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EMPIRICAL ANALYSIS OF THE RELATIONSHIP BETWEEN HAPPINESS AND AGRICULTURAL PRODUCTIVITY IN AFRICAN COUNTRIES

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Abstract

For the important role of the sector of agriculture in our life, the objective of this study was to investigate empirically the relationship between agricultural productivity and happiness. Using a large panel data analysis of 34 African countries covering the period from 2006 to 2020. In this paper, we identify the role of agricultural productivity to increase and improve the level of happiness of African countries and vice versa, the role of happiness factor to increase agricultural productivity. The empirical results show the existence of a double relationship between agricultural productivity and happiness. This relationship is positive but very weak in African countries. The agricultural productivity affects positively and weakly the quality of happiness; the agricultural sector contributes to increased the level of happiness. The happiness increases weakly the quality of agricultural productivity. The increase in the level of happiness makes people more productive and more active in their work.

Keywords: Happiness, agricultural productivity, African countries and Panel Data

JEL classification: I39, N57, Q19

INTRODUCTION

Agriculture plays an important role in the economy and in the life. It is used to satisfy our food needs. It represents an important source of creation of job and contributes to improving the GDP. Agricultural productivity contributes to reducing poverty and improving food security. It presents the fundamental factor of economic growth of the country,(Bjornlund et al.2020; Mukasa et al. 2017; Pawlak and Kołodziejczak, 2020; Pfunzo, 2017).

Productivity growth in agriculture is influenced by several factors, Government spending real GDP per capita, real exchange rate, population, labor force and exports increase agricultural productivity (Kadir and Tunggal,2015; Setshedi and Mosikari, 2019; Igwe and Esonwune ,2011).

While inflation and the exchange rate decrease agricultural production (Setshedi and Mosikari, 2019; Enu and Attah-Obeng ,2013; Kadir and Tunggal, 2015 ;Igwe and Esonwune ,2011).

In other studies, agricultural productivity is linked to subjective well-being (Chang-nian et al. ,2000 ; Dedehouanou et al., 2013; Roslina et al.,2013).

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Happiness is considered a key factor to support the growth in agricultural production, he participates to improve productivity in this sector. Happy farmers produce more than unhappy farmers. The increase in the level of satisfaction among the farmer makes him more active and produces more (Chang-nian et al., 2000; Roslina et al., 2013).

The purpose of this article is to add an accurate assessment of the effect of happiness on the quality of production in the agricultural sector and vice versa. Happiness can be a positive incentive to produce more?

To empirically investigate the relation between agriculture productivity and happiness, we use a sample of African countries covering the period 2006 to 2020.

The remainder of the paper is organized as follows: Section 2 presents the literature review, whilst Section 3 outlines the methodology and empirical strategy used within this paper. Section 4 provides the empirical results and discussions and Section 5 provides the conclusion.

1. THE LITERATURE REVIEW

Several economic researchers have found that the sector of agriculture is generally considered as the source of the economic growth in developing countries (Bjornlund et al.,2020; Mukasa et al., 2017; Pawlak and Kołodziejczak, 2020). Pfunzo (2017) showed that the positive increasing in the agricultural productivity influences economic growth.

With the economic growth, other economists have studied the impact of macroeconomic variables on the agricultural sector.

Setshedi and Mosikari (2019) studied macroeconomic variables' effects on South Africa's agricultural productivity. They used the vector error correction model (VECM) to analyze time-series data for the period 1975 to 2016. Findings showed that increasing government expenditure on agriculture could increase agricultural productivity. In addition, the findings showed that an increase in the consumer price index reduces agricultural productivity. The study focused on agricultural productivity, which differs from this present study's focus on the value of agricultural production (the total quantity produced expressed in monetary terms).

Enu and Attah-Obeng (2013) conducted a study with the aim to identify macroeconomic factors that influence agricultural production in Ghana. The study used the Cobb–Douglas production for analyzing data. The study's findings confirmed that major macroeconomic factors that influence agricultural production are real GDP per capita, real exchange rate, and labor force. Furthermore, the findings suggested that an increase in the labor force increases agricultural production.

Kadir and Tunggal (2015) studied the impact of macroeconomic variables on agricultural production in Malaysia. They used the Autoregressive Distributed Lag (ARDL) model for the period from 1980 to 2014. The results of the study showed that an increase in money supply, government spending and exports increase agricultural productivity, while inflation and the exchange rate decrease agricultural production.

Igwe and Esonwune (2011) tried to determine the determinants of agricultural production, based on public expenditure in Nigeria. In their study, they used multiple regression and correlation for the period from 1994 to 2007.

Nevertheless, the results obtained indicated that the total area cropped, the total population and the annual rainfall are important determinants of agricultural production.

Several economists have analyzed the relationship between subjective well-being and agricultural productivity in several countries.

Roslina et al. (2013) studied the factors associated with the level of happiness of rice-farming households in the granary area of Kedah. he used a quantitative research technique using an interview questionnaire to obtain household-level data. He used Structural Equation Modeling (SEM) to analyze the factors affecting the happiness of rice farmers. The study revealed that the institution factor is the important factor to happiness of paddy farmer with a coefficient value of 0.36. Efficient use of machinery, ownership of financial assets and human assets increase in technology, the management of leisure time also positively significant influencing the happiness of paddy farmers. In addition, the environmental factors such as waste disposal pollution, weed use, land degradation also have a significant negative influence on the happiness of rice farmers. Eventually slim found that the introduction of modern technologies to farmers, are considered the best way to increase the level of happiness of paddy farmers.

In a study on the effects of contract farming on the happiness of farmers in Senegal, Dedehouanou, S.F.A. et al.2013) showed that animal husbandry is an effective factor for happiness.

Here, 43.3% of the surveyed farmers are happy to be farmers in the current situation, with the area of irrigation, education level, income, and farming experience being statistically

significant at different rates in their happiness (Roslina Kamaruddin et al., 2013) .

Heleh Adam et al.(2013) used a data from a mobile phone survey. They collected 10,032 observations of life satisfaction each week for a year in land-owning farmers in Bangladesh. The results show that most individuals report stable and midrange life satisfaction. The small groups have fluctuating levels of satisfaction. They concluded that Agricultural activities are significantly associated with reported life satisfaction, but not always consistent with low seasons.

S.K. Srivastava (2013) used interviews in the rural areas, on 50 head of the families. The results of the study reveal that most respondents are unhappy in their lives because they do not participate in harvest productivity.

Chang-nian et al. (2000) studied the factor structure of life satisfaction in agricultural workers in Japan. One hundred and sixty-five farmers (87 men and 78 women) , whose age ranges from 19 to 72 years (mean = 44.3 years). They completed a questionnaire. Chang-nian et al. (2000) showed that the score of life satisfaction is higher in men than in women, and that of older people is higher than in younger people.

They found that the ill health and stress experienced in agricultural work are associated with a decrease in life satisfaction.

2. METHODOLOGY AND EMPIRICAL STRATEGY

The aim of this subsection is to test the impact of happiness on agricultural productivity in African countries over the period 2006 to 2020.

3.1. The Data

We present in this part in a detailed way the structure of our sample and we discuss the main variables of our study. These variables represent agricultural productivity and

happiness. Our sample is composed by 34 African countries for a period of 15 years (from 2006 to 2020).

In this article, we have used the agricultural productivity (AP) to express production in the agricultural sector. This indicator is collected of the World Bank. This variable is used by several authors (Khaled and Hammas, 2014, 2016).

The happiness variable is collected from the World data base on happiness. This database is based on different happiness quizzes for a representative sample of the population.

In our study, we used the mean value of verbal life satisfaction in ten stages.

Economists who used the happiness variable(Ben Afia and Harbi, 2017; Ben Afia, 2019 ; Lyubomirsky, 2007; Easterlin, 2013; Di Tella et al., 2010; Deaton, 2008; Bjornskov et al., 2007).

The dependent variable is agricultural productivity (regression 1) and happiness (regression 2). Following Alani (2012), we measured agricultural productivity using labor, capitaland technological progress. The independent variables consisted of a set of macroeconomic factors as defined below.

The table below shows the variables used in our empirical study.

Table 1. Data Information

Variable	Definition	source
AP: agriculture productivity	AP expresses production in the agricultural sector as a percentage of GDP. Agriculture contains fishing, hunting, plant and animal production and forestry. The added value is the net output of a sector after subtracting all intermediate inputs and adding all outputs. It is calculated without making deductions for loss value or degradation of natural resources or depreciation of manufactured goods. The origin of the added value is determined by revision 3 of the International Standard Industrial Classification of All Economic Activities	*World Development Indicators* (2022).
H :Happiness	The mean value obtained from the distribution of the ten verbal life satisfaction	World data base on happiness
RP: people live in rural areas	RP Presents people who live in rural areas. This variable designates the difference between the total population and the urban population. (defined of national statistical offices)	*World Development Indicators* (2022).
ODA: the net official development assistance	ODA is the net official development assistance. This variable refers to loand is bursements at concessional rates (excluding principal repayments) and grants from member agencies of the multilateral institutions, Development Assistance Committee (DAC) and non-governmental countries DAC members to stimulate well-being and economic growth in countries and territories on the DAC list of ODA recipients. ODA refers to loans with a grant of at least 25%	*World Development Indicators* (2022).

	(data discount rate is 10%).	
LF: Life expectancy at birth	The Life expectancy at birth (years) expresses the number of years a newborn child would live if the general conditions of mortality at the time of its birth remained the same throughout its life.	*World Development Indicators* (2022).
L:the number of employees working in the agricultural sector	L Presents the number of employees working in the agricultural sector as a percentage of all jobs. In addition to the farmers, we also find in this sector those who live from hunting and fishing and forestry workers.	*World Development Indicators* (2022).

3.2.ECONOMETRIC METHODOLOGY

The model to estimate is derived from a Cobb-Douglas production function by taking agriculture productivity and happiness variable as the dependent variable.

The function of the model is expressed as:

$$\mathbf{Y_{it}=AK^{\alpha}L^{\beta}} \quad (1)$$

Where Y_{it} is the agriculture productivity in the first equation and the happiness variable in the second equation since we choose the static panel (FE, RE) and 2SLS method of estimation. The agriculture productivity variable is explained by the « agricultural value added per worker » **(AP)** in countries (i) and in period (t). The happiness variable is explained by thedegree of joy **(H)**. A, K and L are respectively the technical progress is neutral in the sense of Hicks, the human capital and the Labors.

The human capital is explained by the rural population **(RPOP)**, official development assistance **(ODA)** and Life expectancy at birth **(LE)** variable. The labor is explained by labor inthe agricultural sector **(L).**

The model to be estimated is the following (Gaolu Zou, 2022):

$$Y_{it}=C_{it}+\alpha K_{it}+\beta L_{it}+\xi_{i}\mathbf{t} \quad \mathbf{(2)}$$

The model finally looks like this:

$$L(AP)=C_{it}+\gamma H+\alpha K_{it}+\beta L_{it}+\xi_{it} \quad \mathbf{(2.1)}$$

$$H=C_{it}+\gamma L(AP)+\alpha K_{it}+\beta L_{it}+\xi_{it} \quad \mathbf{(2.2)}$$

For **i**=1, 2……..N **and t**=1, 2……T_i

i :represents country.

t : represents year.

Our methodology is based on a static panel (Fixed Effect, Random Effect) and

two least square (2LS)) evaluationsince there is a causal relationship between the agricultural productivity and happiness.

The table below presents the descriptive statistics of all variables used in our study.

Table 2. The descriptive statistics of the variables

Variable		Mean	Std.Dev	Min	Max
H	Overall	4.392922	0.6715998	2.7	6.8
	Between		0.4829735	3.413333	6.213333
	within		0.4734963	2.946255	6.206255
L(AP)	Overall	2.834792	0.7985329	0.5866749	4.183545
	Between		0.7928045	0.7932854	4.002904
	within		0.162492	1.9594	3.557326
L(L)	Overall	3.805559	0.5541477	1.526056	4.432482
	Between		0.5517022	1.660049	4.355066
	within		0.1038653	3.432827	4.335019
L(ODA)	Overall	1.457637	1.220621	-4.246789	7.610358
	Between		1.134289	-1.211445	3.45212
	within		0.4885623	-2.137351	6.541908
L(RPO)	Overall	4.013938	0.3670418	2.293343	4.440956
	Between		0.3680607	2.555827	4.429724
	within		0.0545626	3.751454	4.28501
L(LE)	Overall	4.098922	0.1032012	3.780843	4.342519
	Between		0.090198	3.932835	4.325316
	within		0.0523313	3.882065	4.224121
Observation		N=510 n= 34 T= 15			

Note: N: total number of observations; T: number of observation for only one country; n: number of countries.

3. EMPIRICAL RESULTS AND DISCUSSIONS

3.1. Empirical Results

The table below shows the results of the evaluation of model (**2.1**) and model (**2.2**) to the static panel (fixed effect (FE) and random effect (RE)) and 2LS (two least squares) for a sample composed of 34 countries of Africa (north, south, west) over the period 2006-2020.This table measures the relationship between agriculture productivity and happiness.

The Model **(2.1)** explains the impact of happiness on the agriculture productivity.

The model **(2.2)** explains the reverse case: impact of the agriculture productivity on the happiness). Table 3 presents the estimation result of model (2.1) and model (2.2).

Table 3. Estimation result of model (2.1) and model (2.2)

Model	2.1			2.2		
Dependent variable	L(AP)			H		
Regression	1	2	3	1	2	3
Method of estimation	Fixed Effect	Random Effect	2SLS	Fixed Effect	Random Effect	2SLS
L(AP)	---------	---------	----------	0.319926	0.2100	0.2101
				(0.029)	(0.022)	(0.022)
H	0.03148	0.0375321	0 .038014	----------	----------	----------
	(0.029)	(0.012)	(0.011)			
L(L)	0.40005	0.4471113	0.452670		-0.6850657	-0.6924
	(0.000)	(0.000)	(0.000)	-0.6526132	(0.000)	(0.000)
				(0.020)		
L(ODA)	0.01694	0.0272097	0. 027957			-0.06574
	(0.243)	(0.069)	(0.062)	-0.0448047	-0.0644705	(0.109)
				(0.333)	(0.116)	
L(RPO)	-1.0939	-0.55579	-0. 536608		-0.1841351	-0.19478
	(0.000)	(0.001)	(0.001)	-1.023335	(0.386)	(0.360)
				(0.088)		
L(LE)	-1.3122	-0.8735556	-0. 82522			-0.97185
	(0.000)	(0.000)	(0.000)	-1.251209	-0.86060	(0.016)
				(0.042)	(0.032)	
N	510	510	510	510	510	510
Hausman test	0.0000			0.1887		

Note : Panel estimation of 34 countries. The dependant variables are the agriculture productivity (model 2.1)and Happiness (model 2.2). The F-Fisher for the coefficients is in parentheses. *, ** and *** denotes significance at 1%, 5% and 10% respectively. The estimation of model (2.1) and (2.2) by the 2SLS method uses agricultural productivity (AP) as an independent variable and happiness (H) as an instrument and inversely.

The model (2.1) is estimated with fixed effects, random effect and 2SLS, the test of Hausman shows us an equal probability to 0.000<0.1, it is about the model to fixed effects(regression 1).

The two estimators (Fixed effect and 2SLS) give the same meaning of variable variations.

According to the regression (1), we note that the agriculture productivity (AP) increase by 1 percentage points, the Happiness (H) increase by 0.031 percentage points, the labor (L) inthe agriculture sector increase by 0.4 percentage points, the official development assistance(ODA) increase by 0.01 percentage points, the rural population (RPOP) decrease by 1.09 percentage points and the life expectancy (LE) decrease by 1.3 percentage points.

According to the regression (3), we see that the agriculture productivity (AP) increase

by 1 percentage points, the Happiness (H) increase by 0.038 percentage points, the labor (L) in the agriculture sector increase by 0.45 percentage points, the official development assistance(ODA) increase by 0.028 percentage points, the rural population (RPOP) decrease by 0.536 percentage points and the life expectancy (LE) decrease by 0.82 percentage points.

The model (2 .2) is estimated with fixed effects, random effect and 2SLS, the test of Hausman shows us an equal probability to 0.1887>0.1, it is about the model to random effects(regression 2).

The two estimators (random effect and 2SLS) give the same meaning of variable variations.

According to the regression (2), we note that the happiness increase by 1 percentage points, the productivity of the agriculture (AP) increase by 0.21 percentage points, the labor (L) in the agriculture sector decrease by 0.68 percentage points, the official development assistance(ODA) decrease by 0.06 percentage points, the rural population (RPOP) decrease by 0.194 percentage points and the life expectancy (LE) decrease by 0.86 percentage points.

According to the regression (3), the happiness increases by 1 percentage points, the productivity of the agriculture (AP) increases by 0.21 percentage points, the labor

(L) in the agriculture sector decreases by 0.692 percentage points, the official development assistance (ODA) decreases by 0.065 percentage points, the rural population (RPOP) decreasesby 0.18 percentage points and the life expectancy (LE) decrease by 0.91 percentage points.

The Ramsey RESET test explains that our model has no omitted variables.

3.2. DISCUSSIONS

The model (2.1) is estimated by Fixed effect (regression 1) and 2SLS (regression 3). This model explains the tendency of the happiness variable and his impact on the agricultural productivity for a sample composed of 34 countries of Africa region over the period 2006-2020.

The quality of agricultural productivity is improved by the increase in happiness. The happiness makes people more productive and more active in their work. According to three random studies by Andrew J. Oswald, Eugenio Proto and Daniel Sgroi (2015), People who are happy have about 12% higher productivity than people who are not happy. A fourth experiment studies the major real shocks (mourning and family illness). Lower happiness is consistently associated with lower productivity. These different forms of evidence, with complementary strengths and

weaknesses, are consistent with the existence of a causal link between human well-being and human performance.

Considering that happiness and productivity are positively related, policy interventions that contribute to create the level of happiness can be a cause to increase the productivity.

For example, subsidies and happiness are positively related. Thus, governments can improve farmers' productivity through carefully designed subsidy programs (Wanglin et al., 2022).

Improving agricultural productivity in African countries is linked to improving the labor situation in this sector. The increase in workers' income is considered a factor of happiness. Ourresult is confirmed by the studies of Leomarich and Casinillo Moises,

2022.

These authors investigated the influence of socio-economic factors on rice farmers' subjectivewell-being in Philippines. They found as a result that an increase in income leads to an increase in household assets, giving benefits and comfort to the family and directly influencing their well-being.

In our study, agriculture productivity is affected positively by the happiness (H), labor (L) and the officialdevelopment assistance (ODA) factor. Also the productivity is affected negatively by rural population (RPO) and Life expectancy (LE).

Labor is a necessary factor for improving agricultural productivity through their effort in production. The same applies to official development assistance in the form of subsidies for farmers, which contributes to strengthen the agricultural sector. Conversely, rural exodus destroys productivity through the footprint (Khaled, 2017).

The relationship between agricultural productivity and life expectancy at birth (LE) is negative in the African country. It is a health status variable (OECD, 2021).This negative impact is explained by the labor force provided by the young and not by the old in Africa region. Also the link is explained by the destruction of human health by chemicals and pesticides which reduces the number of workers in the sector and subsequently the reduction of agricultural productivity.

The model (2.2) is estimated by random effect (RE) (regression 2) and 2SLS (regression 3), this model explains the progress of the agriculture productivity variable and his impact on the happiness for a sample composed by 34 African countries over the period 2006-2020.

In the second model, we notice that the variable agricultural productivity has a positive effect on happiness. Other factors such as work (L), official development assistance (ODA), rural population (RPO) and life expectancy (LE) affect negatively the variable happiness.

This variable also has a negative effect on happiness in African countries.

The negative relationship between these variables is acceptable in African countries where the poverty rate is very high, the level of happiness is very low.

Happiness in African agriculture is linked to financial means. Our analysis is confirmed by the studies of Roslina et al., 2013. These authors showed that financial and human resources are important factors to increase the level of happiness among farmers and make them happy.

The results found imply that increasing financial and human assets increase the level of happiness among farmers. As we know that the rural subsistence system constitutes a diverse economic, social and cultural “universe” in which rural families must earn their living. People acquire livelihoods in a variety of ways, with varying degrees of success depending on their possession of livelihood assets, their access to resources, and their ability to manage their assets and resources. These results are confirmed by , Jamal Ali and Mohd Saad, 2013.

We noted above that the agriculture productivity has a positive effect on happiness; it contributes to increase happiness in the panel countries used.

Specifically, an increase in the volume of agricultural production by 0.21% leads to an increase in happiness level by 1%. In other words, the agricultural sector harms and improves the quality of happiness in our study.

Farmers in African countries regardless of land owners or employees still feel unhappinessbecause of low rent or salary even though the productivity is improved. They

only felt satisfaction towards their works.

CONCLUSION

The purpose of this paper is to study the relationship between agricultural productivity and happiness with a detailed empirical study. Data covering a large panel of 34 African countries for the period 2006 - 2020. The empirical analysis carried out by two static panel methods (fixed effect and random effect) and 2SLS. In this paper, we identify the role of agricultural productivity to increase and improve the level of happiness of African countries and vice versa, the role of the happiness factor to increase agricultural productivity.

The empirical results show the existence of a double relationship between agricultural productivity and happiness, agricultural productivity affects positively and weakly the quality of happiness and happiness stimulates weakly the agricultural productivity. This relationship is positive but very weak in African countries.

According to the first relation, Agricultural Productivity increases slightly the level of Happiness because the salary of workers is weak in Africa compared with the rising of food prices and the rising of energy prices in African countries.

The majority of the workers are women and minors who work with low salary due to poverty. They are not satisfied and happy with their conditions of life, they are obliged to produce and work to live.

Happiness increases weakly the agricultural productivity, the increase in the income of the worker in the agricultural sector serves to create happiness for the workers in particular and the agricultural population in general. Similarly, social benefits contribute to creating happiness for farmers; these benefits serve to improve agricultural productivity.

In light of our results, policies insist on protecting farmers to be happy and produce more. The protection and encouragement of farmers is achieved through the guarantee of social security and retirement because employees in this sector are exposed to chemicals, pesticides to pollution air and soil, subsequently leads to serious illnesses. Also it is necessary to fix a Salary which improves the purchasing power of farmers and improve their level of life which in turn has a positive effect on happiness and agricultural productivity.

These proposals improve the conditions of life to employees in the sector of agriculture and increase the level of happiness of farmers and the agricultural productivity.

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