from the households' register from the Village Executive Officer (VEO). However, Agricultural Extension Officers (AEO) was also accessed during the sampling of households from the village households register. Furthermore, the processors, supporters and wholesalers were obtained from Mpwapwa District Business Council Report. To determine the influence of sunflower value chain production activities on smallholder farmers' livelihood at Mpwapwa, the following data collection techniques were used: questionnaires, focus group discussion, interviews and documentary review. All these data collection techniques were used based on the

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nature of variables deduced by the study to ensure the information collected is reliable and meets the objective of the study. To ensure the reliability of the study, Cronbach`s Alpha as a measure of internal consistency was used whereby, Cronbach`s Alpha scored 0.813 which is above 0.7 implying that the questionnaire was reliable since they indicate greater internal consistency reliability of the data collection instrument (George and Mallery, 2003). Both qualitative and quantitative techniques were used to analyse the data. The process of analysing qualitative data involves the categorization of data from interviews and notes into common themes (Theme content Analysis). The data were then presented and analysed per their common themes. The analysis of the quantitative data involved coding, data entry, data cleaning, and running regression analysis to determine the contribution of sunflower value chain activities to the livelihood of smallholder farmers in Mpwapwa District. For this reason, the following regression models were used. To identify the influence of sunflower production activities on small holder farmers' livelihood in terms of household income, household assets, food security, as well as improved welfare, the logistic regression technique was quantitatively used to analyse and explain this relationship. The following logistic regression model helped to describe the expected relationship between the variables: $Y=a + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + e$.

Table 1: Definition of Model Variables

Variable	**Variables definitions and Units of measurement**
Dependent variable Smallholder farmers livelihood	Dichotomous = High score: Moderate livelihood Low score: Poor livelihood
Independent Variables	
A β's FP (X_1)	Y intercept when X is zero Regression Coefficients Farm preparation, Dummy; (0=FP properly done, 1= FP not properly done)
CT(X_2)	Cultivation technology, Dummy; (0= used, 1= not used)
SP (X_3)	Seeding process, Dummy; (0=SP properly done, 1= SP not properly done)
WP (X_4)	Weeding process, Dummy (0=WP properly done, 1= WP not properly done)
HS (X_5)	Harvesting and storage arrangements, Dummy; (0=HS properly done, 1= HS not properly done)
DA (X_6)	Distribution arrangements, Dummy; (0=DA properly done, 1= DA not properly done)

Source: Field Data (2023)

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4. Findings and Discussion

To determine the influence of sunflower production activities on smallholder farmers' livelihood, logistic regression was used to predict whether smallholder farmers' livelihood in Mpwapwa District can be influenced by the named sunflower production variables.

Smallholder farmers' livelihood was denoted as Y (categorical dependent variable), which was tested against six (6) key independent variables (denoted by *X)*, that included, farm preparation (properly done or not properly done); cultivation technology (used, or not used); deeding process (properly done, or not properly done; weeding process (properly done, or not properly done); harvesting and storage arrangements (properly done, or not properly done) and distribution process (efficient, or not efficient). Therefore, the following binary logistic regression model was used.

$$Y=a + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_{6+} e.$$

Where Y=Smallholder's Livelihood, yes = 1 if there is better Smallholder's Livelihood due to sunflower production variables, no = 0 better Smallholder's Livelihood, X_1-X_6= explanatory sunflower production variables, β_1- β_6= parameter coefficients to be estimated, a = constant and ε= error term.

4.3.1 Omnibus Tests of Model Coefficients

The Omnibus Tests of Model Coefficients are indicated in Table 2 which explains the overall performance of the developed model "goodness of fit." The findings show a significant value of .016. This is significant because the value is less than 0.05. On other hand, the model's Chi-square value with five degrees of freedom was 73.149. This suggests that the model used was worthwhile and strong enough to describe the link between the independent and dependent variables for this objective and that the model created was able to differentiate between respondents who claimed improved livelihood and those who did not.

Table 2: Omnibus Tests of Model Coefficients

		Chi-square	**Df**	**Sig.**
Model 1	Step	73.149	1	.016
	Block	73.149	1	.016
	Model	73.149	1	.016
a. Predictors: (Constant), Farm preparation & cultivation technology; seeding process; weeding process; harvesting and storage arrangements, distribution process.				

Source: Field Data (2023)

4.4.2 The model summary - the influence of sunflower value chain production activities on smallholder farmers' livelihood

The model contained five independent variables (farm preparation and cultivation technology, seeding process, weeding process, harvesting and storage arrangements and distribution process). The results in Table 3 indicate that the model as a whole explained between 25.1 (Cox and Snell

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R square) and 32.9 per cent (Nagelkerke R squared) of the variance in production variables to smallholder farmers' livelihood status, and correctly classified 82.7 cases (as shown in Table 3).

Table 3: Model Summary - The influence of sunflower value chain production activities on smallholder farmers' livelihood

Model	**-2 Long likelihood**	**Cox & Snell R squire**	**Nagelkerke R Square**
1	198.123[a]	.251	.329
a. Predictors: (Constant), Farm preparation & cultivation technology; seedin b. g process; weeding process; harvesting and storage arrangements and distribution process			

Source: Field data (2023)

The researcher employed binomial logistic regression to evaluate the probability that variables in the sunflower value chain production would have an impact on the livelihood of smallholder farmers in Mpwapwa District. The study findings are presented in Table 4, which include descriptions of the percentage accuracy in classifications of prediction sensitivity, specificity, positive predictive value, and negative predictive value. To achieve this, the SPSS set threshold of 0.05 helped to estimate how the sunflower production variables would influence the smallholder farmers' ability to improve their livelihood.

Table 4: Classification Table

Observed			**Predicted**		
			Sunflower value chain production activities in livelihood		
			0 No	1 Yes	Percentage Correct
Step 1	Sunflower value chain production activities in livelihood - recorded 01	0 No	32	10	76.2
		1 Yes	7	60	89.6
	Overall %				82.7

a. The cut value is .500

Source: Field Data (2023)

The model's sensitivity is defined as the proportion of the population that agrees with the statement that the model correctly predicted (true positives). The analysis's conclusion was accurately foreseen: about 89.6 per cent of the respondents agreed that activities related to the

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production of the sunflower value chain would have an impact on smallholder farmers' ability to improve their livelihood.

Additionally, the study determined the specificity of the model, which denotes the proportion of the group not agreeing with the statement that the model correctly detected (true negatives). The conclusion of the analysis was accurately foreseen by 76.2 per cent of respondents indicating that smallholder farmers' livelihoods would be impacted by sunflower value chain production activities.

The proportion of cases that the model identifies as having the characteristic seen in the group is known as the positive predictive value (Peat, 2001). The findings in Table 4 showed a 15 per cent positive predictive value. This was obtained by dividing the total number of expected = yes cells (10 + 60 = 70) by the number of cases in the observed = yes cells (60), then multiplying the result by 100 to get the percentage, that is, 10/70*100 resulting in 4.3 per cent. According to these findings, the model correctly identified 14.3 per cent of the individuals whose livelihoods were projected to be impacted by the sunflower value chain production operations.

The number of cases in the expected = no cell (7 cases) and observed = no cell (32) was divided by the sum of the predicted = no cells (7 + 32 = 39) and multiplied by 100 to obtain the negative predictive value, which was the goal of the study. This yields 7 divided by 39 multiplied by 100, or 17.9 per cent. Based on the negative predictive value of 17.9 per cent, it follows that the model correctly identified 17.9 per cent of those who believed that sunflower value chain production activities would not have an impact on smallholder farmers' livelihoods.

4.3.2 The variables in the equation- the influence of sunflower value chain production activities on the smallholder farmers' livelihood in the study area

Based on the developed logistic regression model, a regression analysis was performed, and the result in Table 5 indicates a regression result between the sunflower value chain production activities and the livelihood of smallholder farmers in Mpwapwa District.

Table 5: Regression Results between Sunflower Production Activities and Smallholder farmers' Livelihood

Variable	B	S.E.	Wald	Df	Sig.	Exp (B)
Farm preparation and Cultivation Technology	3.174	0.640	24.594	1	0.0001	23.899
Seeding arrangements	2.684	0.818	10.777	1	0.009	14.649
Weeding arrangements	3.632	1.376	6.970	1	0.001	37.747
Harvesting and storage arrangements	2.487	0.694	5.924	1	0.015	12.683
Distribution process	2.257	0.490	5.324	1	0.027	11.880
Constant	-11.658	2.598	20.142	1	0.0001	0.0001

Source: Research Findings (2023)

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The model regression results in Table 5 include the logistic regression coefficient, Wald Test, level of significance and odds ratios for an independent variable (sunflower production activities) and a dependent variable (smallholder farmers' livelihood). From the study findings, sunflower value chain production activities were measured using five different indicators namely; farm preparation and cultivation technology, seeding process, weeding process, harvesting and storage arrangements and distribution process.

The results indicate that farm preparation and cultivation technology had a significant influence (B=3.174 and p-value=0.0001) on smallholder farmers' livelihood. It was further revealed that farm preparation and cultivation technology increases the odds of smallholder farmers' livelihood by a factor of 23.899. The interviews with smallholder farmers found that the farm preparation process and the technology used in cultivation had a significant contribution to the value creation of the sunflower grains. This results in better livelihood for the smallholder farmers at the end of the value chain processes.

Moreover, the seeding process was significant (B=2.684 and p-value=0.009) on smallholder farmers' livelihood with the fact that it increases the odds of smallholder farmers' livelihood by a factor of 14.649. Interviewed respondents claimed that the efficiency of the seeding process has a greater contribution to the outputs (volume of sunflower grains harvested). This has a significant contribution to the livelihood outcome of the smallholder farmers in Mpwapwa District through the revenue they get after selling large volumes of sunflower grains to processors.

Furthermore, the study findings indicate that the weeding process had a significant influence (B=3.632 and p-value=0.001) on smallholder farmers' livelihood with an odds ratio of 37.747. This was also evidenced from interviews where the majority of the interviewees indicated that the sunflower weeding process enables sunflowers to grow strong and healthier and yield high output. It was observed that smallholder farmers who weed at least twice their sunflower do contribute to improving the quality of sunflower grains which stimulates the value chain process and finally the smallholder farmers' livelihood.

On the other hand, harvesting and storage arrangements had a significant influence (B=2.487and p-value=0.015) on smallholder farmers' livelihood. Interviewed respondents indicated that harvesting and storage arrangements play a significant role in the value creation of sunflower seeds. This was confirmed as the odds ratio was 12.683. It was further revealed that the distribution process of sunflower seeds to the local and regional processors had a significant contribution to the value creation of sunflowers and the improved livelihood of smallholder farmers in Mpwapwa District. This was true because the variable had a significant influence (B=2.257and p-value=0.027) on smallholder farmers' livelihood with an odds ratio of 11.880. The interviewed respondents mentioned that the distribution function of sunflower seeds to the processors ensures place utility which creates more value for the sunflower and ultimately contributes to the smallholder farmers' livelihood.

Generally, the study findings indicates that farm preparation and cultivation technology and weeding arrangements were noted as most significant in influencing the smallholder farmers' livelihood (B=3.174, p=0.0001 and B= B=3.632 and p-value=0.001 respectively). These

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findings supports production theory which claims that effective utilization of the factors of production such as land and human resources results into improved output and ultimately the livelihood outcomes. The report of URT (2015) on sunflower sector development strategies is consistent with this finding as it reported farm preparation and weeding activities as the specific production activities with a significant influence on the value creation of the sunflowers.

Sunflower production activities play a significant part in the value creation of sunflower products. The local government at Mpwapwa District Ward is also involved in providing advice to the smallholder farmers including advising farmers to use better production tools, and quality seeds, and decide on the economical way of utilizing the farmland for improved production. One of the interviewed respondents said,

"*The local government provides us with a guide to using at least 2/3 available agricultural land for food crops and only dedicate the remaining 1/3 for cash crops such as sunflower. This enables us to plan for our land before the beginning of the farming season. Also, they provide us with agricultural officers who provide technical advice regarding the sunflower production activities to improve the sunflower production.*" 13th June 2023-Chunyu ward.

Other studies (Ogutu, 2018; Getachew, 2014) support this finding as both of them mentioned sunflower production activities as the main point where the value for sunflowers is starting to be created. Ogutu, (2018) insists that there is a need for sunflower smallholder farmers to use the modern tools of production such as tractors for the first ploughing and an oxen plough for the second ploughing and finally hoes for weeding. This makes the sunflower seeds grow well and yield high output.

Perhaps, the study of Fernandez-Stark (2016) suggested that sunflower production can be efficiently carried out by improving farming technology instead of continuing using hand hoes or oxen draught ploughs which leads to low earnings and unable to get credit to expand farmers' land size. Trienekens (2011) on other hand insist that strategies such as process upgrading including introducing new farming technology have a greater influence on sunflower production, value creation and improved livelihood of the smallholder farmers.

5. Summary, Conclusion and Recommendation

Based on the findings from the study, it revealed that there is a close relationship between sunflower value chain practices and the livelihood of smallholder farmers in Mpwapwa District. Production activities such as farm preparation and cultivation technology, seeding process, weeding process, harvesting and storage arrangements and distribution process have a significant influence on smallholder livelihood in terms of improving their living standards, food security and access to invest in other non-farm activities and others. Despite the existing relationship between the sunflower value chain activities and the smallholder farmers' livelihood, challenges still exist on the areas such as pest and disease management, soil fertility improvement, and post-harvest handling practices. Furthermore, access to credit and affordable inputs, such as quality seeds and fertilizers, remains a challenge for small-scale sunflower producers, hindering their ability to invest in improved cultivation techniques. This calls for need to strengthen sunflower production activities through ensuring access to farming technology, quality seeds, provision of

farming advices, and access to credits so as farmers could realize their livelihood output through this production activities. The Government of Mpwapwa District should provide training to farmers on how to use modern farming techniques which include the use of improved seeds, fertilizers and proper sowing. Subsidies or various credit arrangements to support smallholder farmers in Mpwapwa District should be provided to help small-scale farmers to undertake farming activities at low cost. The participants in the value chain of Mpwapwa District should support each other to create the value of sunflower oil. Input suppliers should support small-scale farmers and large-scale farmers by providing them with agricultural advice. Participants of value chain activities should establish beneficial relationships that will enable them to create mutual benefits and continue to exploit the opportunity available in sunflower agriculture.

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