



## Influence of Operational Control on Happiness among Fish Farmers in Lapan-Gwari Fish Farming Community of Bosso Local Government Area, Niger State

<sup>1</sup>Adamu Firdausi; <sup>2</sup>Abdulmumini Baba Alfa and <sup>3</sup>Musa Salihu Ewugi

<sup>1,2,3</sup>Department of Economics, Ibrahim Badamasi Babangida University, Lapai, Niger State, Nigeria.  
[adamufirdausi4@gmail.com](mailto:adamufirdausi4@gmail.com)

### Abstracts

Entrepreneurs engage in economic activities not only to generate income but also to attain success which can result in personal wellbeing and happiness. Achieving these outcomes depends substantially on effective operational control of their ventures and as such this study examined the influence of operational control on happiness among fish farmers in Lapan-Gwari fish farming community of Bosso Local Government Area, Niger State. The study adopted a cross-sectional survey design with data collected from 201 participants selected through a simple random sampling technique. A structured questionnaire adapted from the World Values Survey (WVS) using a Likert scale was employed, and data were analyzed using descriptive statistics, Pearson correlation analysis, Variance Inflation Factor (VIF) diagnostics, Probit regression, and average marginal effects. The results reveal that operational control variables considered jointly were marginally significant at the 10% level [ $LR \chi^2(12) = 19.67, p = 0.074$ ] but fell short of the conventional 5% threshold. At the individual variable level, labour input (li) exerted a statistically significant negative effect on happiness ( $\beta = -0.151, p = 0.013$ ), with a marginal effect indicating that each additional unit of labour input reduces the probability of happiness by approximately 5.8%. Frequency of fish feeding and receipt of technical advisory support also approached significance, while availability of technical advisory support positively influenced happiness at the 10% level. The study recommends targeted investment in labour-saving technologies, cooperative labour-sharing arrangements and proactive extension service delivery to ease operational burdens and improve the well-being of fish farmers in the community.

**Keywords:** Operational control, fish farmers, happiness, subjective well-being, Probit model, aquaculture, Lapan Gwari, Niger State, Nigeria

### 1.0 Introduction

Fish farming has emerged as one of the fastest-growing agricultural activities globally, playing a crucial role in food security, employment generation, and rural livelihood development. As of 2024, the global fisheries sector contributed approximately 214 million tonnes of fish and related products to the world's food supply (Chan et al., 2024). In Africa, the fishing industry is projected to create 20.7 million jobs by 2030 and 21.6 million by 2050, with an estimated annual investment of USD 1.8 billion (Chan et al., 2024). In Nigeria, agriculture remains a cornerstone of the national economy, accounting for nearly 40% of the Gross Domestic Product (GDP) (Olaifa et al., 2022). Within this sector, fish farming plays a particularly critical role, with Nigeria producing roughly one million metric tonnes of fish annually, of which approximately 275,645 metric tonnes are derived from fish farms (Ogunji & Wuertz, 2023).

Beyond its economic contributions, fish farming has a direct bearing on the psychological well-being of its practitioners. Research in happiness and well-being economics indicates that fulfilment, purpose-driven work, and operational autonomy influence life satisfaction as much as monetary income (Diener, Kahneman, & Helliwell, 2010; Easterlin, 2010). Despite these, fish farmers in the study context continue to experience low level of happiness and well-being emanating from numerous operational challenges including production inefficiencies, poor resources utilization and fluctuating input costs which create stress and reduces satisfaction with their occupation. Among the dimensions of fish farmers' livelihoods, operational control defined as the degree of technical mastery, physical supervision, and managerial autonomy that a fish farmer exercises over critical farm production dynamics is a particularly significant yet underexplored determinant of subjective well-being. Effective operational control enables farmers to minimize production risks, reduce unexpected losses, and maintain sustainable yields (Ugwumba & Chukwuji, 2010; FAO, 2022), and thus has direct implications for farmers' overall happiness.

Despite the substantial growth of the Nigerian fisheries sector, most existing studies focus on production efficiency, profitability, and financial performance metrics, with minimal attention directed toward the psychological and subjective well-being of fish farmers themselves (Thompson et al., 2024; Ogunji & Wuertz, 2023). Within the Lapan Gwari Fish Farming Community in Bosso Local Government Area, Niger State which operates under the umbrella of the Happy Day Fish Farmers Association and comprises approximately 750 registered fish farmers recurring operational challenges including poor water quality management, inadequate access to extension services, high labour intensity, and rising feed costs have been documented. These challenges potentially suppress the well-being of farmers, yet no prior study has empirically examined how operational control influences their happiness in this community.

This paper therefore, seeks to fill this empirical and conceptual gap by examining the influence of operational control on fish farmers' happiness in the Lapan Gwari Fish Farming Community, Bosso Local Government Area, Niger State, Nigeria. Specifically, the study tests the null hypothesis that operational control has no significant influence on fish farmers' happiness in Lapan Gwari. By employing a Probit regression framework that captures both individual variable effects and joint significance, the study contributes to the growing body of happiness economics literature, advancing its application to smallholder aquaculture in sub-Saharan Africa.

The remainder of this paper is structured as follows: Section 2 reviews relevant conceptual, empirical, and theoretical literature. Section 3 presents the research methodology, including the study area, sampling procedure, and empirical model specification. Section 4 discusses the results, data analysis, and interpretation of findings, while Section 5 provides the summary, conclusion, and policy recommendations.

## **2.0 Literature Review**

### **2.1.1 Concept of Fish Farming and Operational Control**

Fish farming involves the controlled cultivation of fish species in specially designed environments such as ponds, tanks, cages, and raceways for food production, income generation, and livelihood sustainability. It is distinguished from capture fisheries by the deliberate human management of growth, reproduction, feeding, and harvesting of fish, allowing for more predictable and scalable outputs (FAO, 2022). Fish farming is not merely an economic activity; it is a livelihood strategy embedded in social, cultural, and psychological

dimensions, wherein farmers derive not only income but also a sense of purpose, community identity, and personal satisfaction (Samuel, 2021).

Fish farmers' operational control refers to the farmer's ability to plan, coordinate, and regulate the day-to-day activities of fish farming in order to achieve desired production outcomes (Osmundsen et al., 2021). Operational control encompasses decision-making over inputs, production processes, resource allocation, and quality management, ensuring that fish farming operations are efficient, consistent, and aligned with business objectives (Oluwasanmi, 2019). According to Hasanbegović (2024), operational control is the process through which managers ensure that organizational activities conform to planned objectives and established standards. Applied to fish farming, this implies that farmers must effectively manage feeding schedules, water quality, stocking density, pond maintenance, and disease prevention while continuously monitoring outputs to maintain optimal production. In small-scale fish farms, operational control is often informal, relying heavily on the farmer's experience, observation, and intuition rather than systematic procedures (Tafesse & Abate, 2018), and external factors such as adverse weather and disease outbreaks can weaken control despite the farmer's best efforts (FAO, 2019).

### **2.1.2 Concept of Happiness and Subjective Well-Being**

Happiness is described as a state of consistently experiencing positive attitudes, comfort, and satisfaction with life, coupled with the pursuit of higher life values (Clay and Smith, 2022). According to Alamry (2022), happiness is a natural human right that every individual aspires to achieve. It encompasses a felt experience of comprehensive cognition by individuals or families and serves as a crucial index for measuring quality of life (Walsh et al., 2018). Within the realm of economics, happiness is often used interchangeably with other terms like subjective well-being, satisfaction, utility, well-being, and welfare (Easterlin, 2001). Happiness encompasses positive and negative emotions, life satisfaction, and feelings of belonging and meaning in an individual's life, which can be directly assessed through self-reported information (Shams & Kadow, 2023). Subjective well-being plays a vital economic role, as it reliably predicts productivity, creativity, income, and various work-related behaviours (Dwyer, 2023; Benjamin et al., 2023; Ballas & Thanis, 2022). In the context of fish farming, job satisfaction manifests as the degree to which farmers feel positive about their farming activities, the returns they receive, and the conditions under which they work all of which feed directly into their broader happiness (Thangaswamy & Thiyagaraj, 2017).

## **2.2 Empirical Review**

A growing body of empirical literature examines the relationship between operational control and happiness among agricultural and aquaculture producers, though direct studies on fish farmers' happiness remain limited. Nwankwo (2026) examined the relationship between operational control and quality of life among 200 agricultural producers, finding that effective biosecurity and environmental control significantly improved life satisfaction. The study concluded that operational control is a key determinant of well-being, though it combined different categories of farmers, creating a population gap that the present study addresses by focusing exclusively on fish farmers.

Kabir (2025) investigated the effect of environmental and operational control on producer well-being, finding that operational control improved production stability and enhanced job satisfaction, and concluded that predictable production environments improve farmers' well-being. However, the focus on technologically advanced systems creates a contextual gap for

small-scale fish farmers operating under traditional production systems. Ayanboye et al. (2025) examined technical efficiency among fish farmers in Osun State, Nigeria, revealing a mean technical efficiency of 0.801 and identifying that key production variables such as fingerlings, feed, labour, and depreciation cost had significant positive effects on output. The study also found that socio-economic factors, including education, household size, and experience, reduced inefficiency, while age increased it.

Chukwuka et al. (2024) examined the relationship between operational control, technical efficiency, and emotional well-being among 180 catfish farmers in North-Central Nigeria, finding that effective operational control significantly improved both technical efficiency and emotional well-being, and concluding that reducing production risks enhances farmers' welfare. However, the study focused mainly on technical efficiency rather than overall happiness. Thompson et al. (2024) assessed operational efficiency, profitability, and constraints of fish farmers in Southwest Nigeria, revealing that enterprise profitability was moderate, with a net profit margin ratio of 21.96%, while operational efficiency was heavily constrained by high operating expenses and inadequate institutional support. The study concluded that access to credit, institutional support, and cooperative participation are necessary for sustaining local fish production, but failed to examine how these realities translate into farmers' psychological well-being.

Elfitasari and Albert (2017) examined operational challenges among small-scale fish farmers in Central Java, Indonesia, finding that internal challenges dictated product sustainability primarily through water quality limitations, while external challenges impacted sustainability through poor feeding practices and substandard seed management. Kundu et al. (2016) examined socio-economic factors influencing the success of small-scale fish farming in Western Kenya, finding that access to road infrastructure, pond management quality, water source reliability, and feed availability were significant drivers, while growth was severely constrained by limited capital, high feed costs, theft, and inadequate extension services. Ogunji and Wuertz (2023) examined the current state and sustainability of aquaculture in Nigeria, identifying high feed costs, limited training in disease prevention, labour-intensive production systems, and limited financial support as major constraints.

Across the empirical literature, a critical gap is identified: while studies extensively document operational constraints, management practices, and technical efficiency metrics, they evaluate these variables strictly against biological and economic benchmarks, viewing the farmer merely as a system operator rather than an autonomous human subject whose psychological well-being is impacted by operational conditions. The present study directly addresses this gap by empirically assessing how operational control variables collectively and individually influence the happiness of fish farmers in the Lapan Gwari Fish Farming Community.

### **2.3 Theoretical Framework**

This study is anchored on three complementary frameworks. Self-Determination Theory (SDT) by Deci and Ryan (1985) posits that autonomy, competence, and relatedness must be satisfied to foster intrinsic motivation and well-being, directly applicable to how operational control shapes happiness. Utility Theory (Bentham, 1748–1832) explains that individuals engage in activities maximizing satisfaction, with utility reflected in the happiness derived from effective operational management and reduced production stress. Maslow's Hierarchy of Needs (1943) provides a framework wherein operational control contributes to safety needs through stable production, esteem needs through technical mastery, and self-actualization through purposeful aquaculture engagement. Effective operational control contributes to improved productivity, profitability and reduced operational uncertainty thereby increasing the utility and satisfaction

obtained by fish farmers. Moreover, Maslow’s hierarchy of needs argues that individual strive to satisfy a progression of needs and through improved operational performance and business success, operational control can facilitate the fulfillment of these needs leading to higher level of happiness.

**3.0 Methodology**

The study employed a quantitative research design as used in the studies (Ayanboye et al., 2025; Chukwuka et al., 2024; Thompson et al., 2024). The total population of the study comprised 750 registered fish farmers in the Lapan-Gwari fish farming community of Bosso Local Government Area, Niger State (Happy Day Fish Farmers Association and Bosso LGA Agricultural Department, 2025). Using the Taro Yamane (1973) formula, 261 was obtained as the sample size. A structured questionnaire adapted from the World Values Survey (WVS) happiness scale was used to collect data from the respondents. A simple random sampling technique was adopted in selecting respondents from the population. In gathering data from the fish farmers, subjective and objective means were employed (Mugambi & Gatobu, 2024; Mibey et al., 2023; Pattanayak & Padhy, 2020). Out of 261 questionnaires administered, 201 were properly completed and returned (response rate = 77.0%), which is considered adequate for valid statistical inference (Babbie, 2010; Mugenda & Mugenda, 2003). Probit regression and average marginal effects with the aid of Stata were used to analyse the data collected. Descriptive statistics were also used to analyse the respondents' demographic data.

The study adapts the utility maximisation model of Frey and Stutzer (2002) with operational control as the independent variable and the happiness status of fish farmers as the dependent variable.

This model is stated as follows:

$$\begin{aligned}
 U &= f(X1, X2, X3 \dots \dots Xn) \dots \dots \dots 1 \\
 U &= U1(X1) + U2(X2) + U3(X3) + \dots \dots \dots Un(Xn) \dots \dots \dots 2 \\
 &= \Phi(\beta_0 + \beta_1 X1 + \beta_2 X2 + \beta_3 X3 + \beta_4 X4 + \beta_5 X5 + \beta_6 X6 + \beta_7 X7 + \beta_8 X8 + \\
 &\quad \beta_9 X9 + \beta_{10} X10 + \beta_{11} X11 + \beta_{12} X12) \dots \dots \dots 3 \\
 Pr\left(Hpi = \frac{1}{p}\right) &= \Phi \beta_0 + \beta_1 tfpoi + \beta_2 pmi + \beta_3 feedi + \beta_4 fcpi + \beta_5 fingi \\
 &\quad + \beta_6 lii + \beta_7 wqmi + \beta_8 aii + + \beta_9 teci + \beta_{12} bmpi + \beta_{13} aesi \\
 &\quad + \beta_{14} resi + \beta_{15} agei + \beta_{16} geni + \beta_{17} msti + \beta_{18} hsizei \\
 &\quad + \beta_{19} eduli + \beta_{20} yffei + \beta_{21} numpi + \beta_{22} psi + \beta_{23} asseti \\
 &\quad + \beta_{24} syi + ut
 \end{aligned}$$

Where: Pr(HPI<sub>i</sub> = 1) = probability that fish farmer i is happy, Φ = cumulative distribution function of the standard normal, β<sub>0</sub> = intercept, β<sub>1</sub> ... β<sub>12</sub> = coefficients of each independent variable, tfpo = total fish production output per cycle, pm = quality of pond maintenance practices, feed = frequency of fish feeding, fcp = cost of feeding per production cycle, fing = quantity and quality of fingerlings stocked, li = labour input used in production, wqm = maintenance of water quality conditions, AI = availability of roads, facilities, and farm support, tec = technical efficiency or ability to maximise output from inputs, bmp = adoption of best management practices, aes = availability of technical advisory support, res = frequency of receiving technical advisory support, u<sub>i</sub> = error term for farmer i.

## 4.0 Results and Discussion

### Descriptive Statistics of Operational Control Variables

**Table 1: Descriptive Statistics of Operational Control Variables**

Code	Description	Mean	SD	Skew	Kurt	Min	Max
Tfpo	Total fish production output per cycle (kg)	9,126.65	9,097.58	6.44	60.26	20	100,000
Pm	Pond management practices	0.43	0.50	0.27	1.07	0	1
Feed	Frequency of fish feeding	0.47	0.50	0.13	1.02	0	1
Fcp	Feeding cost per cycle (₦)	4,974,483	4,724,396	1.65	6.79	10,000	30,000,000
Fing	Number of fingerlings stocked per cycle	9,767.71	6,778.78	2.19	8.63	150	40,000
Li	Labour input used in production	2.53	1.80	1.36	3.84	1	9
Wqm	Water quality management	0.40	0.49	0.42	1.17	0	1
Ai	Access to infrastructure	0.42	0.49	0.33	1.11	0	1
Tec	Technical efficiency	0.54	0.50	-0.17	1.03	0	1
Bmp	Adoption of best management practices	0.55	0.50	-0.19	1.04	0	1
Aes	Access to extension services	0.42	0.50	0.31	1.10	0	1
Res	Frequency of receiving extension services	0.55	0.50	-0.19	1.04	0	1
Hpi	Happiness status (dependent variable)	0.39	0.49	0.44	1.19	0	1

Note. N = 201. SD = Standard deviation. Currency values in Nigerian Naira (₦). Binary variables: 0 = absent/low, 1 = present/high. Source: Field Survey, 2026.

Table 1 presents the descriptive statistics of the operational control variables. The results reveal that pond management practices ( $pm = 0.43$ ) and water quality management ( $wqm = 0.40$ ) are below desirable levels, consistent with field observations of recurring fingerling mortality attributable to poor water management. Access to extension services ( $AES = 0.42$ ) and infrastructure ( $AI = 0.42$ ) also remains limited. The average feeding cost per cycle ( $fcp = ₦4,974,483$ ) highlights the significant production cost burden. Only 39% of fish farming households were classified as happy (mean  $hpi = 0.39$ ), underscoring the low subjective well-being baseline in the community.

**Variance Inflation Factor (VIF) Diagnostics****Table 2: Variance Inflation Factor (VIF) Diagnostics**

Variable	Description	VIF	1/VIF (Tolerance)
tfpo	Total fish production per cycle	2.18	0.459
feed	Frequency of fish feeding	2.12	0.472
res	Receipt of technical advisory support	1.44	0.697
ai	Availability of roads and farm support	1.36	0.735
pm	Quality of pond maintenance practices	1.36	0.736
wqm	Maintenance of water conditions	1.28	0.780
aes	Availability of technical advisory support	1.24	0.807
li	Human effort used in production	1.22	0.818
fing	Quantity and quality of fish stocked	1.12	0.892
tec	Ability to maximise output from inputs	1.12	0.896
bmp	Use of recommended fish farming practices	1.10	0.911
fcp	Cost of feeding per cycle	1.03	0.967
<b>Mean VIF</b>		1.31	

Note. VIF > 10 indicates problematic multicollinearity. All values are well below the critical threshold. Source: Stata output, Field Survey, 2026.

Table 2 presents the VIF diagnostics. The highest individual VIF was 2.18 (tfpo) and the mean VIF was 1.31, substantially below the critical threshold of 10 (Hair *et al.*, 2019; Wooldridge, 2016). Tolerance values (1/VIF) ranged from 0.459 to 0.967, well above the minimum acceptable threshold of 0.10. All operational control variables were therefore retained for Probit regression estimation.

**Probit Regression Results****Table 3: Probit Regression Results: Influence of Operational Control on Fish Farmers' Happiness**

Variable	Description	Coeff.	Std. Error	z-value	p-value	95% CI
tfpo	Total fish production output (kg/cycle)	8.66e-07	1.14e-05	0.08	0.940	[-2.15e-05, 2.32e-05]
pm	Quality of pond maintenance	-0.134	0.217	-0.62	0.537	[-0.560, 0.292]
feed	Frequency of fish feeding	-0.533	0.294	-1.81	0.070*	[-1.109, 0.044]
fcp	Cost of feeding per cycle	-1.83e-08	2.06e-08	-0.89	0.376	[-5.87e-08, 2.22e-08]
fing	Quantity and quality of fish stocked	5.82e-06	1.50e-05	0.39	0.699	[-2.36e-05, 3.53e-05]
li	Human effort used in production	-0.151	0.061	-2.48	0.013**	[-0.271, -0.031]
wqm	Maintenance of water conditions	0.202	0.212	0.95	0.341	[-0.214, 0.617]
ai	Availability of roads and farm support	-0.094	0.222	-0.42	0.672	[-0.530, 0.341]
tec	Ability to maximise output from inputs	0.004	0.195	0.02	0.984	[-0.379, 0.387]
bmp	Use of recommended practices	-0.095	0.196	-0.48	0.629	[-0.479, 0.289]
aes	Availability of technical advisory support	0.351	0.212	1.65	0.098*	[-0.065, 0.768]
res	Receipt of technical advisory support	-0.443	0.227	-1.95	0.051*	[-0.889, 0.002]
Constant		0.525	0.407	1.29	0.197	

Observations: 201 | LR  $\chi^2(12)$ : 19.67 | Prob >  $\chi^2$ : 0.074 | Log-likelihood: -124.855 |  
McFadden Pseudo-R<sup>2</sup>: 0.073

Note. Dependent variable: hpi (Happiness, binary; 1 = Happy, 0 = Not Happy). N = 201. \* p < 0.10; \*\* p < 0.05. Socio-economic control variables included in the model but not reported for brevity. Source: Stata output, Field Survey, 2026.

Table 3 presents the Probit regression results for the influence of operational control on fish farmers' happiness. The operational control Probit model achieved marginal joint significance [LR  $\chi^2(12) = 19.67$ ,  $p = 0.074$ ], significant at the 10% level but short of the conventional 5% threshold. The McFadden Pseudo- $R^2$  of 0.073 indicates that operational control variables explain approximately 7.3% of the variation in fish farmers' happiness. Labour input (li) was the only variable significant at the 5% level ( $\beta = -0.151$ ,  $p = 0.013$ ), indicating that higher labour intensity significantly reduces the probability of happiness, consistent with the disutility-of-labour principle. Feeding frequency (feed) approached significance at the 10% level ( $\beta = -0.533$ ,  $p = 0.070$ ), suggesting intensive feeding practices reduce happiness likely due to financial and managerial burdens under rising feed prices. Availability of technical advisory support (aes) produced a positive coefficient approaching the 10% threshold ( $\beta = 0.351$ ,  $p = 0.098$ ), while receipt of technical advisory support (res) was negatively associated with happiness ( $\beta = -0.443$ ,  $p = 0.051$ ), likely reflecting a selection effect. The remaining variables did not exert statistically significant effects.

## Hypothesis Testing

**Table 4: Hypothesis Testing**

Hypothesis	Statement	Test Statistic	Decision
H <sub>01</sub>	Operational control has no significant influence on fish farmers' happiness in Lapan Gwari	LR $\chi^2(12) = 19.67$ , $p = 0.074$	NOT REJECTED at 5% level (Rejected at 10%)

Note. Decision rule:  $\alpha = 0.05$ . Source: Author's computation from Stata output, Field Survey, 2026.

Table 7 presents the hypothesis testing decision. The operational control Probit model yielded LR  $\chi^2(12) = 19.67$ ,  $p = 0.074$ . Since  $p = 0.074$  exceeds the conventional 5% threshold, H<sub>01</sub> is not rejected at the 5% level. Operational control variables, considered jointly, do not exert a statistically significant influence on fish farmers' happiness at the conventional threshold. However, labour input (li) individually exerts a significant negative effect ( $p = 0.013$ ), and receipt of technical advisory support (res) approaches significance ( $p = 0.051$ ), indicating that specific operational factors particularly labour intensity remains economically meaningful determinants of farmer well-being warranting continued policy attention.

## Discussion of Findings

Operational control variables do not jointly exert a statistically significant influence on the happiness of fish farmers. This finding suggests that the overall operational control mechanisms adopted by fish farmers may not be sufficient to directly and reliably enhance their subjective well-being and happiness. This might be due to the fact that happiness is a multidimensional construct influenced by economic, social and psychological and environmental factors. The findings partially contrast with previous studies like Kabir (2025) and Chukwuka et al. (2024). Notwithstanding the insignificant joint influence, labour input was found to have a significant influence on fish farmers' happiness. This signifies that increased labour intensity may reduce well-being and happiness by increasing physical demands, stress, fatigue and managerial pressure. The finding implies that farmers who devote excessive labour to farm operations may experience lower levels of happiness despite potential gains in productivity.

## 5.0 Conclusion and Recommendations

This study empirically examined the influence of operational control on fish farmers' happiness in Lapan-Gwari of Bosso LGA, Niger State, Nigeria. Using a cross-sectional survey of 201 fish farming households and a Probit regression framework, operational control variables collectively achieved only marginal significance at the 10% level, failing to reach the conventional 5% threshold. The null hypothesis that operational control has no significant influence on fish farmers' happiness is therefore not rejected at the 5% level. Notwithstanding the overall null joint result, the study identifies important individual operational determinants. Labour intensity is the most economically significant operational factor, significantly reducing farmers' happiness at the 5% level. Frequent intensive feeding was negatively associated with happiness at the 10% level, while availability of technical advisory support positively influenced happiness. The counterintuitive negative effect of receiving extension services likely reflects a selection effect, suggesting existing extension programmes are reactive rather than proactive. Low mean scores for water quality management (0.40) and pond management (0.43), alongside field observations of fingerling mortality concerns and absence of modern processing equipment, illuminate the practical operational challenges suppressing potential well-being gains. This study makes a novel contribution as the first empirical assessment of operational control as a determinant of fish farmers' subjective well-being in Nigeria's North-Central zone.

Based on the findings, the following recommendations are proposed:

- i. Government agencies and cooperative societies should promote labour-saving technologies, partial mechanization of pond operations, and cooperative labour-sharing arrangements to reduce the physical burden on farmers and mitigate the negative effect of excessive labour input on happiness.
- ii. Shared or cooperative-owned feed milling and pelletizing facilities should be established within the community to reduce dependence on expensive commercial feeds, lower production costs, and ease operational feeding burdens.
- iii. Extension service providers should redesign advisory support systems to emphasize proactive and preventive engagement before production challenges emerge, rather than responding reactively to existing problems, thereby improving the contribution of extension services to farmer well-being.
- iv. Relevant government agencies should strengthen water quality management through targeted training programmes, provision of water testing kits, and access to aeration equipment to reduce fingerling mortality and associated financial and emotional strain.
- v. Policymakers should recognize that integrated interventions simultaneously addressing labour intensity, feed costs, water quality management, and extension service effectiveness are essential for enhancing the happiness and overall well-being of fish farming households in Lapan-Gwari.

## References

- Alamry, G. (2022). The role of interior design in enhancing happiness and comfort at educational institutions in Saudi Arabia: A case study of Girls' College of Science and Arts in Mahayel Aseer, at King Khalid University. *J*, 5(3), 455-469. <https://doi.org/10.3390/j5030455>

- Ayanboye, A. O., Busari, A. O., Oluwafemi, Z. O., & Olutumise, A. I. (2025). Technical efficiency among the fish farmers in Osun State, Nigeria. *Scientific Papers Series: Management, Economic Engineering in Agriculture and Rural Development*, 25(1), 33–46.
- Babbie, E. (2010). *The practice of social research* (12th ed.). Wadsworth Cengage Learning.
- Ballas, D., & Thanis, I. (2022). Exploring the geography of subjective happiness in Europe during the years of the economic crisis: A multilevel modelling approach. *Social Indicators Research*, 161(2–3), 745–768.
- Béné, C., Arthur, R., Norbury, H., Allison, E. H., Beveridge, M., Bush, S., & Williams, M. (2016). Contribution of fisheries and aquaculture to food security and poverty reduction: Assessing the current evidence. *World Development*, 79, 177–196.
- Benjamin, D. J., Cooper, K. B., Heffetz, O., & Kimball, M. S. (2023). Self-reported wellbeing indicators are a valuable complement to traditional economic indicators but aren't yet ready to replace them. *Applied Research in Quality of Life*, 18(1), 269–298.
- Chan, Y., Tran, N., Cheong, K. C., Sulser, T. B., Cohen, P. J., Wiebe, K., & Nasr-Allah, A. M. (2024). The future of fish in Africa: Employment and investment opportunities. *PLOS ONE*, 16(2), 1–21.
- Chukwuka, E. N., Bello, S. A., & Mustapha, R. O. (2024). Technical management efficiency, operational control, and psychological distress among intensive catfish producers in Niger State. *Journal of African Agribusiness*, 19(3), 201–216.
- Clay, P. M., & Smith, C. L. (2022). Measuring subjective and objective well-being: Analyses from five marine commercial fisheries-Where are we now? *Human Organization*, 81(1), 83-85. <https://doi.org/10.17730/0018-7259-81.1.83>
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Plenum.
- Diener, E. (2000). Subjective well-being: The science of happiness and a proposal for a national index. *American Psychologist*, 55(1), 34–43.
- Diener, E., Kahneman, D., & Helliwell, J. F. (2010). *International differences in well-being*. Oxford University Press.
- Dwyer, P. C. (2023). Happiness, productivity, and prosocial behavior: A new test of their direction of causality. *Social Psychological and Personality Science*, 14(2), 223–232.
- Easterlin, R. A. (2001). Income and happiness: Towards a unified theory. *The Economic Journal*, 111(473), 465–484.
- Easterlin, R. A. (2010). *Happiness, growth, and the life cycle*. Oxford University Press.
- Elfitasari, T., & Albert, A. (2017). Challenges of small scale fish farmers for fish product sustainability. *Omni-Akuatika*, 13(2).
- FAO. (2022). *Climate change and aquaculture in West Africa*. Food and Agriculture Organization of the United Nations.
- FAO. (2024). *The State of World Fisheries and Aquaculture 2024: Blue transformation in action*. FAO.
- Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics* (5th ed.). McGraw-Hill.

- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning.
- Hasanbegović, E. (2024). Controlling as a key success factor in business operations. *Nauka i tehnologija*, 12(1), 26–32.
- Ifabiyi, J. O., Bello, O. G., Komolafe, S. E., & Banjoko, I. K. (2023). Status of climate-smart aquaculture practices in Ilorin West Local Government Area of Kwara State, Nigeria. *Iraqi Journal of Aquaculture*, 20(1), 95–114.
- Kabir, A. (2025). Sustainable recirculating aquaculture systems (RAS): Development and challenges. *Water*, 18(9), 1093–1110.
- Kundu, R., Muchiri, M., Njiru, M., & Nyamweya, C. (2016). Effect of social and economic drivers on the success of small-scale fish farming in Western Kenya. *African Journal of Tropical Hydrobiology and Fisheries*, 14(1), 29–44.
- Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, 50(4), 370–396.
- Mugenda, O. M., & Mugenda, A. G. (2003). *Research methods: Quantitative and qualitative approaches*. Acts Press.
- Mukoya, D., Ngala, C., & Simiyu, J. (2024). Moderating effect of entrepreneurship determinants on the relationship between economic diversification and sustainable livelihoods among fish farmers in Kakamega County. *African Journal of Empirical Research*, 5(2), 343–357.
- Nguyen, M. D. (2008). Farmers' satisfaction with aquaculture — A logistic model in Vietnam. *Ecological Economics*, 68(1–2), 525–531.
- Nwankwo, C. U. (2026). Health-related quality of life of small-scale farmers in southeastern Nigeria. *Cogent Social Sciences*, 11(1), 251–268.
- Ogunji, J., & Wuertz, S. (2023). Aquaculture development in Nigeria: The second biggest aquaculture producer in Africa. *Water*, 15(24), 4224.
- Olaifa, E. S., Osabuohien, E. S., & Issahaku, H. (2022). Enhancing fish production for food security in Nigeria. *Materials Today: Proceedings*, 65, 2208–2214.
- Oluwasanmi, O. O. (2019). *Multinationals' dominance and operational performance of indigenous firms in the upstream sector of the Nigerian petroleum industry* (Doctoral dissertation, Kwara State University).
- Osmundsen, T. C., Karlsen, K. M., Robertsen, R., & Hersoug, B. (2021). Shared waters — shared problems: The role of self-governance in managing common pool resources. *Aquaculture Economics & Management*, 25(3), 275–297.
- Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annual Review of Psychology*, 52, 141–166.
- Shams, S., & Kadow, A. (2023). The relationship between happiness and social and economic indicators: A systematic review. *Journal of Happiness Studies*, 24, 1615–1637.
- Thompson, O. A., Amos, T. T., Oparinde, L. O., & Omosowone, O. O. (2024). Determining operational efficiency in an aquaculture enterprise to boost fish production for improved food security in Southwest, Nigeria. *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, 24(3).

- Twumasi, M. A., Asante, D., Asante, I. O., Addai, B., & Jiang, Y. (2022). Assessing fish farm economic performance and access to financial services nexus: Empirical evidence from Ghana. *Aquaculture Economics & Management*, 27(2), 249–266.
- Ugwumba, C. O. A., & Chukwuji, C. O. (2010). The economics of catfish production in Anambra State, Nigeria. *Journal of Agriculture and Social Sciences*, 6, 12–14.
- Wooldridge, J. M. (2016). *Introductory econometrics: A modern approach* (6th ed.). Cengage Learning.
- Xu, H., Zhang, C., & Huang, Y. (2023). Social trust, social capital, and subjective well-being of rural residents: Micro-empirical evidence based on the Chinese General Social Survey (CGSS). *Humanities and Social Sciences Communications*, 10(1), 49.
- Yamane, T. (1973). *Statistics: An introductory analysis* (3rd ed.). Harper and Row.