Sustainable Socio-Economic Welfare and Agricultural Employment in ECOWAS: Is there a Non-Linear Relationship?

Sustainable Socio-Economic Welfare and Agricultural Employment in ECOWAS: Is there a Non-Linear Relationship?

Oluwarotimi A. Owolabi[1,2,*], Chinyere H. Umehruo[1], Busayo Aderounmu[1,2], Mercy O. Rotimi[1] and Evans S. Osabuohien[1,2]

[1]Department of Economics and Development Studies, Covenant University, Ota, Ogun State, Nigeria.

[2]Centre for Economic Policy and Development Research (CEPDeR), Covenant University, Ota, Ogun State, Nigeria.

Corresponding author's e-mail: oluwarotimi.owolabi@covenantuniversity.edu.ng

Abstract. Agriculture is central to welfare especially in the context of developing countries which include those of ECOWAS, however among those individuals' dependent on agriculture for their livelihood are those living in poverty and earning low incomes amongst other living standards. On the other hand, sustainable socio-economic welfare is not given much attention in the welfare literature compared to other welfare categorisations such as socio-economic welfare and economic welfare. This study explores the effect of agricultural employment on sustainable socio-economic welfare as well as the possibility of a non-linear relationship between the aforementioned variables in a balanced panel of Fifteen ECOWAS member countries. Human Sustainable Development Index (HSDI) was used as proxy for Sustainable socio-economic welfare, while the proportion of employed individuals realising a living from agriculture is the measure for agricultural employment. The results from utilising panel data fixed effects estimation show that agricultural employment adversely and significantly resulted in sustainable socio-economic welfare declining while the hypothesis of non-linear relationship between the aforementioned variables was not supported. Consequently, the study recommends that ECOWAS member country governments in raising welfare levels focus necessarily on sustainable socio-economic welfare rather than socio-economic welfare that has been the traditional focus of welfare efforts. Also ECOWAS country governments should ensure that agriculture sector interventions effectively target the poor and vulnerable households relying on agriculture for their livelihood.

Keywords: Sustainable Socio-economic Welfare, Agricultural employment, ECOWAS, Human Sustainable Development Index (HSDI), Sub-Saharan Africa, (SSA) Non-Linear Relationship

1. Introduction

The realisation of sustainable socio-economic welfare must of a necessity be at the centre of efforts of the government to raise living standards in all countries of the world. This is more so in light of countries pursuit of the United Nations Sustainable Development Goals (SDGs) by 2030, and especially where

countries either individually or collectively with other countries have abundance of natural resources as is the case of countries in Economic Community of West African States (ECOWAS) in Africa.

Sustainable Socio-Economic Welfare formally defined, refers to improvements in the quality of life of individuals from three perspectives – economic, social and environmental. The economic perspective is focused on an individuals' income realized from their livelihood, the social perspective is focused on an individuals' interaction with people in society, while the environmental perspective is focused on the quality of the environment in which individuals perform their economic and social activities. Thus, incorporated into the Human Development Index (HDI), which by design is a socio-economic welfare measure – comprising income, health and education indices, is carbon emissions giving rise to the Human Sustainable Development Index. The consideration of including carbon emissions into welfare is based on the argument that as countries progress in their development, they contribute to global carbon emissions, and this affects the quality of life that individuals may otherwise have enjoyed in the absence of such emissions. Hence, the Human Sustainable Development Index (HSDI) may be argued as a significant welfare measure for assessing true welfare [1-2]. The HSDI as a composite index of welfare comprises of four indices, namely: Carbon emissions index (which reflects the sustainable component of welfare), Income (which reflects the economic component of welfare) as discussed by [2], and Education and health indices (which respectively reflect the social component of welfare), and contrasts with the Human Development Index [3] and other narrower measures of welfare such as GDP per capita [4], Poverty [5-6], Food insecurity [5], Income [7] which have previously been used in empirical studies assessing welfare.

Linked to welfare are the contributions of a number of productive sectors of a country, of which that of the agriculture sector may be argued as most important in the context of ECOWAS member countries. This is in light of the vast agriculture resources, as well as sizeable labour force present across the entire ECOWAS regional economic community. For instance, Nigeria has sizeable fertile land which is yet to be fully utilised for agriculture, as well as the largest population in Africa, which can be deployed productively to the agriculture sector while [8], [9] and [10] highlight the potential of Nigeria's agricultural sector for employment creation, food security and poverty reduction. Cote D'Ivoire also are a major cocoa producer in the world and hence possess economic prowess. Ghana similarly has sizeable agriculture output, which can contribute to the potential massive agriculture output of the ECOWAS regional economic community. Thus, the combined potential agriculture output of ECOWAS member countries contributes to ECOWAS emerging as an economic powerhouse in Sub-Saharan Africa (SSA). This is consistent with arguments of the broader development literature that agriculture is the dominant profession and is significant in solidifying the economic foundations of developing countries.

Consistent with the view that agriculture contributes to welfare, previous empirical studies in recent time highlight agriculture as boosting welfare with various measures of agriculture employed in their analysis such as Maize technology [11], smallholder irrigation [12], and agricultural productivity [13]. However, agricultural employment as a measure of agriculture is yet to be employed in assessing the contribution of agriculture to welfare, while it is the earnings from agricultural employment that may justify the value associated with agriculture as a major occupation in developing countries especially. Further, sustainable socio-economic welfare has not been employed as a measure of welfare in empirical studies despite the centrality of sustainability considerations in welfare and the merits of sustainable socio-economic welfare indicators over traditional indicators [14]. It is the case that agriculture remains at a low level of development in most sub-Saharan African countries including ECOWAS countries. Hence the contribution of agriculture as a productive activity to welfare while plausible, is arguable more so in light of the emergence of other sectors of the economy that may likewise contribute to welfare based on their relative attraction as a productive activity, such as the industrial sector.

Further, the agriculture sector dominance of developing country economies such as those of most ECOWAS countries may be argued as giving rise to a number of socio-economic challenges. Firstly, the agriculture sector is characterised by individuals earning low incomes, often inadequate to cater for the basic needs of the individuals earning their livelihood from agriculture. Secondly, the agriculture sector is characterised by subsistence farming and hence resulting in low output by the

developing countries, which is often insufficient to cater for the supply of food to a sizeable amount of the local population. Third, due to low agricultural output and the subsistence nature of farming in developing countries, there is limited capacity to employ individuals in the agriculture sector resulting in rising unemployment. Fourth, as the governments often neglect the rural sector while focusing on the urban sector, agriculture receives little support from the government in its development as a major occupation. Thus, agricultural employment on the basis of the aforementioned, may be negatively related to Socio-economic welfare in developing countries such as those of ECOWAS. However, while the dominance of agriculture as a major occupation, may challenge socio-economic welfare, Sustainable Socio-economic welfare in as much as it provides for an outlook regarding welfare for future generations of individuals yet unborn and the perceived inability of individuals earning a livelihood from agriculture to afford clean energy due to low incomes earned, provides an alternative dimension by which agriculture may be linked to welfare and which previous studies have not examined. Hence this constitutes the present study's significant addition to existing literature on welfare as agricultural employment is investigated for its relationship with sustainable socio-economic welfare using HSDI as proxy, in the context of ECOWAS member countries. This is more so as agriculture, through its role in promoting zero poverty (SDG 1), Zero Hunger (SDG 2), and decent work and economic growth (SDG 8), may consequently give rise to sustainable development as individuals achieve sustainable socio-economic welfare. A related hypothesis to be further tested by this study is the existence of a non-linear relationship between agricultural employment and sustainable socio-economic welfare as agriculture in light of its popular positive link with socio-economic welfare by some studies as previously highlighted, may initially promote welfare but on account of neglect or insufficient focus as a major occupation may later give rise to an inverse relationship between agriculture and sustainable socio-economic welfare.

Over subsequent sections, this study unfolds. Section two is the discussion of pertinent literature, while section three presents the methodology. The presentation as well as discussion of findings is done in section four, and the final section concludes.

2. Literature Review

The emergence of the sustainability consideration of socio-economic welfare and hence the use of the HSDI as an improvement to the United Nations' Human Development Index (HDI) may be traced to [2]. The omission of carbon emissions by the HDI is highlighted as the weakness of the welfare measure. Consistent with the argument, [14] argue various indices reflective of the sustainability expectation of welfare such as the Index of Sustainable Economic Welfare (ISEW), sustainable or green(ed) GDP, which may be better alternatives to GDP in measuring welfare. Hence studies relating agriculture to welfare using either GDP, GDP per capita, Poverty or HDI as welfare measures ignore the potential sustainable welfare contribution of agriculture that may be assessed where the HSDI is utilized as the measure of welfare.

Utilising economic growth in assessing welfare, declining agricultural output on account of cheap imports is argued to undermine local production leading to increased poverty in Nigeria by [15]. In relation [16] argue a role of incentives as well as infrastructure in promoting agriculture's sizeable contribution to Nigeria's GDP growth, while [17] opine that developing countries are at low levels of development on account of poor growth in (agricultural) productivity in the countries. However, employing GDP per capita as a measure of welfare [4] found a long-run relationship with agriculture in support of evidence of the value of greater investment in agricultural research and infrastructure advancement.

Poverty may also be traced to poor agriculture performance as farm households have escaped poverty as better maize technology is utilised in growing greater quality maize varieties, based on evidence from Benue State, Nigeria by [11]. Similarly, use of biofortified cassava brought about improvements in the fortunes of smallholder farmers in Nigeria based on survey data by [7]. Also, [12] find that smallholder irrigation may bring about a decline in rural poverty, while the government has a role to play in raising agricultural productivity as a strategy for raising household welfare, as highlighted

by [13]. An appropriately orchestrated social protection policy on agriculture, for instance, as argued by [18], may aid the reduction of poverty in the context of ECOWAS and greater access of households to agricultural credit as farmers' experience greater productive capacity as highlighted by [19]. However, interventions aimed at raising levels of welfare may only be successful to the extent that such interventions focus on poorer and vulnerable households, as found by [20] based on evidence from Ethiopia. This may explain the finding of [6], who based on evidence from Computable General Equilibrium (CGE), finds in South Africa that while agriculture reduces poverty, rises in income from agriculture relative to other sectors is not on account of agriculture. This is because, relying on agriculture relative to other sectors are more households.

Examining welfare through the lens of sustainability as reflected by carbon emissions, there exist few studies. [21] find in Ethiopia that welfare is adversely affected by CO2 emissions. However, as argued by [22], through agriculture output, carbon emissions may be positively related to welfare as measured by life expectancy. Conversely, as highlighted by [23], as food security and incomes are enhanced resulting from the adoption of climate-smart agriculture, agriculture productivity may be argued to raise welfare. This is supported by findings by [24] in Kenya that greater household income aids smallholder farmers accumulate assets as they practice climate-smart agriculture.

It is evident based on studies surveyed that agricultural employment has not been employed in assessing welfare however defined, while no study has yet examined the potential of non-linearity of the agriculture and welfare association. The aforementioned constitute germane research gaps that will be filled as this study adds to the existing welfare literature with specific emphasis on sustainable socio-economic welfare.

3. Methodology

ECOWAS member countries in their entirety comprise the observations for this study. In other words, all fifteen ECOWAS countries are represented in the data set used for this study. Further, data employed for this present study is secondary data over the period of 2010 to 2019 for all countries. The choice of 2010 start date is on account that the computed sustainable socio-economic welfare indicator, HSDI, utilised is based on the revised HDI computation – employing the geometric mean of income, health, and education indices, employed by the UNDP from 2010 onwards (which contrasts with the computation of the HDI prior to 2010). Further, the diversity of the ECOWAS region in terms of countries with an abundance of agriculture resources, population sizes, and levels of sustainable socio-economic welfare measured using HSDI informed the choice of ECOWAS as a SSA regional economic community of interest, while the community is additionally arguably endowed with the highest concentration of agriculture resources, as well as the greatest share of the population of SSA. Thus, ECOWAS has considerable capabilities to achieve improved welfare levels for individuals in member countries.

The fundamentality of functionings in enabling an individual's capabilities should be at the centre of welfare considerations, as argued by the theory of welfare put forward by Armatya Sen and which is the theoretical foundation of this present study. The theory is as discussed by [25]. Hence, in relation to this present study, provided agriculture amongst other employments can aid individuals to function, and achieve improved levels of welfare, agricultural employment in ECOWAS countries with abundant agriculture resources can promote improved welfare and specifically sustainable socio-economic welfare. Earnings realised from agricultural employment where utilised for welfare needs of a social, economic or sustainable nature including: education, health care, security, clean fuels/energy and so on, may promote sustainable socio-economic welfare, especially as individuals most especially those residing in and earning a livelihood from rural areas, rely less on burning of wood which results in carbon emissions, for their energy needs. Figure 1 illustrates the agricultural employment - sustainable socio-economic welfare link argued by this present study.

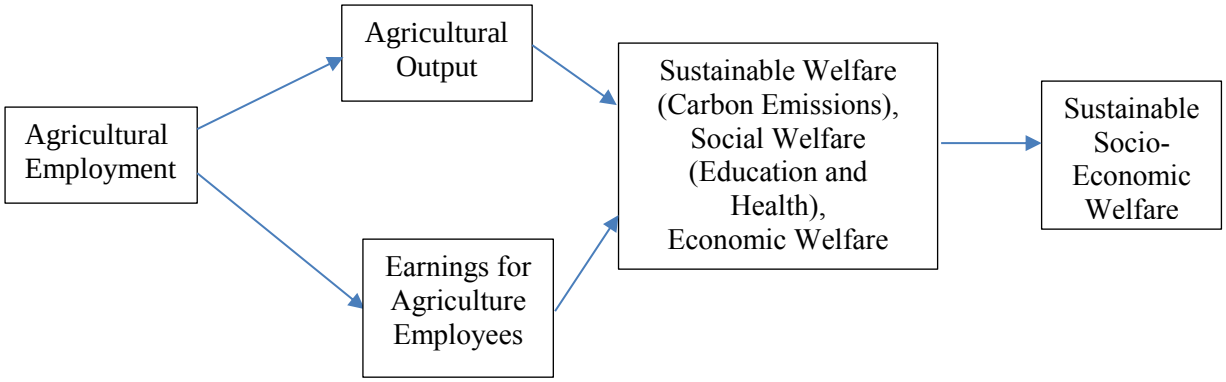

Figure 1: Conceptual Diagram Linking Sustainable Socio-Economic Welfare to Agricultural Employment

Figure 1 illustrates that either through agricultural employees earning income from their employment or through the sale of agriculture output resulting from employing agricultural workers in farms, welfare – Sustainable, social and economic, is affected, consequently impacting sustainable socio-economic welfare.

Following the adaptation of the model of [26] for this study, equation (1) results with HSDI as proxy for Sustainable Socio-economic Welfare

$$HSDI = f(AGEMP, INDEMP, TEMP, DINV, PD, INF, AGLAND, ROL) \quad (1)$$

Equations (2) and (3) employed to test the hypotheses of this study results from the econometric model specification of Equation (1).

3.1. Hypothesis One: Effect of Agricultural Employment on Sustainable Socio-economic Welfare

Equation (2) presents the econometric specification of Equation (1)

$$HSDI_{it} = \alpha_0 + \alpha_1 AGEMP_{it} + \alpha_2 INDEMP_{it} + \alpha_3 TEMP_{it} + \alpha_4 DINV_{it} + \alpha_5 PD_{it} + \alpha_6 INF_{it} + \alpha_7 AGLAND_{it} + \alpha_8 ROL_{it} + \varepsilon_t \quad (2)$$

Where, HSDI: Human Sustainable Development Index, AGEMP: Agricultural employment, INDEMP: Industry employment, TEMP: Total employment, DINV: Domestic Investment, PD: Density of the population, INF: Inflation, AGLAND: Agricultural land, ROL: Rule of law, ε: error term, $\alpha_0 \ldots \alpha_8$: model parameters, i: 1-15, t: 2010-2019.

3.2. Hypothesis Two: Non-Linear relationship between Agricultural Employment and Sustainable Socio-economic Welfare

Equation (3) specified for this study results from equation (2) given the nature of the hypotheses. More specifically, the model differs from equation (2) to the extent that the square of agricultural employment ($AGEMP^2$) features as an independent variable.

$$HSDI_{it} = \beta_0 + \beta_1 AGEMP_{it} + \beta_2 AGEMP_{it}^2 + \beta_3 INDEMP_{it} + \beta_4 Log\, TEMP_{it} + \beta_5 DINV_{it} + \beta_6 PD_{it} + \beta_7 INF_{it} + \beta_8 AGLAND_{it} + \beta_9 ROL_{it} + \varepsilon_t \quad (3)$$

Where, HSDI: Human Sustainable Development Index, AGEMP: Agricultural employment, INDEMP: Industry employment, TEMP: Total employment, DINV: Domestic Investment, PD: Density of the population, INF: Inflation, AGLAND: Agricultural land, ROL: Rule of law, ε: error term, $\beta_0 \ldots \beta_9$: model parameters, i: 1-15, t: 2010-2019.

From equations (1) – (3), variables employed are chosen based on previous empirical studies. Agricultural employment is the explanatory variable of interest, other variables are controls. HSDI was computed as earlier discussed on the basis of the UN HDI, and in light of its similar calculation as the HDI [25] is between zero and one with higher values reflective of greater sustainable socio-economic welfare. In contrast data on Agricultural Employment, Industry employment, Total employment (in millions), Domestic Investment (using formation of gross fixed capital as proxy), Density of the population, Inflation, and Agricultural Land, were each obtained from the World Development Indicators (WDI) of World Bank. The World Bank World Governance Indicators (WGI) was accessed for data on Rule of Law. Further note that Total employment in equations (2) and (3) is log-transformed due to its large size and which will enable standardisation of regression estimates. Further note that Rule of Law, which by design ranges from -2.5 to 2.5 with greater values reflective of better quality, features as an institutional indicator in this study because it contributes to the promotion of a conducive climate for the realisation of improved welfare that is socio-economic and preserves the environment.

The models as in equations (2) and (3) are estimated using panel data fixed effects in contrast to the alternative panel data random effects estimation following the outcome of the Hausman test performed.

4. Results

In respect of all variables employed in this study Table 1 is a summary. Just as according to the United Nations and as discussed by [25], countries are classified into categories on the basis of their HDI, following similar analogy, ECOWAS countries may be classified into categories of low, medium, high and very high levels of Human Sustainable Development based on their HSDI. This is because as earlier discussed, the HSDI follows a similar computation method as the HDI in addition to sharing similar characteristics as the HDI.

Further from Table 1, mean HSDI of ECOWAS countries over the study period was 0.579, reflecting medium level of Human Sustainable Development and the maximum HSDI of 0.732 reflects high sustainable socio-economic welfare.

Table 1. Summarised Variable Statistics

Variables	Observations	Mean	Std. Dev	Min	Max
HSDI [In decimal figures]	150	0.579	0.0620	0.436	0.732
AGEMP[%}	150	45.45	16.10	10.6	75.14
INDEMP[%}	150	13.18	6.060	5.42	31.55
TEMP [In Millions}	150	7.310	12.532	0.175	57.80
DINV [In Billions of Dollars]	150	7.86	18.8	0.066	114
PD [people per Sq. Km of land area]	150	91.13	55.84	12.33	225.31
INF[%}	150	4.815	5.572	-3.233	23.563
AGLAND[% of Land Area}	150	47.43	17.80	17.77	75.90
ROL [In decimal figures]	150	-0.642	0.487	-1.586	0.635

Fixed effects panel data estimation outcome presented in Table 2 are founded on Hausman test results that are statistically significant evidenced by significant chi-square statistics of 41.16 and 35.76 for equations (2) and (3) respectively.

Table 2. Fixed Effect Panel Data Results

Equation	**(2)**	**(3)**
Dependent Variable	**HSDI**	**HSDI**
C	-0.423	-0.206
	(0.234)	(0.234)
AGEMP	-0.00215***	-0.0000764
	(0.000386)	(0.000721)
$AGEMP^2$		-0.0000272***
		(0.00000810)
INDEMP	-0.00220***	-0.00236***
	(0.000674)	(0.000650)
Log TEMP	0.0685***	0.0525***
	(0.0159)	(0.0160)
DINV	-0.00182	-0.00193
	(0.00218)	(0.00210)
PD	0.000258**	0.000376***
	(0.000117)	(0.000118)
INF	-0.000591***	-0.000635***
	(0.000170)	(0.000164)
AGLAND	0.00277***	0.00246***
	(0.000814)	(0.000788)
ROL	0.0193***	0.0188***
	(0.00511)	(0.00492)
R-Square	**0.8548**	**0.8667**
F-Stat	**93.45*** **	**95.05*** **
No. of Countries	**15**	**15**
Observations	**150**	**150**

Standard errors shown in parenthesis. ** and *** denote significance at the 5 and 1% levels respectively

Equations (2) and (3) estimation results from Table 2 reveal absence of mis-specification error reflected by the statistically significant F-statistics of both models. The models fit the data well in light of the R-Squared of approximately 0.85. Hence, we elucidate the estimates for equation (2) in testing Hypothesis One of this study, Agricultural Employment (AGEMP), is negatively signed and is significant statistically in affecting sustainable socio-economic welfare (measured by HSDI). However, testing Hypothesis Two of this present study based on estimating equation (3), there exists no evidence of a non-linear relationship between Agricultural Employment and Sustainable Socio-economic Welfare given the insignificance of the coefficient of Agricultural Employment and the similarity in signs of the coefficients of Agricultural Employment (AGEMP) and the square of Agricultural Employment ($AGEMP^2$).

From Equation (2), the statistically significant coefficient of Agricultural Employment (AGEMP) of -0.00215 reveals that Agricultural Employment importantly affects HSDI, providing evidence against the null hypothesis for Hypothesis One that agricultural employment does not affect sustainable socio-economic welfare. A boost in agricultural employment of one percent results in a 0.00215-unit fall in HSDI. On the other hand, equation (3) reveals an insignificant coefficient of Agricultural Employment of -0.0000764, and a statistically significant coefficient of squared Agricultural Employment ($AGEMP^2$) of -0.0000272, informing the failure of this study to reject the null hypothesis for Hypothesis Two that there exists no non-linear relationship between agricultural employment and sustainable socio-economic welfare.

On the basis of the two tested hypotheses of this study, evidence suggests a negative effect of agricultural employment on sustainable socio-economic welfare in ECOWAS in contrast to studies suggesting a positive effect of agriculture on welfare such as [18], [11] and [6]. The contrast in findings might reflect that previous studies in employing measures of agriculture have not used HSDI to measure welfare. On the other hand, sustainable socio-economic welfare given limited interest according to recent literature, is of relevance in the present age in light of the quest by countries of the world for incessant advancement (and in relation the attainment of the Sustainable Development Goals) and the expected rise in carbon footprints of countries such as those of ECOWAS as they progress in their development.

Importantly, and consistent with arguments by [20], the finding from table 2 of an adverse effect of agricultural employment on sustainable socio-economic welfare while unpopular, might be the result of unsuccessful or limited agricultural sector interventions of governments to the extent that they are not focussed on poor and vulnerable households earning their livelihoods from agricultural employment. Poor and vulnerable households constitute the bulk of the poor in developing countries, especially in rural areas. Agricultural employment in ECOWAS despite the abundance of agricultural resources and enormous potential of the agricultural sector is unable to translate to better living standards whereby individuals are able to realise adequate incomes for their needs towards raising their level of sustainable socio-economic progress. The incomes realised from agricultural employment are often low and inadequate to cater for the needs of agricultural sector employees which includes health, education and a quality environment to inhabit (reflecting the sustainability of welfare) amongst other needs.

Further, the finding that agricultural employment and sustainable socio-economic welfare do not have a non-linear relationship as observed from Equation (3) in table 2, suggests that while agricultural employment adversely affects sustainable socio-economic welfare, at no point does agricultural employment later contribute to raising welfare. However, this study is the first to explore the non-linearity between agriculture and any welfare measure in the literature.

Table 2, in addition, reveals that determining HSDI from equations (2) and (3) apart from Agricultural Employment and possessing similar signs, are all other independent variables. Further Industry employment (INDEMP), Log of total employment (Log TEMP), Density of the population (PD), Inflation (INF), Agricultural land (AGLAND), and Rule of Law (ROL) are all statistically significant, while Domestic investment (DINV) is statistically not significant.

5. Conclusion and Recommendations

The effect of agriculture on sustainable socio-economic welfare, has been the focus of this present study. This is in light of evident low levels of welfare (often measured by indicators as HDI, and GDP per capita in the literature) to which agricultural employment is argued in this study to play a role. However, agriculture has been, and remains the dominant occupation in developing countries as those of ECOWAS because of their abundance of agricultural resources as well as human resources. Based on panel data fixed effects estimation covering the period of 2010 to 2019 and utilising all ECOWAS member countries, this present study finds that agricultural employment adversely affects sustainable socio-economic welfare. This contrasts with the popular finding of a positive association between agriculture and welfare in the literature. Rationalising the aforementioned contrast in findings of this present study, the test for a possible non-linear association between agricultural employment and

sustainable socio-economic welfare provided evidence against the hypothesis that a non-linear relationship existed. This study concludes that in as much as agriculture remains the mainstay of developing countries such as those of ECOWAS for now, effectiveness at maximising the use of abundant agricultural resources, the effectiveness of government in intervening in the agricultural sector together with a renewed focus on welfare that is sustainable is of the essence, especially given the quest for achieving sustainable development goals 2030.

This study recommends firstly that, ECOWAS member country governments in raising welfare levels focus necessarily on sustainable socio-economic welfare rather than socio-economic welfare that has been the traditional focus of welfare efforts. Secondly, in seeking to raise the level of sustainable socio-economic welfare of individuals, the ECOWAS members should ensure that agriculture sector interventions effectively target the poor and vulnerable households relying on agriculture for their livelihood. Thirdly, relevant laws and policies that will ensure a sustainable environment for agriculture progress should be enacted and enforced by ECOWAS country governments supported by prudence agriculture resource management.

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