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Determinants of income diversification by smallholder sweet potatoes farmers in the Greater-Tzaneen Local Municipality, South Africa

Jenny Potsiso Mokhaukhau[1] *, Florence Matlala [1], Lesetja Jacob Ledwaba [1], Tshepi Kingsley Thaba[1]
[1] University of Limpopo, Sovenga, South Africa
* Corresponding Author. E-mail: jenmkha@gmail.com

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ABSTRACT

Sweet potato production contributes towards South Africa's agricultural sector due to its nutritional value. The paper analyzed the determinants of income diversification by smallholder sweet potato farmers in Greater-Tzaneen Local Municipality. A purposive sampling technique was used to identify 109 smallholder sweet potato farmers and data was collected through semi-structured questionnaires. Descriptive statistics and Binary logistic regression models were employed to analyze the data. The average age of the smallholder sweet potato farmers was 43 years while the average number of years in farming was 9 years. The Binary logistic results indicate that age of the farmer, distance to the market and the level of education influenced smallholder sweet potato farmers to diversify their income. To enhance the livelihoods of smallholder sweet potato farmers, training and exposure to alternative income opportunities are crucial, with a focus on younger farmers who are eager to learn and diversify their income.

INTRODUCTION

Sweet potato production holds significant importance in South Africa's agricultural sector due to its nutritional value and contribution to food security. The crop has been identified as one of the food crops that has potential to contribute to food security and poverty alleviation due to its widespread cultivation, and ability to thrive in conditions where other crops, such as maize, will not thrive (Mgcibelo, 2014). According to (Afzal et al., 2021), sweet potato is the world's most nutritious vegetable producing more output per hectare than any other crop. In South Africa, sweet potatoes are classified as the second most significant root crop, with a production of 82,000 tons in 2018/19 (Mokhaukhau et al., 2024). The main regions where sweet potatoes are predominantly grown in South Africa are Limpopo, Mpumalanga, the Brits area in North-West, and certain parts of KwaZulu-Natal and Western Cape (Laurie et al., 2018). Moreover, the production of sweet potato in South Africa has a well-developed commercial value (Hillstrom & Hillstrom, 2000). While its consumption level has increased rapidly due to its recognized nutritional and health benefits (Govender et al., 2019).

Sweet potato is a multipurpose ingredient in the food industry as its roots, stems and leaves are edible parts with varying nutrient composition commonly consumed as nutrient-dense and health promoting parts of the crop (Danso-Abbeam et al., 2018). According to (Mgcibelo, 2014), the crop contains significant amounts of carbohydrates when compared to starchy rice, maize and sorghum porridge. Although its protein content is slightly lower than in potatoes and other grain crops, sweet potato is classified as a root crop with almost all the micro and macro-nutrients, substantial quantities of vitamin C, moderate amounts of vitamin B complex (vitamin B1, B2, B5 and B6) and folic acids, as well as satisfactory amounts of vitamin E (Govender et al., 2019). According to (Brez et al., 2020; Marías & Glasauer, 2014), orange-fleshed sweet potato is widely used in different regions, including South Africa as a supplementary food to alleviate vitamin deficiencies in Children. As a result, sweet potato is considered a high value root crop with the potential to enhance the

viability of small-scale agriculture through income diversification (Afzal et al., 2021; Joshi et al., 2004). According to (Nyathi et al., 2019), income diversification is considered the most important strategy for raising income for small-scale farmers. The study of (Agyeman et al., 2014) defines income diversification as a situation where smallholder farmers rely on income from multiple sources; both farm and non-farm. Additionally, (Gecho, 2017) defined income diversification as the amount of income which is derived from off-farm sources.

Previous studies have highlighted various factors that influence income diversification choices among smallholder farmers. For example, access to markets and market opportunities have been found to be significant determinants (Fafchamps & Hill, 2005). The proximity of farms to urban centers and transportation infrastructure can enhance market access, enabling farmers to diversify their income by engaging in off-farm activities such as selling produce directly to consumers or supplying to agro-processing industries (Laurie et al., 2018). Furthermore, some studies indicated that farmers' demographic characteristics and household characteristics play a role in income diversification decisions (Sánchez Bogado et al., 2024; Wang et al., 2025). These studies identified age, education level, gender, and household size as factors influencing the extent and type of income diversification activities undertaken (Grilli et al., 2024) and resources, enabling them to explore diverse income-generating opportunities.

The study of (Sallawu et al., 2016) examined the determinants of income diversification in rural farming households in Niger State, Nigeria. The study used the Tobit model to analyze the determinants of income diversification among farming households. (Sallawu et al., 2016) estimated the impact of age of the respondent, education level of the household head, livestock ownership, household size, credit use and poverty status on income diversification. The results revealed that these factors do not influence income diversification by rural farming households. Similarly, another study conducted in South Africa by Toyin and (Toyin & Abbyssiania, 2017) the Poisson regression model to identify determinants of income diversification among households and the results revealed that engagement in agriculture, number of economic active members and population group are among the determinants of the income diversification strategy of households.

Despite these socio-economic factors, the integration of smallholder farmers in the agricultural value chain remains a critical aspect for income diversification (Koiry et al., 2024). Therefore, the participation of smallholder sweet potato farmers in the value chain can increase their access to markets which will ultimately improve their income. However, this integration requires farmers to overcome barriers such as lack of information, limited bargaining power and access to resources such as capital. In addition, (Jogo et al., 2021) emphasise that the adoption of new innovation such as disease resistant varieties could significantly improve the income diversification of farmers. Hence, this study intends to analyze determinants of income diversification among smallholder sweet potatoes farmers in the Greater Tzaneen Municipality.

METHOD

The Greater Tzaneen Local Municipality (GTLM) is situated in the picturesque landscapes of the Limpopo Province, South Africa, and serves as a vibrant hub for agricultural activities. This local municipality is located on the south-western part of the Mopani District Municipality and is bordered by Maruleng (on the South), Lepelle-Nkumpi Local Municipality (on the south-west), Molemole Local Municipality (on the west), Greater Letaba Local Municipality (on the north), Greater Giyani Local Municipality (on the north-east) and Ba-Phalaborwa Local Municipality (on the east). The GTLM covers an area of approximately 3242.6 square kilometres, and it encompasses of Haenertsburg (in the west), Rubbervale (in the east), Modjadjiskloof (in the north) and Trichardsdal (in the south). Tzaneen, Nkowankowa, Lenyenye, Letsitele and Haenetzburg are the main towns of the municipality. Greater Tzaneen Municipality has a population size of 390 095, which is the largest municipality in terms of population contribution (36%) in the Mopani District. Greater Tzaneen Municipality had a total of 108 926 households in 2011, 23.7% of the households are vegetable producers and 27.7 % produce other crops. The soil condition of the municipality is suitable for the production of sweet potatoes due to its sandy loamy soil type.

Data was collected from smallholder sweet potato farmers through a semi-structured questionnaire. The semi-structured online questionnaire was developed to gather information on socio-economic characteristics, institutional and economic factors influencing income diversification by smallholder sweet potato farmers in Greater Tzaneen Local Municipality. The semi-structured questionnaire specifically gathered information on socio and economic information of the respondents in the study area. Due to the unknown number of sweet potato farmers in the study area, snowball and purposive sampling techniques were used to identify 109 smallholder farmers.

The study used descriptive statistics (i.e., measures such as the mean, median and standard deviation) to address the first objective which is to profile the socio-economic characteristics of smallholder sweet potato farmers in Greater Tzaneen Local Municipality. Binary logistic regression model was used to address the

second objective which is to analyze the socio-economic factors influencing income diversification by smallholder sweet potato farmers in Greater Tzaneen Local Municipality. The Binary Logistic regression was used to analyze the determinants of income diversification among smallholder sweet potato farmers in the study area. This model was chosen because the dependent variable is dichotomous and comprises two potential outcomes denoted as 0 and 1. In this study, 1 means that smallholder farmers diversify their income and 0 means they do not diversify. Various authors have used the binary logistic model to analyse the determinants of income diversification (Adem et al., 2018; Saba et al., 2022; TIUMELESAN, 2022). The Binary Logistic model is expressed as follows:

$$log\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 X_1 + \cdots + \beta_n X_n + \alpha_i \quad \ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where: P is the probability of the sweet potato farmer to diversify their income, $1 - P_1$ is the probability of the sweet potato farmer not to diversify their income, log is the natural logarithm, β_0 is the intercept, $\beta_1, \ldots, \beta_n$ are the coefficients of the estimated parameters, $X_1, \ldots, X_n$ are the independent variables and α_i is the error term.

RESULT AND DISCUSSION

Table 1 shows the descriptive results for age of the farmer, number of years farming, number of household members, size of arable land and distance to the market. The average age of the smallholder sweet potato farmers was 43 years. This average age of farmers suggests that most of the smallholder farmers in the study area are within the economic working population. Similarly, the average number of years farming is 9 years. On average, smallholder sweet potato farmers have a minimum of 1 household member and a maximum of 8 household members. The maximum household size suggests that a larger household size encourages households to diversify their income based on the available human resource (Debesai, 2020).

The descriptive results also show the average size of arable land as 1.71 hectares. These results suggest that farmers in the study area are able to produce sweet potatoes and other agricultural products based on their plantation season. On the other hand, the minimum distance to the market is 0 which implies that some farmers sell directly from their farms or consumers travel to the farmers' residence to purchase the sweet potatoes. Nevertheless, on average, farmers are likely to travel 1.4 km to the market.

Table 1: Description of continuous variables

Variables	N	Min.	Max.	Mean	Std. Deviation
Age of the farmer (years)	109	20	75	43	14.61
Number of years farming (years)	109	1	50	9	4.10
Number of household members (actual number)	109	1	8	4	2,07
Size of arable land (hectare)	109	1	7	1,71	1,29
Distance to the market (Kilometre)	109	0	13	1,4	2.80

The results presented in Table 2 show the frequency and percentages of selected categorical variables. About 52% and 48% are male and female sweet potato smallholder farmers respectively. In addition, about 59.7% of the respondents do not diversify their income while 41.3% diversify their income. These results suggest that most of the farmers in the study area rely on the income from sweet potatoes to sustain their livelihoods. The majority of the respondents (34.9%) have primary education while 17.4% have no form of education. It is therefore noteworthy that most of the farmers are educated and that might influence their decision to diversify their income. Many of the sweet potato farmers (43.1%) rely on family labour as a form labour resource. These results imply that family members share the production responsibilities of sweet potato farming. In addition, these results could mean that sweet potato production is a joint family activity where all members have to contribute in the form of human resources.

Although most of the sweet potato smallholder farmers do not have access to credit, about 65.1% have access to the market which can improve their household income. Nevertheless, most farmers (37.6%) use their

own transport to deliver the sweet potatoes to the market. It is evident that many farmers do not receive extension services (86.2%) and are also not members of any agricultural cooperatives (81.7%) but are able to rely on the radio (32.1%) for agricultural information. Therefore, these suggest that smallholder sweet potato farmers in the study area are self-reliant.

Table 2: Descriptive results for categorical variables

Variables	Frequency	Percent	Variables	Frequency	Percent
Gender			**Access to the market**		
Male	57	52	If farmer has access to market	71	65,1
Female	52	48	If farmer has no access to the market	38	34,9
Income diversification			**Transport to the market**		
No income diversity	64	59,7	Own transport	41	37,6
Income diversity	45	41,3	Customers buy directly from the farm	35	32,1
			Hired labour	11	10,1
Level of education			None	15	13,8
Primary education	38	34,9	Other forms of transportation	7	6,4
Tertiary education	20	18,3			
Secondary education	32	29,4	**Access to extension services**		
No education	19	17,4	If farmer receives extension services	15	13,8
			If farmer receives no extension services	94	86,2
Type of labour			**Agricultural cooperative membership**		
Hired labour	34	31,2			
No labour	26	23,9	If farmer is a member of any cooperative	20	18,3
Family labour	47	43,1	If farmer is not a member of any cooperative	89	81,7
Other forms of labour	2	1,8			
Access to credit			**Source of agricultural information**		
If farmer has access to credit	19	17,4	Internet	8	7,3
If farmer has no access to credit	90	82,6	Television	14	12,8
			Radio	35	32,1
			Farmers' meeting	21	19,3
			Other forms	13	11,9
			None	18	16,5

Table 3 presents the Binary Logistic results on the determinants of income diversification by smallholder sweet potato farmers in the Greater-Tzaneen Local Municipality. The model fit results show that the -2Log likelihood is 62,906 and the model is significant at 0,001. Additionally, the Cox and Snell R-Square is 0,541. The Nagelkerke R Square is 0,729. This implies that 72,9% of the proportion of the variation is explained by the dependent variable.

Table 3: Binary Logistic regression results on the determinants of income diversity

Variables	B	S.E.	Wald	Sig.
Constant	1,219	5,863	0,043	0,835
Gender	0,054	0,825	0,004	0,948
Age of the farmer	-0,069**	0,034	4,071	0,044
Level of education	-3,057***	0,782	15,3	0,001

Type of land ownership	1,076	0,845	1,622	0,203
Farm labour	-0,414	0,484	0,73	0,393
Access to credit	0,962	1,217	0,625	0,429
Access to market	1,636	1,021	2,565	0,109
Transport to the market	0,596	0,453	1,729	0,189
Extension services	0,592	1,461	0,164	0,686
Cooperative	-0,513	1,586	0,104	0,746
Source of agricultural information	0,102	0,383	0,071	0,790
Number of household members	-0,128	0,195	0,43	0,512
Distance to the market	0,418*	0,229	3,318	0,069
Size of arable land	0,098	0,396	0,061	0,805
Model chi-square: 84,871				
Model significance: 0,001				
-2Log likelihood: 62,906				
Cox and Snell R-square: 54,1%				
Nagelkerke R Square: 72,9%				

Note: *,** and *** represent significance level at 10%, 5% and 1%.

The results presented in Table 3 show that age of the farmer, level of education and distance to the market are significant. The age of the farmer is statistically negative and significant at 5% level which implies that as farmers age increases, the income diversity of smallholder sweet potato farmers in the study area is likely to decrease. As farmers grow older, they are less eager to accept new farming innovations and are more risk-averse (Ayisi et al., 2022). On the contrary, (Mathebula et al., 2017) found a positive correlation between age of the household and income diversification implying that the chance to earn from diversified income sources increases as the household head ages. Similarly, (Olugbire et al., 2020) argued that the diversification tends to increase with age particularly through non-farming activities. Therefore, in this study older farmers tend to focus on farm operation than venturing into other sources of income.

Level of education is negative and significant at 1% level. The results imply that the educational level might not increase the income diversification of the smallholder sweet potato farmers in the study area. (Wudil et al., 2021) also found similar results and attest that a farmer with high level of education tend to be reluctant to diversify their income due to the large income they currently receive from their current employment. (Anang & Yeboah, 2019) corroborate that education is important as it improves human capital and the ability to participate in high paying agricultural jobs. Similarly, (Adeoye et al., 2019) agrees that the extend of income diversification decreases as the farmers level of education improves. This could indicate that while education enhances human capital and boosts opportunities for high paying jobs, it may however discourage farmers to diversify their income.

Distance to the market is positive and significant at 10% level of significance. The results imply that an increase in distance to the market might increase the diversity of income. This suggests that the smallholder sweet potato farmers might diversify their income based on the distance travelled to the market. These results are rather unexpected because studies show that the shorter the distance travelled to the market, the more the farmers will diversify their income (Adem & Tesafa, 2020; Getahun et al., 2023). However, the long distance suggest that farmers might be able to explore other non-farm income opportunities as they travel longer to the market. Also, for smallholder sweet potato farmers who rely on sweet potato production for income, if the distance to the market increases, they are likely to look for other sources of income to have a continuous source of livelihood. (Danso-Abbeam et al., 2018) argue that when distance to the market increases, farmers might find it difficult to transport their products to the market centres due to constraints like finance and other factors such as networks.

CONCLUSION

The study has revealed that income diversification by smallholder sweet potato farmers is crucial for its contribution towards food security and poverty alleviation in the Greater Tzaneen Local Municipality. Most respondents were male, and the majority had primary education. From the regression analysis variables age of a farmer, level of education and distance to the market showed

that they are important towards income diversification of the smallholder sweet potato farmers. It is therefore recommended that smallholder farmers who travelled long distances to the market be exposed to other non-farm income opportunities that they could benefit from, while moving their sweet potatoes to distant markets. Moreover, exposure to diversified income sources other than farm income should be done when farmers are still in their active ages because young farmers are more eager to explore potential opportunities compared to older farmers.

AUTHORS CONTRIBUTIONS

J.P. Mokhaukhau was primarily involved in conceptualizing the research, designing the methodology, and conducting formal analyses. Matlala F drafted the original manuscript and participated in the writing, reviewing and editing of the manuscript. Ledwaba LJ took on roles related to validation of results, writing, review and editing of the manuscript. Thaba TK participated in the writing, review and editing of the manuscript.

REFERENCES

Adem, M., Tadele, E., Mossie, H., & Ayenalem, M. (2018). Income diversification and food security situation in Ethiopia: A review study. *Cogent Food & Agriculture*, *4*(1), 1513354. https://doi.org/10.1080/23311932.2018.1513354

Adem, M., & Tesafa, F. (2020). Intensity of income diversification among small-holder farmers in Asayita Woreda, Afar Region, Ethiopia. *Cogent Economics & Finance*, *8*(1), 1759394. https://doi.org/10.1080/23322039.2020.1759394

Adeoye, I. D., Seini, W., Sarpong, D. B., & Amegashie, D. (2019). Off-farm income diversification among rural farm households in Nigeria. *Agricultura Tropica et Subtropica*, *52*(3–4), 149–156. https://doi.org/10.2478/ats-2019-0017

Afzal, N., Afionis, S., Stringer, L. C., Favretto, N., Sakai, M., & Sakai, P. (2021). Benefits and trade-offs of smallholder sweet potato cultivation as a pathway toward achieving the sustainable development goals. *Sustainability (Switzerland)*, *13*(2), 1–17. https://doi.org/10.3390/su13020552

Agyeman, B. A. S., Asuming-Brempong, S., & Onumah, E. E. (2014). Determinants of income diversification of farm households in the western region of Ghana. *Quarterly Journal of International Agriculture*, *53*(1), 55–72.

Anang, B. T., & Yeboah, R. W. N. (2019). Determinants of Off-Farm Income among Smallholder Rice Farmers in Northern Ghana: Application of a Double-Hurdle Model. *Advances in Agriculture*, *2019*, 1–7. https://doi.org/10.1155/2019/7246176

Ayisi, D. N., Kozári, J., & Krisztina, T. (2022). Do smallholder farmers belong to the same adopter category? An assessment of smallholder farmers innovation adopter categories in Ghana. *Heliyon*, *8*(8), e10421. https://doi.org/https://doi.org/10.1016/j.heliyon.2022.e10421

Brez, C., Sridharan, V., Barber, W., Beatty, I. D., Yeager, D. S., Orvidas, K., Schleider, J. L., Wang, M. T., Parada, S., Fink, A., Lodi, M., Fernandez, O. E., Nallapothula, D., Broda, M., O'Brien, K., Rhee, J., Bradbury, A., Mielicki, M. K., Justice, L. M., … Li, P. (2020). A Growth Mindset Lowers Perceived Cognitive Load and Improves Learning: Integrating Motivation to Cognitive Load. *Frontiers in Psychology*, *11*(2), 739–756. https://doi.org/10.1119/perc.2019.pr.Beatty

Danso-Abbeam, G., Ehiakpor, D. S., & Aidoo, R. (2018). Agricultural extension and its effects on farm productivity and income: insight from Northern Ghana. *Agriculture & Food Security*, *7*(1), 74. https://doi.org/10.1186/s40066-018-0225-x

Debesai, M. (2020). Rural household income diversification in developing countries: A Case study of Eritrea. *E3S Web of Conferences*, *175*, 13014. https://doi.org/10.1051/e3sconf/202017513014

Fafchamps, M., & Hill, R. V. (2005). Selling at the Farmgate or Traveling to Market. *American Journal of Agricultural Economics*, *87*(3), 717–734. https://doi.org/10.1111/j.1467-8276.2005.00758.x

Gecho, Y. (2017). Rural Farm Households' Income Diversification: The Case of Wolaita Zone, Southern Ethiopia. *Social Sciences*, *6*(2), 45. https://doi.org/10.11648/j.ss.20170602.12

Getahun, W., Haji, J., Mehare, A., & Zemedu, L. (2023). Drivers of income diversification among rural households in the Ethiopian central highlands. *Food and Energy Security*, *12*(3). https://doi.org/10.1002/fes3.443

Govender, L., Pillay, K., Siwela, M., Modi, A. T., & Mabhaudhi, T. (2019). Improving the Dietary Vitamin A Content of Rural Communities in South Africa by Replacing Non-Biofortified White Maize and Sweet Potato with Biofortified Maize and Sweet Potato in Traditional Dishes. *Nutrients*, *11*(6), 1198. https://doi.org/10.3390/nu11061198

Grilli, G., Pagliacci, F., & Gatto, P. (2024). Determinants of agricultural diversification: What really matters? A review. *Journal of Rural Studies*, *110*, 103365. https://doi.org/https://doi.org/10.1016/j.jrurstud.2024.103365

Hillstrom, K., & Hillstrom, L. C. (2000). *American Civil War Almanac* (Vol. 3).

Jogo, W., Bocher, T., & Grant, F. (2021). Factors influencing farmers' dis-adoption and retention decisions for biofortified crops: the case of orange-fleshed sweetpotato in Mozambique. *Agrekon*, *60*(4), 445–459. https://doi.org/10.1080/03031853.2021.1956555

Joshi, P. K., Gulati, A., Birthal, P. S., & Tewari, L. (2004). Agriculture diversification in South Asia: patterns, determinants and policy implications. *Economic and Political Weekly*, 2457–2467.

Koiry, S., Kairi, B., & Pooja, P. (2024). Impact of income diversification on multidimensional poverty: Household level evidence from tea estates in Bangladesh. *Heliyon*, *10*(5), e26509. https://doi.org/https://doi.org/10.1016/j.heliyon.2024.e26509

Laurie, S. M., Faber, M., & Claasen, N. (2018). Incorporating orange-fleshed sweet potato into the food system as a strategy for improved nutrition: The context of South Africa. *Food Research International*, *104*, 77–85. https://doi.org/10.1016/j.foodres.2017.09.016

Marías, Y. F., & Glasauer, P. (2014). *Guidelines for assessing nutrition-related knowledge, attitudes and practices.*

Mathebula, J., Molokomme, M., Jonas, S., & Nhemachena, C. (2017). Estimation of household income diversification in South Africa: A case study of three provinces. *South African Journal of Science*, *113*(1/2), 9. https://doi.org/10.17159/sajs.2017/20160073

Mgcibelo, M. N. (2014). *Agronomic and Physiological Approaches to Improving Productivity of Selected Sweet Potato (Ipomoea batatas L.) Cultivars in Kwazulu-Natal: A Focus on Drought Tolerance*. University of KwaZulu-Natal, Pietermaritzburg.

Mokhaukhau, J. P., Matlala, F., Matlala, L. J., & Thaba, T. K. (2024). Key drivers of income diversification among smallholder sweet potato farmers in Greater Tzaneen Municipality. *Harmoni Sosial: Jurnal Pendidikan IPS*, *11*(1).

Nyathi, M. K., Du Plooy, C. P., Van Halsema, G. E., Stomph, T. J., Annandale, J. G., & Struik, P. C. (2019). The dual-purpose use of orange-fleshed sweet potato (Ipomoea batatas var. Bophelo) for improved nutritional food security. *Agricultural Water Management*, *217*, 23–

37. https://doi.org/10.1016/j.agwat.2019.02.029

Olugbire, O. O., Obafunsho, O. E., Olarewaju, T. O., Kolade, R. I., Odediran, F. A., & Orumwense, L. A. (2020). The composition and determinants of rural non-farm income diversification in Nigeria. *Journal of Agribusiness and Rural Development*, *57*(3), 279–288. https://doi.org/10.17306/J.JARD.2020.01344

Saba, S., Sarker, M. A. R., & Gow, J. (2022). Determinants of non-farm income diversification strategies and decisions of Bangladesh farm households. *Economic Analysis and Policy*, *76*, 226–235. https://doi.org/10.1016/j.eap.2022.08.007

Sallawu, H., Tanko, L., Nmadu, J. N., & Ndanitsa, A. M. (2016). DETERMINANTS OF INCOME DIVERSIFICATION AMONG FARM HOUSEHOLDS IN NIGER STATE, NIGERIA. *Russian Journal of Agricultural and Socio-Economic Sciences*, *50*(2), 55–65. https://doi.org/10.18551/rjoas.2016-02.07

Sánchez Bogado, A. C., Estrada-Carmona, N., Beillouin, D., Chéron-Bessou, C., Rapidel, B., & Jones, S. K. (2024). Farming for the future: Understanding factors enabling the adoption of diversified farming systems. *Global Food Security*, *43*, 100820. https://doi.org/https://doi.org/10.1016/j.gfs.2024.100820

TIUMELESAN, E. T. (2022). *DETERMINANTS OF INCOME DIVERSIFICATION AMONG RURAL HOUSEHOLDS: THE CASE OF WIERA WOREDA, HALABA ZONE, SNNPRS, ETHIOPIA*. HU.

Toyin, M. E., & Abbyssiania, M. (2017). Income Diversification and its Determinants among Households in Eastern Cape Province, South Africa. *Journal of Economics and Behavioral Studies*, *8*(6(J)), 19–27. https://doi.org/10.22610/jebs.v8i6(J).1480

Wang, J., Konar, M., Anderson, P. N., Hadunka, P., & Mulenga, B. (2025). Impact of current and historical climate shocks on crop diversification in Zambia: Insights from household- and district-level observations. *Climate Risk Management*, *47*, 100683. https://doi.org/https://doi.org/10.1016/j.crm.2024.100683

Wudil, A. H., Mamman, B. Y., Boye, M., & KE-Tindagbémè, D. L. I. (2021). Determinants of Income Diversification among Famers in the Kano River Irrigation Project (KRIP), Nigeria. *International Journal of Social Studies*, *1*(1), 01–08. https://doi.org/10.55627/ijss.01.1.0110