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Gendered Impact of Lifestyle Behaviors on Agricultural Productivity

Evidence from Kwara State, Nigeria

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ABSTRACT

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Non-communicable diseases (NCDs), driven by unhealthy lifestyle behaviors, pose significant challenges to public health and economic productivity worldwide. This study examines the gendered impact of lifestyle behaviors on agricultural productivity of farmers in Kwara State, Nigeria employing a cross-sectional survey. Utilizing a combination of Healthy Lifestyles Index, Stochastic Production Frontier Analysis, and Propensity Score Matching, the study reveals that healthy lifestyle behaviors positively impact agricultural productivity, with stronger effects among the female farmers. The study therefore recommends, the need for targeted health and agricultural interventions by governments and non-governmental organizations to improve agricultural productivity, rural livelihood and as well promote gender equity in rural farming communities.

JEL Classification:
I12, J16, Q12, O15

Keywords:
Health, Agriculture; Productivity; Gender Differences; Non-Communicable Diseases; Rural Farmers; Nigeria

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INTRODUCTION

Non-communicable diseases (NCDs), often referred to as lifestyle-related diseases, are a significant public health concern. They account for an estimated 38 million deaths annually, with nearly half of these deaths occurring among individuals aged 30 to 70, predominantly in developing countries, including sub-Saharan Africa (Combary & Traore, 2021; WHO, 2014; Adebisi et al., 2024). NCDs also pose substantial economic challenges, ranking as the second-largest risk to global economic growth due to their high economic burden. For women, NCDs are the leading cause of mortality worldwide (WHO, 2004), contributing to 65% of female deaths, a large proportion of which are preventable through lifestyle interventions. These risk factors include poor diet, physical inactivity, tobacco use, and excessive alcohol consumption.

Evidence highlights that unhealthy lifestyle behaviors are associated with chronic diseases such as hypertension, elevated blood sugar, and cholesterol levels (Tzotzas et al, 2011; Janiszewski & Ross, 2009). These conditions disproportionately affect rural populations in low-income settings, where farming is the primary livelihood and income levels are low. Lower socioeconomic status is strongly linked to higher NCD prevalence, with women being particularly vulnerable due to gendered inequalities in access to resources and healthcare (Hayes et al, 2006; Combary & Traore, 2021, Adebisi et al., 2023; Schuit et al., 2002; Pronk et al., 2004). Additionally, NCDs have a more pronounced impact on women in low- and middle-income countries during their childbearing years compared to their counterparts in high-income countries, underscoring the complex interplay of social and economic determinants (Wandera et al, 2015).

Gendered patterns of lifestyle behaviors reveal inequities in exposure to health risks. These patterns are shaped by societal roles and unequal access to resources, decision-making power, and opportunities, resulting in differential health outcomes for men and women (Jovicic, 2015; Varela-Mato et al, 2012; Combary & Traore, 2021). Such inequities are particularly evident in agricultural communities, where farmers' health directly influences productivity. Farming as an occupation determines income levels and work-related health outcomes, making it essential for farmers to adopt healthy lifestyles to sustain productivity (Ruel & Hawkes, 2006).

A healthy lifestyle involves managing behaviors that promote well-being, such as balanced nutrition, stress management, and regular healthcare utilization (Akgun et al, 2014; Gocer et al, 2018; Combary & Traore, 2021). These practices are critical for farmers, whose physical and mental health significantly impact their agricultural productivity. While numerous studies (Badiane and Ulimwengu, 2009; Ulimwengu, 2009; Reitsma et al., 2017; Smyth et al., 2015) have linked poor health to reduced productivity, there is limited empirical evidence exploring the gendered impact of lifestyle behaviors on agricultural productivity, particularly in sub-Saharan Africa.

Notwithstanding, the theoretical agreement about the effect of health on agricultural productivity, are quite divergent and sometimes contradictory. Poor health can have negative effects on labour productivity by reducing physical and cognitive capacities and working time. These results were found by Touzé and Ventelou (2002) and Perkins et al. (2008). However, public health expenditures by the state for the benefit of the population may have a positive effect on agricultural labour productivity. This has been shown by Fan and Hazell (1999); Fan et al. (2002); Fan and Thorat (2003); Rivera and Currais (2003); Pham et al. (2006); Hassan (2008); and Karbasi and Mojarad (2008).

However, in the context of this study, the importance of disaggregating data based on gender to examine the impact of lifestyle behavior on agricultural productivity cannot be stressed. This is to provide a framework for formulating relevant policies aimed at improving the agricultural productivity, health status and livelihood of the both the male and female farmers.

I categorize the farmers into two, those who engage in healthy lifestyles behavior and those who do not, this was done following healthy lifestyles index constructed on several lifestyles indicators. I found out that only 31 and 30 per cent of the male and female farmers had healthy lifestyle status. Measuring the impact of lifestyle behavior on agricultural productivity of farmers. There was improvement in output by 0.3711 (37.11%) and 0.4461 (44.61%) respectively for the male and female farmers. The improvement in output of farmers who had a healthy lifestyle behavior was significant for only female farmers at 5%, indicating that engaging in healthy lifestyle behavior has a positive effect on the agricultural productivity of farmers especially the female farmers in the study area.

The remaining sections of this paper are organized as follows: methodology describes the study area, sampling technique, data, tools of analysis and empirical model, followed by the results and discussion, and then the conclusions.

LITERATURE REVIEW

The link between health and agricultural productivity has been highly studied, but there are still evidence gaps in understanding the role of lifestyle behaviors. Health is a key determinant of labor productivity, especially in agriculture, where physical strength is important (Touzé & Ventelou, 2002). Nevertheless, ample of the existing literature focuses on the impact of specific health interventions rather than everyday lifestyle behaviors. For instance, studies carried out by Fan and Hazell (1999) showed the benefits of public health expenditures, but they often overlook the gendered dimensions.

Gender differences in access to resources and healthcare significantly influence lifestyle behaviors. Jovicic (2015) and Varela-Mato et al. (2012) highlighted differences in eating habits and physical activity levels between men and women, ascribing the differences to societal roles. Still, these studies rarely link such behaviors to agricultural productivity. Besides, while some studies like Hayes et al. (2006) provide insights into the clustering of risk factors among women, they do not explore the implications for agricultural productivity and outputs.

This study therefore addresses these gaps by integrating lifestyle behavior assessments with productivity measures using a gendered approach. With a focus on crop farmers in Nigeria, this research contributes to the growing body of evidence on health-driven productivity outcomes and gender equity in agricultural settings.

METHODOLOGY

Study design

This study employs a cross sectional survey.

Study Setting

The study was carried out in Kwara State, Nigeria, between 2019 and 2020. It is located between the latitudes 7o45’N and 9o30’N and the longitudes 2o30’E and 6o25’E and has a land area of about 32,500 square kilometres. The state has sixteen local government areas (LGAs) with a population density of 42.5 people per square kilometre and a population of approximately 2.70 million people with over 80% of the state’s population residing in the rural areas (Kwara Agricultural Development Project, 2014). Small scale farmers make up almost 90% of the population, with 50% of them being women (National Bureau of Statistics- NBS, (2012). The state is divided into four zones for the project’s administrative convenience, which are Zone A: LGAs of Baruten and Kaima; Zone B: LGAs in Edu and Patigi; Zone C: LGAs of Asa, Ilorin East, Ilorin South, Ilorin West and Moro; and Zone D: LGAs of Ekiti, Ifelodun, Irepodun, Offa, Oyun, Isin and Oke-Ero. (Adebisi et al., 2023; Ayinde et al., 2008). The well-being index of the state is 0.1168 (Adeyemo and Oni, 2013) which shows the quality of health care facility in the state.

Ethical considerations

The study was approved by the University of Ilorin, Ilorin, Nigeria Ethical Review Committee (Ethics No: UERC/ASN/2019/1487). All participants gave informed consent.

Sampling Technique

The study engaged a cross-sectional survey. The study population comprised farmers in Kwara State. A three-staged sampling technique was utilized to select the farmers. Firstly, 8 Extension Blocks (EBs) were randomly selected from 23 EBs in all the state. Secondly, two Extension Cells (ECs) were randomly chosen from the eight (8) ECs in each EB making a total of sixteen (16) ECs selected. Thirdly, 15 crop farmers were randomly selected from each EC to ensure homogeneity. This was carried out by creating a list of crop farmers with the assistance of the Extension Agents and notable individuals in the extension cells in each of the cells. A total of two hundred and forty (240) crop farmers were utilized for the study and a structured questionnaire which was pretested and validated was used to collect data from them. The sampling ensured that at least 40% of the sample included female farmers to enable the research assess the heterogenous impact of lifestyle behavior on agricultural productivity based on gender.

Analytical Techniques

Descriptive analysis

This entails measures of central tendency and dispersion (mean, mode, median, and standard deviation), percentages, frequencies and tabulation. This was used to depict the socio-economic characteristics of the crop farmers; and their lifestyle behavior.

Healthy Lifestyles Index (HLI)

This was used to categorize the crop farmers into those who engage in healthy and unhealthy lifestyle behavior (Adebisi et al, 2024; Adebisi et al, 2023; Nguyen et al., 2019; Fukunaga et al., 2020). The index was constructed based on several indicators namely dietary behavior, smoking, alcohol consumption, substance use, indiscriminate sexual practice, stress management, and healthcare utilization, being the major lifestyles that influence health. Each lifestyle behavior was classified into a low-risk (following a healthy behavior) or a high-risk (not following a healthy behavior) group. The scores assigned for the low and high-risk groups were 1 and 0 to compute a composite score ranging between 0 and 7, which was further divided by 7 to categorize into two groups: 0 (unhealthy lifestyle behavior) and 1 (healthy lifestyle behavior).

Stochastic Production Frontier

The Stochastic Production Frontier was used to assess the agricultural productivity of crop production and the determinants, this was specified by Cobb-Douglas' frontier production function following the work of Tegegne et al. (2014) because the model accounts for the stochastic error term that takes care of the statistical noise (stochastic elements such as weather, natural disasters, diseases, disruption in input supplies and measurement errors in production) resulting in a more accurate specification. The implicit form was given as:

$$TEi = Yi/Yi^{*} \frac{f(Xi;\beta)\exp(vi-ui)}{f\,(Xi;\beta)\exp vi \exp -ui} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(1)}$$

Where: Y_i: The observed output; Y_i*: The frontier output; TE: Ranges between 0 and 1.

Explicitly, it is specified as:

$$InY = \beta_o + \beta_1 InX_1 + \beta_2 InX_2 + \beta_3 InX_3 + \beta_4 InX_4 + \beta_5 InX_5 + (Vi - Ui) \ldots\ldots \text{(2)}$$

Where: In = Natural logarithms; Y = output of farmers (kilogram grain equivalent); X_1= farm size (hectares); X_2= labour (man days); X_3 = quantity of fertilizer (kilograms); X_4= cost of planting materials (naira); X_5 = quantity of herbicides (litres); β_1- β_5 = Production function parameters to be estimated; B_0= intercept U_i is the negative random error which is assumed to account for errors in technical efficiency in production. It is assumed to be half normally distributed $U_i \sim N(0, \delta^2 u)$ and ranges between zero and one. $V_{i,}$ on the other hand, is the stochastic error term which has zero mean and accounts for measurement errors and random factors beyond the farmer's control such as weather, disruption of input supplies, etc. It is assumed to be a normally distributed random variable N~ (0, δ^2v). U_i and V_i are assumed to be independent of each other.

The technical inefficiency effects, μi was defined as:

$$\mu i = \delta_o + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \cdots + \delta_7 Z_7 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(3)}$$

Where: μ_i: Inefficiency effect; X_6: Farmer's Age (years); Z_1: Healthy lifestyle status (dummy Variable; 1= Healthy lifestyle, 0=otherwise); Z_2: Days lost to illness (number); X_7: Farmer's education (years of schooling); X_8: Household size (adult equivalent); Z_3: Extension visit (numbers); Z_4: Access to credit (dummy).

The δ_0 and δ_i coefficients are unknown parameters estimated along with the variance parameters δ^2 and γ. The δ^2 indicates the goodness of fit and the correctness of the distributional form assumed for the composite error term.

Propensity Score Matching (PSM)

To examine the gendered impact of lifestyle behavior on the agricultural productivity of male and female farmers, the Propensity Score Matching (PSM) approach was employed. In estimating the PSM, farmers that practiced healthy behavior are grouped as the treatment while those that did not were classified as the control farmers. The outcome variable with which the impact of the lifestyle behavior was measured was the farmer's productivity.

PSM is a non-parametric approach introduced by Rosenbaum and Rubin (1983) and has been utilized in different contexts to measure the impact of projects or programmes in many developing countries (Babatunde & Olagunju, 2020; Abebaw et al, 2010). It is usually preferred for two reasons; one, it does not impose any assumption on the data thereby allowing for the estimation of heterogeneous treatment effects. Two, it tends to yield more reliable estimates as it uses only the matched sub-sample as against ordinary least square (OLS) regression that uses all observations in both the treatment and control groups (Babatunde & Olagunju, 2020; Abebaw et al, 2010). The PSM measures the impact of a treatment on the treated by comparing the mean of the outcome variables of interest in the treatment sample with those of the counterfactuals in the control sample.

Following Rosenbaum and Rubin (1983), a dummy Di equals 1 to represent individuals in the treatment group and 0 otherwise, Yi1 and Yi0 are the outcomes variables for unit i conditional on the presence and absence of treatment respectively. The treatment effect for individual i measures the difference between the relevant outcome indicator with the treatment and the relevant outcome indicator without the treatment. It is given as:

$$\Delta Y_i = E(Y_{i1}/D_i = 1) - E(Y_{i0}/D_i = 1) = 1) \qquad (4)$$

While the post-treatment is observed, its value in the absence of treatment (i.e. the counterfactual) is not. In household surveys, it is impossible to observe these outcomes at the same time for same individual. In other words, the treatment indicator takes either 1 or 0 but not both. This is commonly known as a missing data problem in programme evaluation literature. Consequently, the components $E(Y_{i1}/D_i = 1)$ and $(E(Y_{i0}/D_i = 1)$ are observable outcomes, whereas $(E(Y_{i1}/D_i = 0)$

and ($E(Y_{i0}/D_i =1)$ are non-observable outcomes. By filling in the missing data on the counterfactual, PSM provides a potential solution to evaluation problem.

There are various matching techniques in the literature for matching treatment and control households group having similar propensity scores to compute the average treatment effect on the treated (ATT). The common methods usually employed include radius, nearest neighbour and kernel matching techniques. For the purpose of this study, the nearest neighbor was utilized.

RESULTS AND DISCUSSION

Socio-Economic and Farm Characteristics of Farmers based on Gender

This section presents the summary statistics of selected socioeconomic characteristics for the male and female farmers sampled as shown in Table 1, which were further used as covariates in the econometric estimations.

Table 1: Summary Statistics of Socio-economic and Farm Characteristics

Variables	Male Farmers		Female Farmers	
	Mean	Standard Deviation	Mean	Standard Deviation
Age (years)	50.54	10.66	48.41	10.41
Education (years of schooling)	8.88	4.13	9.34	3.87
Household size (Adult Equivalent)	5.75	2.14	5.31	1.85
Days lost to illness (number)	1.01	1.55	0.92	1.25
Extension visit (number)	1.34	1.08	1.09	0.99
Amount of credit assessed (naira)	39821.43	75169.86	41200	75358.13
Output (Kg)	116681.5	99955.69	126646.1	144107.7
Farm size (hectares)	1.55	0.76	1.33	0.74
Labour (man-day)	79.46	40.06	74.48	41.49
Fertilizer (Kg)	453.32	456.98	413.2	396.00
Seed and planting material (naira)	174500	248697.3	158214.3	182510.8
Herbicides (Litres)	10.93	11.27	6.88	8.45

Source: Field Survey, 2020; $1=₦470

The variables as shown in Table 1 indicated that on average, the age of the male and female crop farmers is 50.54 and 48.41 years respectively, an indication that the majority of them are still in their prime age. Also, on average, the male and female farmers have undergone about 8.88 and 9.34 years of schooling with a household size of about 6 and 5 persons for the male and female farmers and both lost about one day to illness. The mean amount of credit assessed by the male and female farmers are N39,821.43 ($84.73) and N41,200 ($87.66), while cost of planting material is approximately N174,500 ($371.28) and N158,214.3 ($366.63) for the male and female farmers respectively in the last planting season. Also, most of the farmers in the area cultivate less than 2hectares of land as the male and female farmers cultivate about 1.55hectares and 1.33hectares of land respectively for their farming activities with an output of 116,681.5 and 126,646.1kg. This shows that most of the male and female farmers are subsistence farmers hence the small size of land cultivated. The summary statistics reveal marginal differences between male and female farmer's socio-economic characteristics.

Lifestyle Behavior of Crop Farmers based on Gender

This segment presents the result of the lifestyle behavior status of crop farmers in the study area.

Table 2: **Lifestyle Behavior Status of Male and Female Crop Farmers**

Lifestyle Status Classification	Male Farmers (n=140)		Female Farmers(n=100)	
	Frequency	**Per cent**	**Frequency**	**Per cent**
Healthy Lifestyle	43	30.71	30	30.00
Unhealthy Lifestyle	97	69.29	70	70.00

Source: Field Survey, 2020

The result from Table 2 shows that about 31 and 30 per cent of the male and female crop farmers which is less than the average of the sampled male and female farmers had healthy lifestyle status while the remaining 69 and 70 per cent exhibit unhealthy lifestyle behaviors, affirming that poor lifestyle practices are predominant in the study area. This result aligns with the study carried out by Wandera et al. (2015), who reported high prevalence rates of poor lifestyle behaviors in rural communities.

Determinants of Agricultural Productivity of male and Female Crop Farmers

This segment presents the maximum likelihood estimates of the stochastic production frontier and the determinants of agricultural productivity of male and female farmers in crop production.

Table 3 shows the maximum likelihood estimates of the Cobb-Douglas stochastic frontier production function of crop production. The estimated sigma square (δ^2) was not significant for both the male and female farmers. The coefficient of gamma (γ) implies that 39.78 and 91.04 per cent of the shortfall below the frontier output of the crop farmers for the male and female farmers was due to technical inefficiency of the farmers. The table also revealed that only cost of planting materials was significant in determining the output of crop production for the male and female farmers and it contributed positively to the output of the crop production at 5% respectively for the male and female farmers. This indicates that the higher the cost of planting materials, the higher the yield of crops.

The result of positive influence of cost of planting materials on agricultural productivity for both genders ($p < 0.05$) is consistent with the study carried out by Badiane and Ulimwengu (2009), who noted that input quality is key for agricultural productivity and efficiency.

Table 3: Maximum Likelihood Estimates of the Stochastic Production Frontier Function of Crop Production

Variable Parameters	Male Farmers				Female Farmers			
	Coefficient	**Std Error**	**Z**	**P>/Z/**	**Coefficient**	**Std Error**	**Z**	**P>/Z/**
Constant- β_0	5.5670***	1.2537	4.44	0.000	5.1309***	1.0955	4.68	0.000
Farm size- β_1	90.2207	0.2319	0.95	0.341	0.1356	0.2799	0.48	0.628
Labour- β_2	0.0359	0.2729	0.13	0.895	0.1565	0.2198	0.71	0.477
Fertilizer- β_3	0.0827	0.1420	0.58	0.560	0.2182**	0.1157	1.89	0.059
Plantingmaterials- β_4	0.4436***	0.0565	7.86	0.000	0.3773***	0.0480	7.85	0.000
Herbicide- β_5	0.1653	0.1928	0.86	0.391	-0.0059	0.2287	-0.03	0.979
Inefficiency model								
Constant- Z_0	-2.8030	3.2286	-0.87	0.385	-185.6134	8037.70	-0.02	0.982
Lifestyle status- Z_1	-3.4869	2.8798	-1.21	0.226	35.8731	1680.66	0.02	0.983
Days of illness- Z_2	0.7119***	0.3413	2.09	0.037	9.5182	380.92	0.02	0.980
Extension contacts- Z_3	-0.2354	0.5059	-0.47	0.642	-61.7095	2915.25	-0.02	0.983
Credit Assessed- Z_4	-1.68e-06	7.23e-06	-0.23	0.816	-0.0005	0.0334	-0.01	0.988
Age- X_6	-0.0291	0.0649	-0.45	0.654	2.1585	98.49	0.02	0.983
Educational- X_7	0.0751	0.1482	0.51	0.612	3.2461	141.21	0.02	0.982
Household size- X_8	0.3465	0.3220	1.08	0.282	3.7049	131.52	0.03	0.978
Sigma squared- σ^2	0.8196	0.0801			0.6343	0.0655		
Gamma- γ	-0.3978***	0.1955	-2.03	0.042	-0.9104***	0.2066	-4.41	0.000
No of Observations	71				49			
Wald Chi2(5)	76.83				88.55			
Prob> Chi2	0.0000				0.000			
Log Likelihood	-91.9175				-48.0483			

Note: * Figures significant at 5% significant level**

Source: Field Survey 2020

Table 3 further shows the determinants of technical inefficiency among the male and female crop farmers. The dependent variable of the inefficiency model represents the inefficiency of farmers, a non-negative coefficient implies that the associated variable has a negative effect on crop production efficiency and vice-versa. The only significant driving factors of inefficiency among the male crop farmers was the number of day's illness while none was significant for the female farmers.

The coefficient of the number of days the crop farmers were unable to go to farm due to illness had a positive sign and was significant at 5% in relation to technical inefficiency of arable crop production which suggests that an increase in days of illness reduced the crop production efficiency. This implies that the lower the number of days the crop farmers were unable to go to farm due to illness, the higher the agricultural productivity and technical efficiency. This result is similar to the findings of Adebisi et al (2023) and Cole (2006) that the number of days the crop farmers were unable to go to farm due to illness influences agricultural productivity and efficiency.

Impact of Lifestyle Behavior of Arable Crop Farmers on Agricultural Productivity

This section presents the result of the impact of lifestyle behavior of male and female crop farmers on the agricultural productivity of crop production in the study area as shown in Table 4.

Table 4: Treatment Table for the Impact of Lifestyle Behavior of Male and Female Crop Farmers on Agricultural Productivity

Variable	Sample	Male Farmers				Female Farmers			
		Treated	**Control**	**Difference**	**T-Stat**	**Treated**	**Control**	**Difference**	**T-Stat**
Output	Unmatched	11.1511	11.0295	0.1216	0.52	11.3906	10.8128	0.5778	2.30***
	ATT	11.3840	11.0129	0.3711	1.18	11.3906	10.9446	0.4461	0.99
	ATU	11.2078	11.1510	0.0567	-	11.2322	10.8826	0.3496	-
	ATE			0.0726				0.4178	-

Source: Field Survey, 2020

*, **, *** indicate the coefficients are statistically significant at 10%, 5% and 1% level respectively. T-values are based on Bootstrapped standard error.

ATT is Average Treatment Effects on the Treated

ATU is Average Treatment Effect on the Untreated

ATE is Average Treatment Effects.

The result in Table 4 reveals that the Average Treatment Effect on the Treated (ATT), which measures the impact of lifestyle behavior of crop farmers on agricultural productivity of farmers who had healthy lifestyle behavior shows there is improvement in output by 0.3711 (37.11%) and 0.4461 (44.61%) respectively for the male and female farmers. The improvement in output of crop production of farmers who had a healthy lifestyle behavior was only significant for the female farmers at 5%. This shows that lifestyle behavior of the female farmers had a significant positive effect on their agricultural productivity. Obtained Average Treatment Effect of lifestyle behavior on the Untreated (ATU) shows that if the male and female farmers who did not have a healthy lifestyle behavior had had, the improvement in their technical efficiency of production would have been increased by 0.0567 (5.67%) and 0.3496 (34.96) respectively while Average Treatment Effect (ATE) shows that if a male farmer and a female farmer were to be picked randomly, the improvement in their agricultural productivity would have increased by 0.0726 (7.26%) and 0.4178 (41.78%) respectively. Since ATT is greater than both ATU and ATE then it implies lifestyle behavior has a positive effect on the agricultural productivity of crop production of farmers especially the female farmers that had healthy lifestyle behavior in the study area. This supports a study carried out by Jovicic (2015), who reported that lifestyle interventions have a pronounced impact on women due to their dual roles in production and caregiving.

CONCLUSION AND RECOMMENDATIONS

This study focuses on the crucial role of lifestyle behaviors in shaping agricultural productivity, with significant gendered differences observed. While healthy behaviors positively correlate with agricultural productivity for both male and the female farmers, the effect is more pronounced among female farmers. These findings highlight the importance of integrating health promotion into agricultural policies to enhance productivity and improve rural livelihoods.

Furthermore, targeted health education programs should be developed by government, non-governmental agencies to encourage healthier lifestyles among farmers; also policymakers should ensure equitable access to resources and healthcare, particularly for women, to bridge the productivity gap.

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