Relationships Among MacArthur Subjective Socioeconomic Status, Ryff Psychological Well-Being, and the Technical Efficiency of Small-Scale Poultry Farmers in Nigeria

Edamisan Stephen Ikuemonisan[1]*

[1] *Agricultural Economics/Agriculture*
    Adekunle Ajasin University/P.M.B, 001 Akungba Akoko, 342111, NIGERIA

*Corresponding Author: edamisan.ikuemonisan@aaua.edu.ng
DOI: https://doi.org/10.30880/jts.2024.16.02.002

Abstract

This study investigated the interplay between MacArthur Subjective Socioeconomic Status (SSS), Ryff's Psychological Well-Being (PWB), and Technical Efficiency (TE) among small-scale broiler farmers in Southwest Nigeria. Using a multistage procedure, 323 respondents were randomly selected. Analysis showed significant relationships between variables, with broilers per production cycle and feed intake positively impacting output. Temperature volatility had a negative effect on output due to increased stress in broilers. Age and cooperative membership were key factors influencing TE. The study also examined how subjective SES and PWB influenced innovative practices and risk-taking, ultimately enhancing TE. Incorporating Ryff's PWB highlighted the positive impact of psychological well-being on TE through autonomy, personal growth, and purpose. Context-specific strategies and inclusive assessments are recommended to optimize technical efficiency in broiler farming, focusing on psychological well-being and subjective perceptions

1. Introduction

Broiler chickens are important domesticated birds that provide meat for people worldwide. According to a report by the United Nations Food and Agriculture Organization in 2023, poultry is the most consumed type of meat. In 2019, the average world poultry consumption per person was 14.8 kg. It is favourably considered for economic and/or health reasons. Studies have shown that a diet rich in protein and essential nutrients has positive effects on birthweight, growth, and cognitive development and decreases child mortality rates (Blackie, 2014). Animal protein consumption is also found to be associated with the income of rural households (Lawal and Balogun, 2021). Furthermore, the prospects and socioeconomic contributions of poultry production in developing economies are highlighted by Erdaw and Beyene (2022). This study emphasized the importance of eggs and poultry meat as sources of crucial nutrients such as protein, minerals, and vitamins.

1.1 Literature Review

The global need for chicken meat is anticipated to increase, especially in developing nations (Mottet & Tempio, 2017). In response to this heightened demand, production methods have been intensified to maximize efficiency and productivity, sometimes compromising the well-being and health of chickens (Azarpajouh et al., 2022). In sub-Saharan Africa (SSA), chicken meat is recognized as a highly affordable animal protein source (Butterworth,

2017). The region is experiencing a notable increase in population growth, as highlighted by the UN World Population Prospects in 2019 (UN, 2019) and research by Samboko, Zulu-Mbata, and Chapoto (2018). However, the slow and inconsistent economic growth in SSA has led to a rise in poverty levels among its population (Erdaw & Beyene, 2022; Pinstrup-Andersen and Rosegran, 2001).

There is evidence that 3 in every 10 poor people in the world live in SSA (Erdaw & Beyene, 2022; Pinstrup-Andersen and Rosegran, 2001). This is one of the reasons why malnutrition remains problematic and pervasive in the subregion. Dominant in their food basket is food high in carbohydrates because of its relative affordability compared to other food types. However, to close the nutrition gap and sustain the agrifood system in the subregion, poultry production is acknowledged as a fast and effective method to rapidly increase the availability of animal protein (Nwobodo et al., 2023). According to the Global Agricultural Information Network, beginning in 2024, the production of chickens in sub-Saharan Africa is expected to experience steady growth. This growth can be attributed to the development of an increasingly vertically integrated industry that will take advantage of lower feed prices resulting from a strong production of maize and soy. To achieve sustainability in the agrifood system of the subregion, researchers have continued to explore various possible approaches. The adverse effects of climate change on poultry production have been highlighted by the FAO (2018). Improving the environmental sustainability of poultry production is crucial for increasing productivity, as emphasized by Leinonen and Kyriazakis (2016). Alice (2016) identified economic and population growth as primary drivers of chicken consumption in sub-Saharan Africa (SSA). This suggests that with the expansion of the economy and an increase in population, chicken consumption is expected to increase as well.

Therefore, the projected growth of chicken production in Sub-Saharan Africa presents opportunities for enhancing the agrifood system. To fully harness the potential of the industry in developing economies, it is crucial to address the hurdles brought about by climate change (specifically temperature fluctuations), enhance socioeconomic and environmental sustainability, and promote the psychological well-being of broiler farmers. This is important because of the socioeconomic contributions and nutritional benefits of poultry production, among other benefits (FAO, 2018; Leinonen and Kyriazakis, 2016; Alice, 2016; Blackie, 2014; Erdaw and Beyene, 2022). In Nigeria, the FMA&RD forecast for poultry meat production and demand in 2019 estimated a national output of 551,000 metric tons (MT) and a demand of 1,080,000 MT, resulting in a supply deficit of 529,000 MT. Growth in population and an improved economy are two major drivers that will influence demand for chickens in the future; however, there is a general concern that the current production pattern will be able to produce enough chicken meat to meet the growing demand in Nigeria. This is a result of the low productivity of broiler production in Nigeria (Bethel et al., 2016; and Adesehinwa et al., 2016). In view of the increasing input costs and limited opportunities for expanding farm size laterally, farmers are anticipated to enhance their resource use efficiency to optimize their outputs.

According to Farrell (1957), farm efficiency is the capacity of a farm to generate optimal output utilizing available inputs. Different empirical studies on the efficiency of poultry systems have shown that the determinants of inefficiency are influenced by two main factors. The first type of factor is related to the characteristics of the farmer, including demographics (such as age), education, and experience. This has been examined by Yenibehit et al. (2019), Ullah et al. (2019), and Oleke & Isinika (2011). The second type of factor is institutional factors, specifically access to credit and extension services. This has been explored by Yenibehit et al. (2019), Ullah et al. (2019), and Bethel et al. (2016). These empirical studies highlight the significance of both farmer characteristics and institutional factors in determining the efficiency of poultry systems.

Evidence in the literature reveals that psychological well-being enhances human functioning (Kállay & Rus, 2014). An example of farmers' functioning is entrepreneurs' efficient utilization of input resources to achieve optimum output. However, this study revealed that none of the literature has determined the influence of the psychological well-being of poultry farmers on their technical efficiency. This study is significant not only because it is creating a new light for debate on the determinants of technical efficiency but also because recommendations from this study will increase policy options available for policymakers to improve the performance of broiler farmers in Nigeria and other countries in SSA. This is hinged on the fact that poultry farmers in developing economies, such as Nigeria, face a significant challenge of achieving high production levels with limited resources, partly due to the poor state of their psychological well-being. Khan et al. (2022) suggested that optimizing the technical efficiency (TE) of poultry business operations shows great promise as a strategic approach. Farmers need to be healthy to be efficient, and every policy strategy that is targeted at achieving this is a worthy effort.

1.2 Theoretical Background

The Cobb Douglas production function provides the theoretical underpinnings for this study on the basis of showing the relationship between output and input. The CD function assumes constant returns to scale and unitary elasticity of substitution.

For two variable inputs, the function can be expressed as:

- $Y = AL^{b_1}K^{b_2}e$ ....(1)

where Y represents the level of output, L and K are the variable inputs, A is a constant factor, b1 and b2 are the coefficients of L and K, respectively, representing the elasticity of the factors, and e is the error term. The sum of b_1 and b_2 indicates the nature of returns to scale. According to Upton (1979) and Terfa and Terwase (2011), the Cobb–Douglas production function cannot capture both increasing and diminishing marginal productivity in a single response curve. As a result, it fails to provide a technical optimum. Despite its disadvantages, researchers still find the Cobb–Douglas production function valuable when analysing surveys involving multiple variable inputs and when it is necessary to measure returns to scale, factor intensity, and overall production efficiency. Additionally, it can be used to obtain coefficients for testing hypotheses (Cobb and Douglas 1928; Erhabor, 1982; Terfa and Terwase, 2011). Erdaw & Beyene (2022), Bethel et al. (2016) and Terfa and Terwase (2011) argue that the Cobb–Douglas production function is superior to other forms of production functions because it better satisfies the economic, statistical, and econometric criteria of many studies.

The literature discusses two approaches for assessing technical efficiency: data envelopment analysis (DEA) and stochastic frontier analysis (SFA). Erdaw and Beyene (2022) highlight a key advantage of SFA, noting that it accommodates situations where farmers lack access to precise and current data about their operations, making the use of SFA feasible even with potentially inaccurate data. In the context of poultry production, the stochastic frontier technique develops a frontier function that accounts for both random errors and the inefficiency component specific to this industry.

The stochastic production function is given by:

- $Y_i = f(X_i, \beta) * e^{v_i - u_i}$ .... (2)
  where
- Y_i = Output (weight of broiler chickens at 8 weeks);
- X_i= Input (quantities: labor, capital, and other inputs directly used in production);
- β = Projected parameters;
- e= 2.718;
- v_i = Effects of exogenous shocks;
- u_i = Technical inefficiency effect.

The composite error term consists of two components: vi and ui. vi represents natural errors and follows a standard normal distribution, while ui represents farm-specific errors and follows an independent, half-normal distribution. These two error terms are unrelated to each other. vi data reflect deviations between maximum and actual values due to natural factors, while ui data capture inefficiencies specific to farmers. Different assumptions about the distribution of ui exist, including a half-normal distribution as proposed by Aigner et al. (1977), an exponential distribution by Meeusen and van den Broeck (1977), and a truncated normal distribution by Stevenson (1980). The technical efficiency (TE) is calculated as follows:

- $TE = \dfrac{Y_i}{Y_i^*} = \exp(-u_i)$ ....(3)

The technical efficiency (TE) of a farmer, as expressed in Equation (3), is calculated by comparing their actual output (Y) to the best possible output (Y*) achievable under the same technological conditions. Stochastic frontier analysis (SFA) employs maximum likelihood estimation (MLE) to quantify this efficiency. To pinpoint the factors influencing observed technical efficiency, Equation (4) was utilized within a single-stage maximum likelihood estimation procedure, incorporating a stochastic frontier model using STATA 18 (2023).

- $u_i = \alpha_0 + \sum_{i=1}^{n} \alpha_i Z_i + e_i$ ....(4)
  where
- μ_i = Technical inefficiency error term of the ith farmer;
- Z_i = Socioeconomic status, institutional factors, and psychological well-being of broiler chicken farmers
- α_o = Constant;
- α_i = Estimated parameters;
- ε_i = Error term.

2. Conceptual Framework

2.1 Objective, Subjective Socioeconomic Status and Poultry Farmers' Technical Efficiency

SES has historically been defined as access to material and social resources (Oakes & Rossi, 2003; and Snibbe and Markus, 2005). According to past studies, objective socioeconomic status (SES) has traditionally been defined as individuals' access to material and social resources (Oakes & Rossi, 2003; Snibbe & Markus, 2005). This type of

SES is commonly measured using objective indicators such as income, educational level, and occupation, which reflect differences in individuals' access to these resources (Lucas & Schimmack, 2009; Kraus & Stephens, 2012).

Income is an important component of objective SES, as it allows individuals to obtain desired services, goods, and experiences. It has been found to be associated with psychological variables such as social trust and prosocial behavior (Lucas & Schimmack, 2009; Kraus & Stephens, 2013). Education serves as a marker for sociocultural and psychosocial outcomes and is linked to economic advantages, such as reduced financial hardship (American Psychological Association, 2007) and improved technical efficiency of poultry production (Bethel et al., 2016). As a proxy for objective SES, occupation is closely connected to income and education, and it also influences individuals' psychological experiences (Duncan & Magnuson, 2012; American Psychological Association, 2007; Kraus & Stephens, 2013).

While objective SES is typically measured using global indices in research, there is growing recognition of the role of subjective assessments based on social comparisons. Subjective SES refers to individuals' perceptions of their position in the social hierarchy relative to others. The MacArthur SSS is a widely used tool to assess subjective SES (Adler et al., 2000; Kraus et al., 2013). Unlike objective SES, subjective SES captures individuals' perceptions of their standing, which may not always align with their actual material resources. Recent studies have shown distinct associations between subjective SES measures, such as the MacArthur SSS scale, and traditional objective SES indicators, highlighting the conceptual and empirical differences between the two (Jury et al., 2019; Loeb & Hurd, 2019; Bjornsdottir et al., 2017; Wang et al., 2019). Intuitively, individuals' perceptions of their social hierarchy relative to others in the industry carry some responsibilities to competently perform their role as entrepreneurs, such as producers of broiler chickens. However, there is no evidence of the effect of subjective SES on the technical efficiency of farmers.

Regarding the relationship between the MacArthur SSS (subjective SES) and both objectives, the debate in the literature is inconclusive. The subdomains across the variables are related differently, as evidenced in the works of Navarro-Carillo et al. (2020), Destin et al. (2017) and Huang et al. (2017).

2.2 Institutional Factors

Bethel et al. (2016) suggested that institutional factors, such as access to credit, membership in cooperative association(s), and access to extension services, lead to a reduction in technical inefficiency. In other words, a favourable institutional framework enhances the performance (technical efficiency) of poultry farmers.

2.3 Psychological wellbeing

Several psychosocial factors are believed to contribute to distress and suicide risk among male farmers (Woolford et al., 2022). Studies indicate that many male farmers exhibit traits such as stoicism, self-reliance, and emotional suppression (Rickwood & Thomas, 2012), defining health primarily in terms of productivity (Bourke, Humphreys, & Wakerman, 2012). Additionally, research has shown that male farmers often adhere to unsustainable work ethics (Brew, Inder, & Allen, 2016), experience heightened isolation (Brew, Inder, & Allen, 2016), and face significant pressure to conform to traditional gender roles (Perceval et al., 2018). Agricultural work environments can also be challenging. According to Woolford et al. (2022) and Alston & Kent (2008), factors such as risk-taking behaviours increase the risk of physical illness, which affects production expectations (Gunasekera et al., 2007) and has the potential to contribute to harmful outcomes.

The above discussion shows how farmers' psychological well-being also contemporaneously affects their objective and subjective SES (Navarro-Carrillo, 2020). The Spanish version of Ryff's Psychological Well-Being Scales adaptation is explained below following the studies of Navarro-Carrillo (2020). The psychological well-being (PWB) domain encompasses several major subscales, each addressing key aspects of an individual's mental and emotional health. Autonomy (A), as one of these subscales, refers to a profound sense of independence, self-determination, and personal agency. It encompasses the feeling of being in control of one's own actions, decisions, and life choices, which are fundamental to a sense of empowerment and well-being.

Another critical subscale within the PWB domain is Environmental Mastery (EM). This subscale pertains to an individual's ability to effectively manage and adapt to his or her environment. It involves feeling competent, capable, and adept at navigating the challenges and opportunities presented by one's surroundings, thereby fostering a sense of confidence and resilience.

Personal growth (PG) is yet another important component of psychological well-being. It encompasses the continuous process of development and self-improvement. This subscale reflects an individual's commitment to learning, growth, and striving for personal excellence, contributing significantly to a sense of fulfilment and purpose in life.

Positive Relations (PR), as a subscale, focuses on the quality of an individual's social connections and relationships. It emphasizes the importance of having fulfilling, supportive, and meaningful interactions with others, such as family, friends, and community members. Strong positive relations contribute to emotional well-being and overall life satisfaction.

Purpose in Life (P) is a vital aspect of psychological well-being that involves a sense of meaning, direction, and significance in life. It involves feeling motivated by meaningful goals, values, and a sense of purpose that provides a sense of fulfilment and direction in life.

Self-acceptance (SA) reflects an individual's ability to have a positive and realistic view of oneself. It encompasses self-confidence, self-respect, and self-compassion, allowing individuals to accept both their strengths and weaknesses without harsh self-judgment. Self-acceptance is foundational to psychological well-being because it fosters a sense of inner peace and self-contentment.

Figure 1 shows the conceptual model that connects farmers' objective and subjective socioeconomic status, institutional factors and psychological well-being to their technical efficiency. The relationship (r) between farmers' objective and subjective socioeconomic status was tested, and because the two variables were found to be strongly correlated, the income, education and occupation subscales in objective SES were dropped for the similar subscales in the subjective SES to set up the model for the technical efficiency of the broiler farmers. Ultimately, the desired outcome of every broiler producer is to attain that production level where there is optimum output (yield) with minimal resources (efficiency).placed next to each other to save space. For example, see Fig. 1. The figures and the number should be placed in the table. Then, the table border needs to be adjusted to no border.
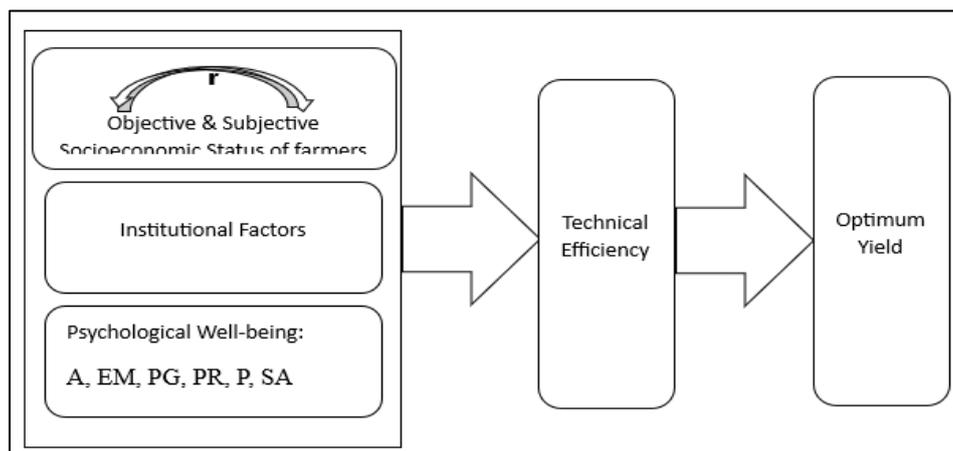

Fig. 1 *Conceptual model connecting farmers' objective and subjective socioeconomic status, institutional factors and psychological well-being to their technical efficiency*

3. Methodology

3.1 Study Area, Sample Size, and Sampling Technique

The study was conducted in the Southwest, a zone within Nigeria. The region has a high density of commercial poultry farms, primarily focusing primarily on broiler and layer chicken production for both meat and eggs, respectively, with smallholder chicken farming being a dominant activity because it is a major source of income for many in the zone. The region encompasses a geographic area located between latitude 6°N and 4°S and longitude 4°W and 6°E. It covers a land area of 114,271 km2, which represents 12% of the country's total land mass. The region consists of six states: the Ekiti, Lagos, Ogun, Ondo, Osun, and Oyo states. According to the Federal Ministry of Agriculture & Natural Resources (FMA&NR; 1997), the region has a typical equatorial climate characterized by distinct dry and wet seasons. The main growing season lasts up to 9 months, with peak periods in July and September. The amount of rainfall varies across the region, ranging from 2600 mm in the coastal areas of Lagos and Ogun States to nearly 1200 mm in the northern areas of Ondo, Oyo, and Osun States. On average, the region receives 1480 mm of rainfall. The temperature ranges from 18°-24°C during the rainy season to 30°-35°C during the dry season. Livestock production is also prominent in the region, with goats, sheep, cattle, pigs, and poultry being the main livestock species.

A multisampling approach was used to select our respondents for this study, and the same technique was employed for broiler farms. In the first stage, the Southwest Zone was chosen for the research because the preponderance of smallholder chicken farming is a dominant activity in this zone. In the second stage, three states within the zone were randomly selected (Ogun, Oyo, and Ondo States). In the third stage, four local government areas (LGAs) were randomly chosen from each state. The choice of LGA instead of agricultural development project (ADP) zones was made because the Poultry Farmers' Association of Nigeria (PFAN), whose membership list was used, was more organized at that LGA level than at the ADP zone level. In the last stage, the ADP and

Ministry of Agriculture in each state met the local government chapters of the PFAN to obtain the list of smallholder broiler chicken farmers in each selected LGA. In line with the study of Adesehinwa et al. (2016), small-scale broiler chicken farmers were categorized as farmers with stock sizes of 20-1,000 birds on their farms. This study could not determine the exact population of all smallholder broiler chickens in the zone; therefore, following Khan et al. (2022) and Kukoyi et al. (2022), the study adopted Cochran's formula for the computation of sample size for an unknown population, which is given in equation 5 (Cochran, 1977).

- $n= (z^2*p(1-p))/d^2$ ....(5)

where n = minimum sample size; z = constant at 95% confidence interval, which is 1.96 for a two-tailed study; p = best estimate of population prevalence of 50% (but this study adopts 30% because of convenience of the data collection); and d = precision, which is at 95% confidence interval of 5%. This yielded a total of 323 samples of poultry farmers (from the environmental control shed system) in the subregion. From each list obtained from the PFAN in each LGA, respondents were randomly selected through a proportional allocation sampling technique, as shown in equation 6:

- $n_i=n^* (N_i/N)$ ....(6)
  where
- n_i = Number of sampled respondents in each LGA;
- n^* = Total sample size of respondents (broiler chicken farmers);
- Ni = Total number of broiler chicken producers in each LGA;
- N = Total number of broiler chicken producers listed in the PFAN register in the study area.

The data set of this study, therefore, comprises 323 broiler chicken producers in Southwest Nigeria, where producers employed an environmental control shed system.

3.2 Data Collection

This study involved the collection and analysis of primary data. To gather these data, a well-structured questionnaire was developed and administered to each respondent through an interview schedule consisting of both closed- and open-ended questions. The respondents, who were selected as a sample for this study, were personally interviewed at their farms. The questionnaire covered various aspects, including farmers' demographics, institutional factors, input usage, and output obtained during their last 2023 production season (October-December). Farmers were also asked about the average temperature during this production cycle, and where they were unable to provide any temperature data, the study relied on weather information collected by other organisations within the same community. Additionally, questions were asked about the farmers' objective and subjective socioeconomic status, as well as their perception of their psychological well-being.

A total of 36 enumerators were chosen from the study area to collect the primary data from 323 respondents. Each selected local government area (LGA) had three enumerators responsible for gathering data from broiler farmers. The study followed ethical protocols, and participants provided consent for their involvement in the interview. The enumerators were selected based on their familiarity with the study area, acceptance by local farmers, experience in data collection, and proficiency in the local dialect. The final version of the questionnaire was refined after necessary modifications, and a pretest was conducted to ensure the collection of detailed and precise data. Only 318 of the 323 questionnaires administered were good enough, in terms of completeness and consistency of responses, for data analysis.

3.3 Measurement of Subjective Socioeconomic Status and Psychological Well-being

3.3.1 Subjective Socioeconomic Status

This study utilized the traditional MacArthur SSS scale, which consists of a 10-point social ladder, to assess participants' position in the social hierarchy based on income, educational level, and occupation. Participants were asked to select the rung on the ladder that represented their relative position in society. Higher rungs indicated greater placement on the ladder. To measure subjective perceptions, the researchers created three adapted 10-rung ladders for income, education, and occupation. Participants were asked to indicate the rung on each ladder that they believed represented their position. The income ladder reflected perceptions of income, with higher rungs indicating more income. The education ladder assessed perceptions of educational level, with higher rungs indicating more education. The occupation ladder measured perceptions of occupational status, with higher rungs representing better jobs. However, there are limitations to this scale, including subjective perceptions and a narrow focus on income, education, and occupation.

The limitations are as follows: First, the scale assumes a linear relationship between rungs and social status, disregards intersectionality, and may oversimplify social hierarchies. Future research should address these

limitations by incorporating a broader range of indicators, considering intersectionality, and utilizing qualitative approaches.

3.3.2 Psychological Wellbeing

The Swedish version of Ryff's Psychological Well-Being Scales, comprising 18 items rated on a 6-point Likert scale, was utilized in the study. This version has been validated and proven reliable in various studies (Garcia et al., 2023; and Khanjani et al., 2014). The following specific items from each subscale were used: Q15, Q17, and Q18 for autonomy; Q4, Q8, and Q9 for environmental mastery; Q11, Q12, and Q14 for personal growth; Q6, Q13, and Q16 for positive relations with others; Q3, Q7, and Q10 for purpose in life; and Q1, Q2, and Q5 for self-acceptance. The data were rated on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree) (Ryff and Keyes, 1995).

3.4 Analytical Technique

3.4.1 Pearson Correlational Analysis

Pearson correlation analysis was used to explore the relationships between the objective and the MacArthur SSS subscales (subjective SES) of the owners of the broiler farms in the study area. This study adapted the procedure used by Garcia et al. (2023)

3.4.2 Regression Analysis

Following the Cobb–Douglas (CD) production model, the analytical model for this study was as follows:

- $\ln Y_i = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \llbracket \ln X \rrbracket_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + v_i - u_i \ldots\ldots(7)$
  where
- Y = Output (weight broilers sold in kg per production cycle);
- X1 = Number of broilers per production cycle;
- X2 = Labour in man-days per production cycle;
- X3 = Feed intake in kg per production cycle;
- X4 = Quantity of water consumed in litres per production cycle;
- X5 = cost of veterinary services per production cycle;
- X6 = Volatility of temperature during the production cycle;
- β o = Constant;
- β i = Estimated parameters;
- vi = Uncertainty errors;
- ui = Inefficiency effects.
  Technical Inefficiency Variables (Recall equation 4)
- $u_i = \alpha_0 + \sum_{(i=1)}^{14} \llbracket \alpha_i Z_i \rrbracket + e_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(8)$
- Z1 = gender (0 for women; 1 for men)
- Z2 = Age of household head (in years)

Subjective SES Domain
- Z3 = Income (Producers' perception of his/her income level relative to others in the farm hosting location)
- Z4 = Education (Producers' perception of his/her educational level relative to others in the farm hosting location)
- Z5 = Occupation (Producers' perception of his/her years of experience relative to others in the farm hosting location)

Institutional Domain
- Z6 = presence of lending institutions within the broiler farm hosting community. (yes=1, 0 otherwise)
- Z7 = Financial Members of Cooperative (1 if yes, and 0 otherwise)
- Z8 = extension visit in number of times visited

Psychological Well-Being
- Z9 = Autonomy
- Z10 = Environmental Mastery (EM: 1 [strongly disagree] to 6 [strongly agree])
- Z11 = Personal growth (1 (strongly disagree) to 6 (strongly agree))
- Z12 = Positive Relationships (1 [strongly disagree] to 6 [strongly agree])

- Z13 = Purpose of Life (1 [strongly disagree] to 6 [strongly agree])
- Z14 = Self-acceptance (1 [strongly disagree] to 6 [strongly agree])

3.5 Ethical Considerations

The study was approved by the Faculty of Agriculture Ethics Review Board of Adekunle Ajsin University, Akungba Akoko, Nigeria (AAUA/AGRIC/ERB/2305168).and formulae should be typed in Mathtype, and numbered consecutively with Arabic numerals in parentheses on the right hand side of the page (if referred to explicitly in the text). They should also be separated from the surrounding text by one space. The equations and formulae should be placed in the table. Then, the table border needs to be adjusted to no border.

4. Results and Discussion

This study aimed to determine the socioeconomic characteristics of broiler farm entrepreneurs and the relationships among the socioeconomic characteristics (global indicators and MacArthur SSS subscales), psychological well-being and technical efficiency of these entrepreneurs. In this section, the results of the two objectives of the study are presented.

4.1 Socioeconomic Characteristics

Table 1 presents the socioeconomic characteristics of the respondents (smallholder broiler farmers). The table reveals that the average age of the male broilers was 57 years and that of the female broilers was 43 years. The average incomes of male and female producers are N285,049 (male) and N215,714 (female), respectively. The average number of years spent in school by male and female broiler producers is 16 years and 14 years, respectively. According to the Table, the male producers had an average of 426 broilers weighing 759 kg in a production cycle, while the female producers had 110 broilers weighing 317 kg at the end of a production cycle, each accounting for 88 and 83 man-days of labor, respectively. On average, broilers owned by males consume 1386.06 kg of feed per production cycle, while those managed by females consume 1190.7 kg. This suggests that male-managed broiler poultry pens tend to have greater feed intake than female-managed broiler farms. Similarly, findings on the quantity of water consumed in litres per production cycle indicate that broiler farms owned by males consume an average of 805.2 litres of water, while those owned by females consume 1004.7 litres. This indicates that female-managed broiler farms tend to consume more water during the production cycle than male-managed broiler farms. Male-owned broiler farms spend an average of N38,268.54 on veterinary services, while female-owned farms spend N41,615.11. This suggests that females tend to incur slightly greater costs for veterinary services than males. Male-owned broiler farms experience an average temperature of 24.50 (SD: 6.54), while female-owned broiler farms experience an average temperature of 25.90. This indicates that female-owned broiler farmers may experience slightly higher temperatures during the production cycle than males.

Regarding the subjective SES perceptions, the participants rated their positions on different ladders, and the results are presented in Table 1. Male-owners of broiler farmers rated their perceived income at an average of 4.94, while female-owners of broiler farmers rated it at 3.86. This suggests that males perceive themselves to have higher incomes than females. Males rated their perceived educational level at an average of 4.51, while females rated it at 4.02. This finding implies that males perceive themselves to have a slightly higher level of education than females. Males rated their perceived occupational status at an average of 5.85, while females rated it at 3.95. This indicates that males perceive themselves to have higher occupational statuses than females.

In terms of Ryff's psychological well-being assessment, the participants rated their levels on different factors, as shown in Table 1. Male farmers of broilers rated their autonomy at an average of 4.69, while female owners rated it at 3.16. This suggests that males perceive themselves to have greater levels of autonomy than females do. Males rated their environmental mastery at an average of 3.51, while females rated it at 3.01. This indicates that males perceive themselves to have slightly higher levels of environmental mastery than females. Males reported greater personal growth (average rating of 4.18) than females did (average rating of 3.88). Compared with males, females reported more positive relationships (average rating of 4.26) (average rating of 3.05). Compared with males, females reported a greater sense of purpose in life (average rating of 3.92) (average rating of 3.52). Compared with male broilers, females reported greater self-acceptance (average rating of 4.01) (average rating of 3.38).

Table 1 *Socioeconomic characteristics of smallholder broiler farmers*

	Male (227)				Female (91)			
	Max	Min	Mean	SD	Max	Min	Mean	SD
Objective SES								
Age	82	22	57.3	19.1	64	31	42.7	15.4
Income/cycle	903,311	64,185	285,049	52,118	491,521	38,557	215,714	47,022
Education Status/Years in School	22	9	15.8	3.82	18	12	14.1	2.65
Occupational Status/Experience	56	3	23.5	6.44	35	2	21.7	7.19
Output (weight broilers sold in kg per production cycle)	3,116.00	382	758.53	124.17	2153	317	533.1	156.3
Number of broilers per production cycle	1000	100	426.37	144.8	803	110	403.0	188.4
Labour in man-days per production cycle	128	62	88.06	24.2	110	49	83.3	31.5
Feed intake in kg per production cycle	2200	250	1386.06	115.3	1800	128	1190.7	88.9
Quantity of water consumed in litre per production cycle	1750	639	805.2	68.8	1442	550	1004.7	72.4
Cost of Veterinary Services per production cycle	156,044.08	38,268.54	59,233.72	21,902.14	182,226.37	25,131.41	41,615.11	18.002
Average temperature during the production cycle	32	17	24.5	6.54	29	18	25.9	6.61
Subjective SES								
Income Level	9	1	4.94	1.83	7	2	3.86	1.31
Educational Level	9	3	4.51	1.16	7	1	4.02	1.71
Occupational Level	10	2	5.85	2.55	6	3	3.95	1.49
Psychological								
Autonomy	5.72	1.68	4.69	1.14	5.35	1.51	3.16	1.75
Environmental Mastery	5.24	1.15	3.51	1.62	5.02	1.77	3.01	1.04
Personal Growth	5.25	1.64	4.18	1.18	4.42	1.93	3.88	1.01
Positive Relation	5.73	2.82	3.05	1.52	5.85	2.01	4.26	1.14
Purpose of Life	5.29	2.02	3.52	0.51	5.59	1.84	3.92	1.10
Self-Acceptance	5.16	1.08	3.38	1.02	5.06	2.11	4.01	1.15

Source: Field Survey, 2023

4.2 Correlational Analysis

Table 2 presents the Pearson correlations of objective and subjective SES variables with psychological well-being. According to the Table, these correlations indicate that both objective SES indicators (such as income per cycle, education level, and occupational status) and subjective perceptions of SES (income level, educational level, and occupational level) are associated at varying probabilities. However, the strength of these associations varies with

income per cycle, subjective income level, and subjective occupational level. The above evidence accounts for the non-inclusion of both objective and subjective SES into the regression model to avoid multicollinearity.

Table 2 *Pearson correlations of objective and subjective SES indicators with psychological well-being*

		Age	Income /cycle	Education Status/Years in School	Occupational Status/Experience	Income Level	Educational Level	Occupational Level
1	Age	1.00						
2	Income/cycle	0.34*	1.00					
3	Education (Years in School)	0.41*	0.49**	1.00				
4	Occupation (Experience)	0.58**	0.62**	0.34*	1.00			
5	Income Level	0.27	0.58***	0.21*	0.49**	1.00		
6	Educational Level	0.16	0.38*	0.50***	0.43**	0.34*	1.00	
7	Occupational Level	0.29	0.34*	0.28*	0.48**	0.41**	0.39**	1.00

Source: Data Analysis, 2024

4.3 MLE Estimates of the Parameters of the Stochastic Production Frontier

Table 3 presents the maximum likelihood estimates of the Cobb–Douglas stochastic frontier analysis) with the inefficiency effect model (broiler farms). The variance parameters in the Cobb–Douglas stochastic frontier analysis with the inefficiency effect model for broiler farms are crucial for understanding production efficiency. A sigma squared (σ^2) of 0.44 indicates the variability of the error terms around the estimated frontier, suggesting that significant unexplained factors affect production. Gamma (γ) at 0.81 shows that inefficiency contributes significantly to overall variability, highlighting operational disparities among farms. A sigma-v2 (σ_v^2) of 0.01 reflects variability in inefficiencies, indicating varying levels of farm efficiency. A sigma-u2 (σ_u^2) of 0.34 implies that unexplained factors impact production. A Prob > chi2 of 0.00 indicates statistical significance, underlining the importance of these variance parameters in explaining production variability and inefficiencies in broiler farming.

Table 3 *Maximum likelihood estimates of the Cobb–Douglas stochastic frontier analysis) with the inefficiency effect model (broiler farms)*

Variables	Coefficients	Standard Error	P Value
Stochastic Frontiers			
Constant	-0.47***	0.008	0.000
X1=Number of broilers per production cycle	0.12***	0.001	0.000
X2=Labour (man-days per production cycle)	0.05	0.046	0.139
X3=Feed intake in (kg per production cycle)	0.38***	0.011	0.000
X4=Quantity of water consumed in litre per production cycle	0.04	0.099	0.343
X5=Cost of Veterinary Services per production cycle	0.07	0.061	0.126
X6=temperature volatility during the production cycle	-0.09***	0.001	0.000

Inefficiency Model			
Constant	1.38***	0.206	0.000
Z1=Age	-0.56*	0.422	0.092
Z2=Gender (Male)	-0.11	0.088	0.105
Z3=Income Level	-0.19***	0.016	0.000
Z4=Educational Level	-0.27***	0.013	0.000
Z5=Occupational Level	0.10	0.079	0.103
Z6=Lending Institution	-0.02	0.016	0.106
Z7=Cooperative Membership	-0.08**	0.041	0.026
Z8=Extension Visits	-0.06	0.051	0.120
Z9=Autonomy	-0.01**	0.005	0.023
Z10=Environmental Mastery	0.05	0.044	0.128
Z11=Personal Growth	-0.17***	0.02	0.000
Z12=Positive Relation	-0.03	0.027	0.133
Z13=Purpose of Life	-0.05**	0.038	0.006
Z14=Self-Acceptance	-0.01	0.011	0.182
Variance parameters			
Sigma Squared	0.44		
Gamma	0.81		
Sigma -v^2	0.01		
Sigma-u^2	0.34		
Prob > chi2	0.00		

Source: Data Analysis, 2024

The stochastic frontier analysis (SFA) model, as shown in Table 3, provides valuable insights into the factors influencing production efficiency in broiler farming. In the Production Function Model, the constant term (-0.47) is statistically significant (P value < 0.00), indicating its significant impact on the outcome variable. Notably, the number of broilers per production cycle (X1) had a significant positive impact (0.12, P value < 0.00), suggesting that increasing broiler numbers enhances production output (overall weight of broiler chicken to be produced). Similarly, feed intake (X3) significantly improved output (0.38, P value = 0), underlining its crucial role in production processes. On the other hand, factors such as labour input (X2), water consumption (X4), and veterinary service costs (X5) do not exhibit statistically significant impacts on efficiency. Interestingly, the volatility in temperature during production (X6) was statistically significant (-0.09, P value = 0), indicating its negative influence on production output, possibly by increasing stress on broilers.

According to the inefficiency model, the constant term (1.38, P value = 0) signifies inherent inefficiencies or fixed costs in broiler farming. Age (Z1) and gender (Z2) do not have statistically significant impacts on inefficiencies, although they have negative coefficients (-0.56 and -0.11, respectively). However, for subjective socioeconomic SES, income level (Z3) and educational level (Z4) demonstrate significant negative coefficients (-0.19 and -0.27, respectively, both with P values = 0), indicating that farmers' higher ratings of their perceptions of themselves on income and education ladders relative to others are associated with lower inefficiencies. Among other factors, cooperative membership (Z7), autonomy (Z9), purpose of life (Z13), and self-acceptance (Z14) have significant impacts on inefficiencies. These results suggest that aspects related to psychological well-being and organizational factors can play a crucial role in reducing inefficiencies in broiler farming operations.

4.4 Technical Efficiency Level

Table 4 shows the distribution of respondents by their technical efficiency level. Interpreting these results, the majority of respondents (60.06%) demonstrate a technical efficiency level between 0.31 and 0.60. A substantial proportion (23.27%) exhibit an efficiency level below 0.30, indicating a need for improvement in their operational processes or resource utilization. On the other hand, a smaller but notable percentage (16.67%) of respondents showcase a high efficiency level, exceeding 0.61, suggesting effective practices or optimal resource allocation in their operations.

Table 4 *Distribution of respondents by their technical efficiency level*

Efficiency	Frequency	Percentage
< 0.30	74	23.27
0.31 - 0.60	191	60.06
> 0.61	53	16.67

Source: Data Analysis, 2024

4.5 Discussion on the Effects of Farmers' Subjective and Psychological Well-Being on Their Technical Efficiency

This study attempts to determine the relationships among MacArthur Subjective Socioeconomic Status, Ryff's Psychological Well-Being, and the Technical Efficiency of Small-scale Poultry Farmers in Southwest Nigeria. Evidence from the study revealed that the coefficient for the number of broilers per production cycle was statistically significant (0.12, p value < 0.00). This finding, which aligns with that of Khan et al. (2022) and Yenibehit & Murshed (2019), indicates that increasing the number of broilers has a positive impact on production output. This suggests that larger broiler numbers result in a greater overall weight of broiler chickens produced. This finding, which is in line with the findings of Onyewuchi (2019), highlights the importance of broiler stocking density and economies of scale in broiler farming. The coefficient for feed intake is statistically significant (0.38, p value = 0), indicating that feed intake has a significant positive impact on production output. This finding emphasizes the crucial role of proper feeding practices and nutrition in maximizing broiler production. This suggests that increasing feed intake can lead to higher broiler weights and improved production efficiency. The coefficient for stability in temperature during production is statistically significant (-0.09, p value = 0), suggesting its positive influence on production output. This finding implies that maintaining stable temperature conditions during broiler production can reduce stress on broilers and result in improved production efficiency. This highlights the importance of proper temperature control and management practices in broiler farming.

Multiple empirical studies have examined the factors that contribute to the efficiency of broiler production systems. These studies have identified two main types of factors that have a significant impact on efficiency. The first type of factor relates to the characteristics of the farmers themselves. For instance, studies have shown that demographics, such as demographics (age) (Yenibehit & Murshed, 2019 and Ullah et al., 2019) and education (Yenibehit & Murshed, 2019; and Oleke & Isinika, 2011), play a crucial role in determining farmers' technical efficiency. In this study, older and more experienced farmers tended to exhibit higher levels of technical efficiency. Additionally, education was found to positively affect broiler farmers' technical efficiency, as farmers with higher levels of education are better equipped to make informed decisions.

The second type of factor that influences efficiency is institutional in nature. Factors such as access to credit, membership in cooperatives, and availability of extension services have been found to significantly impact farmers' technical efficiency (Yenibehit & Murshed, 2019; and Ullah et al., 2019). Farmers who are members of cooperatives have higher levels of efficiency in their operations.

The findings of these studies are consistent with previous research in the field (Khan et al., 2022; and Bethel et al., 2016). However, there are some inconsistencies in the literature regarding the effects of objective socioeconomic status (SES) on technical efficiency. To address this issue, this study explores the effects of subjective SES on technical efficiency. Rather than focusing on objective measures of SES, the study examines how farmers perceive their own socioeconomic status compared to others. The rationale behind this approach is to gain insights into farmers' behaviour and decision-making processes.

There are several compelling reasons for replacing objective SES with subjective SES as a factor influencing technical efficiency. One key rationale is the recognition of the influence of individual perceptions and experiences on behaviour and decision-making. Subjective SES captures how individuals view their own socioeconomic status relative to others, which can influence their motivation, confidence, and strategic choices. This perception, combined with psychological factors such as self-esteem and perceived control over resources, can drive farmers towards innovative practices, risk-taking, and investment in productivity, ultimately enhancing technical efficiency.

Moreover, the MacArthur SSS (subjective SES) provides a deeper understanding of contextual nuances, including social networks, cultural beliefs, and local dynamics, which play pivotal roles in farmer decision-making. This approach aligns with the need for context-specific strategies in diverse agricultural landscapes, promoting more adaptable and inclusive assessments of socioeconomic influences on farming productivity.

A notable addition in this research is the incorporation of Ryff's psychological well-being into the technical efficiency model for broiler farmers. The results shed light on how the psychological well-being of broiler farmers impacts their technical efficiency. It is particularly interesting to observe that farmers' perceptions of their

autonomy, personal growth, and sense of purpose in life have a positive and significant effect on their technical production.

In this study, three indicators of subjective SES and farmers' psychological well-being were examined: respondents' perceptions of their position on the income ladder or educational ladder and their psychological well-being. The findings revealed that farmers' perceptions of their subjective socioeconomic status, particularly in terms of income and education, significantly influenced their technical efficiency in broiler

5. Conclusion and Recommendations

In conclusion, this study has contributed valuable insights into the intricate relationships among MacArthur Subjective Socioeconomic Status (SES), Ryff's Psychological Well-Being, and Technical Efficiency among Small-scale Poultry Farmers in Southwest Nigeria. The empirical evidence presented here, particularly the statistically significant coefficients and their associated p values, highlights key determinants of production efficiency within the broiler farming sector. First, the study underscores the importance of broiler stocking density and economies of scale, as indicated by the significant positive impact of the number of broilers per production cycle on production output. This finding aligns with previous research and emphasizes the need for optimal broiler numbers to maximize production efficiency. Second, the crucial role of feed intake in enhancing production output is evident, with a significant positive coefficient suggesting that proper feeding practices and nutrition play a pivotal role in broiler farming. This emphasizes the need for farmers to focus on optimizing feed intake to achieve higher broiler weights and overall improved efficiency. Additionally, the study highlights the significance of stable temperature conditions during production, with a statistically significant negative coefficient implying a positive influence on production output. This finding emphasizes the importance of proper temperature control and management practices to reduce stress on broilers and enhance overall production efficiency. Furthermore, the incorporation of subjective SES and psychological well-being into the analysis provides a deeper understanding of the sociopsychological factors influencing technical efficiency. Farmers' perceptions of their subjective socioeconomic status, particularly in terms of income and education, significantly influence their technical efficiency. Additionally, farmers' psychological well-being indicators, such as autonomy, personal growth, and purpose of life, positively affect their technical production, highlighting the holistic nature of factors impacting efficiency.

Based on these findings, several recommendations can be made:

- Farmers should carefully manage broiler stocking density to achieve optimal production levels and maximize economies of scale.
- Farmers should focus on implementing proper feeding practices and nutritional strategies to ensure adequate feed intake and promote higher broiler weights.
- Farmers should implement effective temperature control measures during production to reduce stress on broilers and improve overall production efficiency.
- The government should create an enabling environment for encouraging positive perceptions, autonomy, personal growth, and a sense of purpose among farmers to enhance their decision-making and operational strategies.
- The dynamic interplay between socioeconomic, psychological, and technical factors should be continuously explored to develop more comprehensive strategies for enhancing efficiency in broiler farming.

Acknowledgement

Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

References

Adesehinwa, Abiodun O. K., Plantation, M., & Cho, Gun R. (2016). Production Systems and Constraints in Market-oriented Smallholder Chicken Production in Southwest States of Nigeria. The Journal of the Korean Society of International Agriculture, 28(4).

Aigner, Dennis, Lovell, C. A. Knox, & Schmidt, Peter. (1977). Formulation and estimation of stochastic frontier production function models. Journal of Econometrics, 6, 21–37.

Alice, Marie. (2016). "Global Poultry Trends – Developing Countries Main Drivers in Chicken Consumption." Accessed February 2021. http://www.thepoultrysite.com/articles/3588/global-poultry-trends-developing-countries-main-drivers-in-chicken-consumption [accessed Apr 14 2024].

Alston, Margaret, & Kent, Jenny. (2008). The Big Dry: The link between rural masculinities and poor health outcomes for farming men. Journal of Sociology, 44, 133–147. doi: 10.1177/1440783308089166.

Attia, Youssef A., Rahman, Md. T., Hossain, Md. J., Basiouni, Safaa, Khafaga, Ahmed F., Shehata, Ahmed A., & Hafez, Hafez M. (2022). Poultry production and sustainability in developing countries under the COVID-19 crisis: Lessons learned. Animals, 12, 644.

Azarpajouh, Soroush, Weimer, Stephanie L., Calderón Díaz, Julia A., & Taheri, Hamed. (2022). Smart farming: A review of animal-based measuring technologies for broiler welfare assessment. CABI Reviews, (2022).

Bethel, Edward, Fani, David R., & Odufa, Emmanuel M. (2016). Analysis of technical efficiency of poultry farmers in Cross River State, Nigeria. International Journal of Research Studies in Agricultural Sciences (IJRSAS), 2(4), 40-45.

Bjornsdottir, Ragnheidur T., Alaei, Rozita, & Rule, Nicholas O. (2017). The perceptive proletarian: subjective social class predicts interpersonal accuracy. Journal of Nonverbal Behavior, 41, 185–201. doi: 10.1007/s10919-016-0248-6

Blackie, Sylvia. (2014). "Contribution of Village Chickens to Animal Protein Consumption and Income of Rural Households in the Greater Accra Region, Ghana." Developing Country Studies 4(10):43–49. [accessed Apr 14 2024].

Bourke, Lisa, Humphreys, John S., Wakerman, John, & Taylor, Judith. (2012). Understanding rural and remote health: a framework for analysis in Australia. Health & Place, 18(3), 496-503.

Brew, Bruce, Inder, Kerry, Allen, Julie, Thomas, Megan, & Kelly, Brian. (2016). The health and wellbeing of Australian farmers: A longitudinal cohort study. BMC Public Health. 16, 988. doi: 10.1186/s12889-016-3664-y.

Butterworth, Andrew. (2017). Cheap as chicken. In The Meat Crisis (pp. 155-170). Routledge.

Cochran, William G. (1977). Sampling Techniques, 3rd edn. New York: John Wiley and Sons, Inc.

Coelli, Timothy J. (1996). A guide to Frontier Version 4.1: A Computer Program for Stochastic Frontier Production and Cost Function Estimation; CEPA Working Papers; CEPA: Armidale, Australia, 1996.

Coelli, Timothy J. (1996). Recent developments in frontier modelling and efficiency measurement. Australian Journal of Agricultural Economics, 39, 219–245.

Destin, Mesmin, Rheinschmidt-Same, Megan, & Richeson, Jennifer A. (2017). Status-based identity: A conceptual approach integrating the social psychological study of socioeconomic status and identity. Perspectives on Psychological Science, 12(2), 270-289.

Erdaw, Mekonnen M., & Beyene, Wondmagegn T. (2022). Trends, prospects and the socioeconomic contribution of poultry production in sub-Saharan Africa: a review. World's Poultry Science Journal, 78(3), 835-852.

Farrell, Michael J. (1957). The measurement of productive efficiency. Journal of the Royal Statistical Society: Series A (General), 120(3), 253-281.

FMA&NR (Federal Ministry of Agriculture and Natural Resources). (1997). Nigeria: National Agricultural Research Strategy Plan: 1996-2010. Bukar Shaib, Adam Y. Aliyu and J. S. Bakshi (eds.) Department of Agricultural Sciences, Federal Ministry of Agriculture and Natural Resources, Abuja, Nigeria.

Food and Agriculture Organization of the United Nations (FAO). (2018). Regional Overview of Food Insecurity in Africa; FAO: Rome, Italy, 2018.

Garcia, Danilo, Kazemitabar, Mojtaba, & Asgarabad, Mohammad Hossein. (2023). The 18-item Swedish version of Ryff's psychological wellbeing scale: psychometric properties based on classical test theory and item response theory. Frontiers in Psychology, 14, 1208300.

Gunasekera, Don, Kim, Yunhee, Tulloh, Catherine, & Ford, Mark. (2007). Climate change-impacts on Australian agriculture. Australian Commodities: Forecasts and Issues, 14, 657–676.

Gunn, Kate M., Kettler, Lisa J., Skaczkowski, Gemma L., & Turnbull, Deborah A. (2012). Farmers' stress and coping in a time of drought. Rural and Remote Health, 12, 1–16.

Huang, Shuo, Hou, Jie, Sun, Li, Dou, Dongqi, Liu, Xiangping, & Zhang, Huan. (2017). The effects of objective and subjective socioeconomic status on subjective well-being among rural-to-urban migrants in China: The moderating role of subjective social mobility. Frontiers in Psychology, 8, 819.

Judd, Fiona, Cooper, Alastair-M., Fraser, Cameron, & Davis, Jacqueline. (2006). Rural suicide—People or place effects? Australian and New Zealand Journal of Psychiatry, 40, 208–216.

Jury, Mickaël, Aelenei, Cezar, Chen, Christine, Darnon, Céline, & Elliot, Andrew J. (2019). Examining the role of perceived prestige in the link between students' subjective socioeconomic status and sense of belonging. Group Processes & Intergroup Relations, 22, 356–370. doi: 10.1177/1368430219827361

Kállay, Éva, & Rus, Claudia. (2014). Psychometric Properties of the 44-Item Version of Ryff's Psychological Well-Being Scale. European Journal of Psychological Assessment, 30(1), 15–21. doi:10.1027/1015-5759/a000163

Kennedy, Alison, Adams, Jean, Dwyer, Jane, Rahman, Mohammad A., & Brumby, Susan. (2020). Suicide in rural Australia: Are farming-related suicides different? International Journal of Environmental Research and Public Health, 17, 2010. doi:10.3390/ijerph17062010.

Khan, Nawaz A., Ali, Maqsood, Ahmad, Nabeel, Abid, Muhammad A., & Kusch-Brandt, Sarah. (2022). Technical efficiency analysis of layer and broiler poultry farmers in Pakistan. Agriculture, 12(10), 1742.

Khanjani, Mehdi, Shahidi, Shahrzad, Fathabadi, Javad, Mazaheri, Mohammad A., & Shokri, Omid. (2014). Factor structure and psychometric properties of the Ryff's scale of psychological well-being, short form (18-item) among male and female students. Thoughts and Behavior in Clinical Psychology, 9(32), 27-36.

Kraus, Michael W., Tan, Jacinth J. X., & Tannenbaum, Melvin B. (2013). The social ladder: a rank-based perspective on social class. Psychological Inquiry, 24, 81–96. doi: 10.1080/1047840X.2013.778803

Kukoyi, Oluwasegun, Orok, Ekpedeme, Oluwafemi, Femi, Oluwadare, Tolulope, Oni, Olayemi, Bamitale, Tobiloba, … & Eze, Henry. (2022). Factors affecting the utilization of mental health services among undergraduate students in a Nigerian University. Heliyon, 8(11).

Lawal, Abdulfatai M., & Balogun, Gbenga S. (2021). Animal protein consumption among rural households in Kwara State, Nigeria. African Journal of General Agriculture, 3(1).

Leinonen, Ilias, & Kyriazakis, Ilias. (2016). How can we improve the environmental sustainability of poultry production? Proceedings of the Nutrition Society, 75, 265–273.

Loeb, Emily, & Hurd, Noelle M. (2019). Subjective social status, perceived academic competence, and academic achievement among underrepresented students. Journal of College Student Retention: Research, Theory & Practice, 21, 150–165. doi: 10.1177/1521025117696821

Lucas, Richard E., & Schimmack, Ulrich. (2009). Income and well-being: How big is the gap between the rich and the poor? Journal of Research in Personality, 43(1), 75-78.

Meeusen, Wim, & van Den Broeck, Julien. (1977). Efficiency estimation from Cobb–Douglas production functions with composed error. International Economic Review, 18, 435–444.

Mottet, Aurélie, & Tempio, Grazia. (2017). Global poultry production: current state and future outlook and challenges. World's Poultry Science Journal, 73(2), 245-256.

Navarro-Carrillo, Ginés, Alonso-Ferres, Marta, Moya, Miguel, & Valor-Segura, Inmaculada. (2020). Socioeconomic Status and Psychological Well-Being: Revisiting the Role of Subjective Socioeconomic Status. Frontiers in Psychology, 11, 1303. doi: 10.3389/fpsyg.2020.01303

Nwobodo, Christian E., Okoronkwo, Daniel J., Eze, Remigius I., Ozorngwu, Anthony M., Iwuchukwu, Joy C., Azuka, Vincent C., & Udoye, Chizoba E. (2023). Knowledge Capabilities for Sustainable Poultry Production in Sub-Sahara Africa: Lessons from Southeast Nigeria. Sustainability, 15(14), 11174.

Oakes, J. Michael, & Rossi, Peter H. (2003). The measurement of SES in health research: current practice and steps toward a new approach. Social Science & Medicine, 56, 769–784. doi: 10.1016/S0277-9536(02)00073-4

Oleke, Julius M., & Isinika, Amilia C. (2011). Assessing the technical efficiency of commercial egg production in Tanzania for improved livelihoods. Journal of Development and Agricultural Economics, 3, 343–352.

Onyewuchi, Uche U. (2019). Differentials in technical efficiency among broiler farmers in Imo State, Nigeria. Nigeria Agricultural Journal, 50(2), 45-55.

Palmer, Keith, & Strong, Ryan. (2022). Natural Disasters Mental-Health Impacts on Australian, Greek, and United States Farmers. OAKTrust; North Charleston, SC, USA: 2022.

Perceval, Michael, Ross, Victoria, Kõlves, Kairi, Reddy, Pavan, & De Leo, Diego. (2018). Social factors and Australian farmer suicide: A qualitative study. BMC Public Health, 18, 1367. doi: 10.1186/s12889-018-6287-7.

Pinstrup-Andersen, Per, & Rosegrant, Mark W. (Eds.). (2001). The unfinished agenda: perspectives on overcoming hunger, poverty, and environmental degradation. Intl Food Policy Research Institute.

Rickwood, Debra, Thomas, Kerry, & Bradford, Sue. (2012). Help-seeking measures in mental health: A rapid review. Sax Institute; 1:35.

Ryff, Carol D., & Keyes, Corey L. M. (1995). The structure of psychological well-being revisited. Journal of Personality and Social Psychology, 69(4), 719.

Samboko, Paul C., Zulu-Mbata, Omba, & Chapoto, Antony. (2018). Analysis of the animal feed to poultry value chain in Zambia. Development Southern Africa, 35(3), 351-368.

Snibbe, Alana C., & Markus, Hazel R. (2005). You can't always get what you want: educational attainment, agency, and choice. Journal of Personality and Social Psychology, 88, 703–720. doi: 10.1037/0022-3514.88.4.703

Stata Corp. (2023). STATA 18; Software. StataCorp LLC: College Station, TX, USA, 50.

Stevenson, Rodney E. (1980). Likelihood functions for generalized stochastic frontier estimation. Journal of Econometrics, 13, 57–66.

Terfa, David A., & Terwase, Simeon. (2011). Efficiency of Resource Use in Rice Farming Enterprise in Kwande Local Government Area of Benue State, Nigeria. International Journal of Humanities and Social Science Vol. 1 No. 3; March 201.pp. 4-6.

Ullah, Iftikhar, Ali, Shafaqat, Khan, Shahid U., & Sajjad, Muhammad. (2019). Assessment of technical efficiency of open shed broiler farms: The case study of Khyber Pakhtunkhwa Province Pakistan. Journal of the Saudi Society of Agricultural Sciences, 18, 361–366.

United Nations (UN). (2019). World Population Prospects 2019; United Nations, Department of Economic and Social Affairs, Population Division: New York, NY, USA, 2019; Available online: https://population.un.org/wpp/ (accessed on 16 February 2023).

Upton, Martin. (1979). The unproductive production function. Journal of Agricultural Economics, 30(2), 179-194.

Wang, Zijian, Jetten, Jolanda, & Steffens, Niklas K. (2019). The more you have, the more you want? Higher social class predicts a greater desire for wealth and status. European Journal of Social Psychology. doi: 10.1002/ejsp.2620

Woolford, Daniel D., Smout, Meryl F., Turnbull, Deborah, & Gunn, Kate M. (2022). Male farmers' perspectives on psychological wellbeing self-management strategies that work for them and how barriers to seeking professional mental health assistance could be overcome. International Journal of Environmental Research and Public Health, 19(19), 12247.

Yenibehit, Nir, Murshed, Mahbub, & Islam, Md. (2019). Assessment of technical efficiency of layer production in Mampong Municipality: Stochastic frontier approach. Current Research in Agricultural Sciences, 6, 20–28.