ORJİNAL MAKALE/ORIGINAL ARTICLE

Atatürk Üniversitesi Kadın Araştırmaları Dergisi
Atatürk University Journal of Woman's Studies

EFFECT OF GENDER ON INCOME GAP AMONG FISH FARMERS IN NIGERIA'S KOGI STATE

NİJERYA'NIN KOGİ EYALETİNDE BALIK YETİŞTİRİCİLERİ ARASINDAKİ GELİR UÇURUMUNA CİNSİYETİN ETKİSİ

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Gönderim Tarihi: 22 Eylül 2020
Kabul Tarihi: 25 Kasım 2020

ABSTRACT

The present research determined the effect of gender on income disparity between men and women fish farmers in Nigeria's Kogi State using cross-sectional data collected from a total of 105 (66 male and 39 female) fish farmers sampled through multi-stage sampling technique. The collected data were analyzed using both descriptive and inferential statistics. The empirical evidence revealed a moderate feminization in fish farming the studied area. Furthermore, gender differential has effect on the income of female farmers and this is connected to gender inequality of women to access to productive resources. However, in the log-run, the effect of gender differentials owing to gender inequality fizzled-out; and this may be connected to gender sensitive policies in fishery sub-sector in the studied area. Though, income inequity is the major challenge that confronted the women fish folk and it may be associated with economies of size of their respective fish farms. Therefore, the study advised the policymakers to enlighten the society on the potential threat of gender inequality in access and control to productive resources by women, and gender inequity in income distribution among the women farmers on the growth and development of the local economy and the state in general. Women folk should develop a strong network to maximize the benefits of empowerment to make themselves self-sufficient in all aspects, which will lead to less gender inequality and deprivation and help maintain a quality life.

***Keywords**: Gender, Income, Fish, Farmers, Nigeria*

ÖZ

Bu araştırmanın amacı Nijerya'nın Kogi Eyaletindeki erkek ve kadın balık yetiştiricileri arasındaki gelir eşitsizliği üzerine cinsiyetin etkisini araştırmaktır. Araştırmanın verileri çok aşamalı örnekleme tekniği ile toplam 105 (66 erkek ve 39 kadın) balık yetiştiricisinden kesitsel olarak toplanmıştır. Toplanan veriler hem tanımlayıcı hem de çıkarımsal istatistikler kullanılarak analiz edilmiştir. Ampirik kanıtlar, incelenen alanda balık yetiştiriciliğinde kadın ağırlığının orta derecede olduğunu, kaynaklara erişimdeki cinsiyet eşitsizliğinin kadın balık yetiştiricilerinin gelirini etkilediğini göstermiştir. İncelenen alanda balıkçılık alt sektöründe günlük çalışmada cinsiyete duyarlı politikalarla cinsiyet eşitsizliğine bağlı gelir farklılıkları azalmasına karşın gelir eşitsizliği halen kadın balıkçıların karşı karşıya olduğu en büyük zorluktur. Bu durum balık çiftliklerinin büyüklük ekonomileriyle ilişkili olabilir. Bu çalışmada, politika yapıcılara, kadınların kaynaklara erişim ve kontrolünde karşılaştıkları potansiyel tehditler, yerel ekonomi, devletin büyümesi ve gelişmesinde kadın çiftçilerin gelir dağılımındaki cinsiyet eşitsizliği hakkında toplumu aydınlatmaları önerilmektedir. Kadınlar, her yönden kendi kendine yeterli hale gelmeli ve güçlenmek için güçlü bir ağ geliştirmelidirler. Bu kadınlar için daha az cinsiyet eşitsizliğine ve yoksunluğa yol açacak ve kaliteli bir yaşam sürdürmelerine yardımcı olacaktır.

***Anahtar Kelimeler**: Cinsiyet, Gelir, Balık, Yetiştiriciler, Nijerya*

Atıf için (How to cite): ***Sanusi Sm, Invider Paul S, Makarfi AM, Veenita K.*** Effect of Gender on Income Gap Among Fish Farmers in Nigeria's Kogi State. *Atatürk Üniversitesi Kadın Araştırmaları Dergisi, 2020;2(2):27-45.*

INTRODUCTION

The State of World Fisheries and Aquaculture (FAO, 2018) draws particular attention to the vital importance of fisheries and aquaculture for food and nutrition protection, as well as jobs for millions of people, many of whom struggle to sustain a decent/fair living. Global aquaculture production has grown at an average annual rate of 6.6 percent since 1995, as the world's fastest growing food-producing sector (FAO, 2017). This optimistic shift is expected to continue; meeting food and nutrition protection, jobs and providing the ever-growing population with economic empowerment (FAO, 2018).

The agricultural policy systems of Nigeria have regarded aquaculture as one of the flagship projects to foster inclusive economic growth for nearly two decades. Fish demand is rising rapidly, driven by growth in population and income, increased understanding of health benefits from fish consumption, and changes in lifestyle and consumer preferences. However, due to the decrease in natural fish stocks, which necessitated increased imports of fish, the fish supply lags behind. Aquaculture is the most acceptable option to catch fish to produce fish due to climate change, while also offering environmental protection, nutrition and livelihood co-benefits (Munguti *et al*., 2017). Sustainable aquaculture intensification would therefore help to fill the ever-widening gap in fish demand-supply (Munguti *et al*., 2017).

Empowering women and ensuring gender equality have become a widely debated issue among many political leaders, civil rights advocates and women's organisations (Mukasa and Salami, 2016). It's hard to overemphasize the contribution women make to economic growth. Since women's work is invisible and their contribution is not acknowledged as paid work, instead of "producers" they are regarded as "consumers." Growths plans are often unbalanced and do not overwhelmingly benefit women.

Specifically in agriculture, women face daunting constraints that dramatically restrict their ability and enmesh them into a productivity trap for gender. Mukasa and Salami (2016) stated that they constitute the main driving force in the agricultural sector of many developing countries and spend considerable time planting, weeding, ridging and harvesting, while at the same time carrying out their daily duties. However, irrespective of the country under investigation in Sub-Saharan Africa (SSA), women are frequently found to be less efficient in the agricultural sector than their male counterparts. Indeed, empirical evidence indicates that women's agricultural productivity deficits vary from 4 to 50 per cent worldwide, but are in the SSA region between 20 and 30% (FAO, 2011; Kilic *et al*., 2013).

70 percent of the global aquaculture workforce is female, according to FAO (2013; Githukia *et al*., 2020). Women are the bulk laborers in post-harvest, commodity transformation activities in developing and industrialized countries (FAO, 2017). However, the benefits of aquaculture are not equally distributed between men and women because of disparities in the endowments and restrictions associated with access to production resources (Ndanga *et al*., 2013; Kruijssen *et al*., 2018; Githukia *et al*., 2020). Due to the high investment levels and the adoption of new technology associated with its growth, the aquaculture sector is often considered a male domain (Kumar *et al*., 2018). Although, the fishing and aquaculture industries empower women and contribute to gender equity, their position has been largely unrecognized (HLPE, 2014).

By being at home much of the time ,women hold a central role in the aquaculture industry, which sadly allows fish farming to be assumed as an extension of domestic duties, and therefore unrecognized and unrewarded (Ndanga *et al*., 2013; Githukia *et al*., 2020). It is generally known that women are active in

aquaculture in many ways, contributing significantly to the overall well-being of households; but because of deep-rooted gender differences in social, cultural and economic spheres, women themselves often get very little benefits in return (Harrison *et al*., 2016). Furthermore, when it comes to access to production factors, which are mostly held by men as head of the household and thus the sole decision-makers, women face stiffer constraints compared to men (Rutaisire *et al*., 2010; KMAP, 2016). This restriction further limits the ability of women to access credit facilities, as these assets form collateral.

Williams (2000) and Githukia *et al*.(2020) stated that persistent differences and inequalities between men and women can contribute to too much work overburdening women, but less benefit from it, with negative consequences for the family and society as a whole. This is particularly true when inequality and discrimination constrain women (van Eerdewijk *et al*., 2017). In addition, uneven access to production factors and unequal distribution of benefits among genders means that creation of aquaculture does not benefit the entire community as planned (Ndanga *et al*., 2013). It is difficult to imagine the aquaculture sector without their inclusion, considering the roles played by women (FAO, 2012; Githukia *et al*., 2020).

According to Githukia *et al*. (2020),Weeratunge *et al*.(2012) and FAO (2013) stressed the importance of removing obstacles to restricting the influence of women over access to assets and gender norms in order to achieve gender equality. Furthermore, in value chain research, Schumacher (2014) and Kruijssen*et al*.(2018) suggested a gender perspective to reduce gender inequalities in aquaculture and improve productivity and returns. This includes an examination of the tasks played by men and women and how they communicate with each other, which determines the possibilities of counteracting constraints and optimizing the venture's benefits. This proposal is intended to facilitate the inclusion of women in the value chain of aquaculture as they complement men in order to increase productivity and income and foster gender equality (HLPE, 2014).

No society will grow effectively without giving men and women equal opportunities to form their livelihoods. While many gender disparities have been narrowed, major inequalities, particularly among low-income and marginalized groups, remain. Accordingly, addressing gender disparities by exposing women to fair access to resources and opportunities such as men increases farm production and increases agricultural output that benefits the whole family (Gallant, 2019; FAO, 2011; Weeratunge and Pant, 2011). Since gender equality is enshrined as a key aim to be reached by 2030 in the United Nations Sustainable Development Goal (SDG 5) (FAO, 2011), its achievement in agriculture is important (Me-Nsope and Larkins, 2015).

The fight against gender bias in agriculture is now recognized by most SSA countries as key to maintaining economic growth and ensuring food security. This is especially true in countries where the vast majority of people earn their income from activities focused on agriculture. Although the scale of SSA gender productivity differences is well known, studies evaluating gender bias in agriculture frequently lack a key ingredient: the evaluation of possible benefits that would be anticipated if we were to correctly minimize or eradicate gender inequality in agricultural productivity. This is a significant shortcoming for policy purposes. Indeed, if they are not persuaded of the real benefits of allocating national resources to counter agricultural gender inequality, it is especially difficult to get policymakers committed to closing the gender yield gap.

Simply mentioning the direct and/or indirect positive results of gender equality in agriculture and related sectors is not

enough. Although a qualitative assessment of these effects provides valuable insights, the extent of potential benefits that countries will get is not especially insightful. Against this context, the purpose of this research is to provide a step towards a quantitative assessment of the expected benefits from the gradual reduction or closure of gender productivity differentials among fish farmers in Kogi State of Nigeria. The study supports Zero Hunger Sustainable Development Goal 2 and Gender Equality Goal 5. The research attempts to clarify the complexities and impacts of developments on both men and women by applying gender analysis, and not on women's problems alone. It is generally recognized that integrating a gender lens into an examination of the value chain is invaluable in recognizing the tasks, obligations and constraints of men and women, and improves efficiency, economic benefits and the standard of livelihoods (Schumacher, 2014; Me-Nsope and Larkins, 2015).

Despite the broad belief that income inequality and poverty differ among African headed female and male households, very few studies have been conducted to empirically substantiate that. Thus, it is in lieu of this that this research was undertaken to determine the effect of gender on income gap among fish farmers in Nigeria's Kogi State. The specific objectives were to: compare the socio-economic characteristics of the men and women fish folks; determine the effect and impact of gender differential on income of fish farmers; and, the effect of gender discrimination on income gap of fish farmers in the study area.

RESEARCH METHODOLOGY

The study was conducted in Nigeria's Kogi state that is located on latitude 7.49′N and longitude 6.45′E. The total land area of the state is 28,313.53 square kilometres and has a projected population of 3.3 million people. The state has an average maximum temperature of 33.2°C and an average minimum of 22.8°C per annum and the rainfall ranges between 1016mm to 1524mm per annum. It is referred to as a confluence state as it is located where the two major rivers- River Niger and Benue in the country meets. Thus, the word "Kogi' means water body. The vegetation of the state consists of mixed leguminous (guinea) woodland to forest savannah; the wide expanse of *Fadama* in the river basin and long stretches of tropical forest in the Western and Southern belt of the state. Farming and fishing are the major occupations of the inhabitants of the state, though they supplement it with artisanal works and *Ayurvedic* medicines. Multi-stage sampling technique was used to draw a representative sample size of 105 homestead fish farmers from the studied area. Firstly, Agricultural Zone C was conveniently selected due to cost constraint and limited time factor for the research work. Two Local Government Areas *viz.*Adavi and Lokoja were purposively chosen due to the high concentration of homestead fish producers; beehive of commercial activities and readily available fish market. Furthermore, two villages from each of the selected LGAs were randomly selected. Based on the sampling frame obtained from the Kogi State Agricultural Development Project (KSADP), a proportionate sampling technique was used to select 50% of the fish farmers' population from each of the chosen villages. Lastly, a total of 105 randomly selected fish farmers formed the representative sample size for the study. The instrument used to elicit 2018 fish production data in the studied area is structured questionnaire complemented with interview schedule. The questionnaire administration was conducted by KSADP trained enumerator. The first, second and third objectives were achieved using descriptive statistics; Chow-test and Average treatment effect (ATE); Generalized linear model and Oaxaca-Blinder decomposition model, respectively.

Table 1. Sampling Frame of Fish Farmers in the Chosen LGAs

LGA	Village	Population	Sample size
Adavi	Nagazi	22	11
	Osara	82	41
Lokoja	Ganaja	46	23
	Kankanda	60	30
Total	**4**	**210**	**105**

Source: KSADP, 2018

Tobit regression model

The Tobitregression model is shown below (Tobin, 1958):

$Y_i^* = \alpha + X\beta + \varepsilon_i$ ..... (1)

$Y_i^* = \alpha + X_1\beta_1 + X_2\beta_2 + X_3\beta_3 + X_4\beta_4 + X_5\beta_5 + \cdots . + X_n\beta_n + \varepsilon_i$ ..... (2)

Where:

Y_i* = Income (Logarithm) Index value for i^{th} household;

X_1= Age (years); X_2= Marital status (married =1, otherwise = 0); X_3= Education (years); X_4=Household size (number); X_5= Experience (year); X_6= Farm acquisition (owned =1, otherwise =0); X_7= Farm practices (sole = 1, mixed =0); X_8= Rearing purpose (income =1, otherwise = 0); X_9= Rearing purpose (consumption & income =1, otherwise = 0); X_{10} =Non-farm income (yes =1, otherwise = 0);X_{11} = Extension visit (number); X_{12} = Co-operative membership (yes = 1, otherwise = 0); X_{13} = Access to credit (yes = 1, otherwise = 0); β_0 = Intercept; β_{1-n} = Vector of parameters to be estimated; and, ε_i = Stochastic term.

Chow F-statistics test

Following Onyenweaku (1997); Amaefula*et al.* (2012), the F-statistics tests for Test for Effect of gender differential, Test for Homogeneity of slopes and Test for Differences in intercepts are given below:

To isolate the effect of gender differential, Equation (3) was used:

Test for Effect of the programme: $F^* = \frac{[\sum \varepsilon_3^2 - (\sum \varepsilon_1^2 + \sum \varepsilon_2^2)]/[K_3 - K_1 - K_2]}{(\sum \varepsilon_1^2 + \sum \varepsilon_2^2)/K_1 + K_2}$ ..... (3)

Where $\sum \varepsilon_3^2$ and K_3 are the error sum of square and degree of freedom respectively for the pool group (both male and female), $\sum \varepsilon_1^2$ and K_1 are the error sum of square and degree of freedom respectively for the male group, and, $\sum \varepsilon_2^2$ and K_2 are the error sum of square and degree of freedom respectively for the female group.

If the F-cal is greater than the F-tab, it implies that gender differential has effect on the participation attitude of the treated group.

Test for Homogeneity of Slope: $F^* = \frac{[\sum \varepsilon_4^2 - (\sum \varepsilon_1^2 + \sum \varepsilon_2^2)]/[K_4 - K_1 - K_2]}{(\sum \varepsilon_1^2 + \sum \varepsilon_2^2)/K_1 + K_2}$ ..... (4)

Where $\sum \varepsilon_4^2$ and K_4 are the error sum of square and degree of freedom respectively for the pooled groupwith a dummy variable.

If the F-cal is greater than the F-tab, it implies that gender difference brought about a structural change or shift in the male farmersbehaviour parameter.

Test for differences in intercepts: $F^* = \frac{[\sum \varepsilon_3^2 - \sum \varepsilon_4^2]/[K_3 - K_4]}{\sum \varepsilon_4^2/K_4}$ ..... (5)

If the F-cal is greater than the F-tab, it implies that the gender attitudes of the male farmers differ from that of the female group.

Average Treatment Effect (ATE)

ATE: It show the average difference in outcome between units assigned to the treatment and units assigned to the placebo (control). Following Lokshin and Sajaia (2011); Wang *et al.* (2017) the equation is given below:

Income of male farmers is given by: $E(y_{1i}|I = 1; X)$ ..... (6)

Income of female farmers is given by: $E(y_{2i}|I = 0; X)$ ..... (7)

Income of male farmers if there is no gender difference is denoted by: $E(y_{2i}|I = 1; X)$ ... ... (8)

Income of female farmers if there is gender difference: $E(y_{1i}|I = 0; X)$ ... ... (9)

Where:

$E(.)$ = Expectation operator

y_{1i} = income of male farmers (dependent variable)

y_{2i} = income of female farmers (dependent variable)

I = Dummy variable (1 = male, 0 = female)

X = Explanatory variables that is common to both male and female farmers.

$$ATT = E(y_{1i}|I = 1; X) - E(y_{2i}|I = 1; X) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

$$ATU = E(y_{1i}|I = 1; X) - E(y_{2i}|I = 1; X) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

Average Treatment effect on Treated = ATT

Average Treatment effect on Untreated = ATU

Equations (10) and (11) were further simplified as:

$$\text{ATT} = \frac{1}{N_1}\sum_{i=1}^{N_1}[p(y_{1i}|I = 1; X) - p(y_{2i} \mid I = 1; X)] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

$$\text{ATU} = \frac{1}{N_2}\sum_{i=1}^{N^2}[p(y_{2i}|I = 0; X) - p(y_{1i} \mid I = 0; X)] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (13)$$

Where, N_1 and N_2 are number of male and female farmers respectively, and p= probability.

Oaxaca-Blinder Decomposition model

Following Marwa (2014); Revathy *et al.*(2020) the extent to which the income gap between the male and female farmers can be explained by differences in observed human capital characteristics estimated using the standard Oaxaca-Blinder procedure (Oaxaca 1973; Blinder 1973) is as follows:

$$ln\bar{Y}_M = \beta_{M0} + \beta_{Mi}\sum_{i=1}^{i} X_M + \varepsilon_M \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (14)$$

$$ln\bar{Y}_F = \beta_{F0} + \beta_{Fi}\sum_{i=1}^{i} X_F + \varepsilon_F \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (15)$$

Where,

$\bar{Y}_M = average\ income\ of\ male\ group$;

$\bar{Y}_F = average\ income\ of\ female\ group$;

$X_{i-n} = explanatory\ variables$;

$\beta_0 = intercept$;

$\beta_{i-n} = parameter\ estimates$; and, $\varepsilon_i = stochastic\ term.$

The Oaxaca-Blinder decomposition as cited by Revathy *et al.*(2020), equations 14 and 15 can be explained as follow:

$$\begin{aligned}(ln\bar{Y}_M - ln\bar{Y}_F) = {} & (\beta_{M0} - \beta_{F0}) \\ & + [\beta_{M1}(\bar{X}_{M1} - \bar{X}_{F1}) \\ & + \beta_{M2}(\bar{X}_{M2} - \bar{X}_{F2}) \\ & + \beta_{M3}(\bar{X}_{M3} - \bar{X}_{F3}) \\ & + \beta_{M4}(\bar{X}_{M4} - \bar{X}_{F4}) \\ & + \beta_{Mn}(\bar{X}_{Mn} - \bar{X}_{Fn})] \\ & + [\bar{X}_{F1}(\beta_{M1} - \beta_{F1}) \\ & + \bar{X}_{F2}(\beta_{M2} - \beta_{F2}) \\ & + \bar{X}_{F3}(\beta_{M3} - \beta_{F3}) \\ & + \bar{X}_{F4}(\beta_{M4} - \beta_{F4}) \\ & + \bar{X}_{Fn}(\beta_{Mn} - \beta_{Fn}) \\ & + (\varepsilon_M \\ & - \varepsilon_F) \ldots\ldots\ldots\ldots\ldots\ldots (16)\end{aligned}$$

The income gap is divided into two segments: one is the proportion attributable to differences in the endowments of income-generating activities $(\bar{X}_M - \bar{X}_F)$ evaluated at the male group returns (β_M). This is taken as a reflection of endowment differential and it's termed endowment/characteristics/explained effect. The second segment is attributable to the difference in the returns $(\beta_{Tn} - \beta_{NTn})$ that the male and female groups get for the same endowment of income-generating activities$(\bar{X}_F)$. This segment is often taken as a reflection of discrimination or income differential and its termed discrimination or unexplained effect.

RESULTS AND DISCUSSION

Socio-economic Profile of Men and Women Folks

A cursory review of the results showed the mean ages of the male and female farmers to be 38.03 years and 32.18 years respectively, thus indicating that fish farming is practiced mostly by able bodied youths who are within the active labour force age that yields high labour productivity (Table 2). Farmers within this active age group are innovative and motivational to cope with challenges that may arise from fish farming. In other words, this age group has the capacity to withstand farm stress and perhaps, explore on how best they can improve their productivities. With adequate support for these youths from the government and non-governmental organizations, this self-employed enterprise will play a key role in reducing the over-bloated labour market given the zeal and passion for the business by the youths in the studied area. However, the women farmers are much younger than their male counterparts as evident by the significant of the t-statistics at 10% probability level. This tender age associated with women folk in taken-up fish enterprise is connected to limited available opportunities at their disposal in search for white collar jobs in comparison to their male counterparts due to socio-cultural and religious barriers which deterred them from labour mobility and the need to evade the vicious cycle of poverty.

It was observed that the enterprise is dominated by men folk with a percentage proportion of 63% against 37% for the female folk. This dominancy effect of men in the enterprise is due to their access and control over productive resources, and community politics as compared to the women folk which are hindered by socio-cultural and religious factors. This proportion of women engaged in fish enterprise is a good development as it revealed a paradigm shift from the traditional gender roles of culture which associate men with public sphere, while women's role tends to be seen as within the domestic sphere. According to Tanwir and Sadar (2013), child care and household works, including fuel wood and water collection are considered to be the responsibilities of women, while productive activities and income generation activities are considered to be men's responsibilities. However, the percentage proportion of the women farmers in the enterprise revealed the presence of a moderate feminization in aquaculture farming in the studied area.

The proportion of married women engaged in the enterprise are slightly more than that of the men folk, thus revealing the likelihood of the women been mostly the household breadwinner despite having living husbands. This showed that both gender categories have family responsibilities to carter for as such they will ensure the viability and sustainability of the enterprise in order to meet-up with their households' livelihood needs. However, the prevalence of married women involved in fish farming is linked to the attitude of most primary household heads (male) that are fond of transferring their households' expenditure burdens to their wives, as they mostly re-investment their earnings in more agricultural productivity, personal things and social activities. In most cases, the incomes of male farmers do not improve the quality of food accessible to their families. But if women farmers earn cash, even though relatively less, it is likely to be spent on the households' food.

Most of the men and women folks acquired education beyond the post-secondary school level, an indication of the enterprise been practiced by literate people who will be willing to adopt innovative fish practices and source for market information *viz*. prices that will ensure viability of the business going concern. In addition, this shows that both gender categories have discovered the potentials in fish farming as an avenue for self-employment as there are little or no job

opportunities in the labour market. Furthermore, reviewing the proportion of those who are literate for the both categories, it was observed that majority of the men farmers (86.36%) and women farmers (69.70%) had formal education. This is contrary to what is obtainable in other parts of the country where gender preference, gender discrimination and gender stereotypes are barriers to women education. An investment on a female education is viewed as an aberration and waste of capital as she is only meant to be confine to only household chores (full housewife), performing dual role of reproduction (child bearing, caring for family members such children and elderly people, cooking etc) and community management (fetching of water, health, pedagogy education, collection fire woods and fruits from the forest etc). Low literacy level is pronounced in the Northern part of the country due to high school drop-outs as a result of puberty attainment, preference for educating a male child, financial restrictions, parental attitudes towards educating sons as an investment but educating daughters as a waste of money etc. There is this notion that raising girls is like watering someone else's lawn. Thus, right from the birth, they are seen as burdens rather than as blessings, and the result is low level of literacy among women.

Most of the men and women farmers had a sizeable household which is composed of seven (7) persons, indicating they have a sustainable household size recommended by the FOA for a typical agrarian setting in Africa. Thus, it can be suggested that both men and women farmers have access to free family labour which will be used in the fish farm at no cost, thus reducing the cost of cultivation to be incurred in the enterprise. In addition, a household with less dependency ratio will have a viable and sustainable fish venture as it stands the chance of benefiting from income accumulation *viz*. streams of income remittances by able-bodied household members and less household's expenditure costs. However, if the dependency ratio of farming household is high, then the viability of the enterprise will be affected by excessive household expenditures, thus affecting the sustainability of the business going concern.

The results showed that majority of the male and women fish farmers are new entrants in the business with fish farming experience of 5.86 and 4.74 years in respect of the former and latterrespectively. This did not come as a surprise as people in the study area were skeptical in participating in fish farming when it was first introduced due to high risks associated with it. People earlier felt that there is no need for it as nature has made provision for fish food through water bodies which surrounded the studied area. But afterward, the potential market demand for cultured fish, encouragement and support from both government and government organizations gingered the people to engage in fish farming. In addition, there is inadequate awareness about the enormous economic potentials of fish farming which has suffered neglect by policymakers and development professionals. Generally, it can be suggested that the farmers need more skills on fish farming in order to enable them to be efficient in the management of the scare resources required for fish cultivation, thus enhancing the viability and sustainability of the enterprise. It was observed that most of the men and women fish farmers owned the farms they cultivated fish in, with the percentage proportion of the former and latter been 68.18 and 61.54% respectively. Thus, it can be suggested that both gender categories had access and control over the use of land. Access and control over land resources which is associated with the women farmers showed a drift from the traditional norms which hinder women access and control to land if she has a living husband. Lack of women's access to land in Nigeria continues to be a major obstacle

as it affects their decision-making and long-term planning, thus inhibiting their contribution and economic benefits from agriculture.

The results showed catfish to be the commonest species of fish cultivated by majority of the male and female farmers.

This is connected with the market preference for catfish, rapid growth rate-short production cycle and its high flesh to bone ratio. The implication is that the farmers negate the importance of diversification as a risk strategy by engaging in monoculture, thus the likelihood of having their business going concern affected if there is any sudden change in the market consumption preference. Only few of the male and female farmers' in respect of 39.39 and 20.51% farmed fish exclusively for the market i.e. only few are into the business of fish cultivation for mainly market purpose and this may be connected to the high risk associated with the business as they are afraid of risking the livelihood of their household basic needs. However, the result showed that most of the female farmers (66.67%) were into fish venture for both households' consumption and income generation (market) while few of the men farmers (34.85%) produced fish for both household's consumption and market. Most of the women farmers engaged in the cultivation of fish for dual purpose may be connected with the need to provide their families with good nutrition and to meet other social needs.

A moderate and small numbers of the male and female farmers respectively engaged in other income earning sources other than fish farming. The low participation of women in other income earning activities may be connected with their limited mobility due to cultural and religious constraints. In most cases, tradition made women to have limited access to all sort of allied business activities thus hinders them from expanding their income generating activities. There is poor extension service delivery in the area as only 10.61 and 17.95% of the male and female farmers respectively had access to extension contact. This may be connected with inadequate number of extension personnel and subject specialist in the area of fishery/aquaculture as a result of long neglect of the sector by policymakers and development professionals. Most of the extension personnel had training in crop and livestock areas with little or no exposure in aquaculture.

Membership of social organization is very poor among the male (37.55%) and female (33.33%) farmers. Though, women involvement in social organization is moderates, thus better than that of the male farmers and this may be connected with the need to have social capital among the female farmers so as to benefit from pecuniary advantages *viz*. bulk discount for input purchase, access to credit, bargaining power for their produce, technical services, access to credit, access to viable markets etc, all aimed towards achieving economies of size in their respective farms. There is poor access to credit among most of the farmers as only a negligible percentage of male (7.58%) and female (17.95%) farmers' accessed credit in the studied area. This may be due to lack of collateral to pledge as security for the credit. In addition, most of the credit schemes which are in operation exclude aquaculture from the allied activities that falls under agriculture credit, thus a double jeopardy for credit availability to the fishery sector. Non-conversant of the credit institutions with chattel instrument as a security for credit denies women who have possession of golden jewelries from credit for investment enhancement, thus a triple jeopardy for female gender.

Table 2. Socio-Economic Profile of The Fish Farmers

Variables	Mean/ Proportion^^		t-stat	Population variance		t-stat
	Male	Female		Male	Female	
Age	38.03 (10.32)	32.18 (8.59)	2.97 [0.003]***	106.61	73.94	1.44 [0.22]^{NS}
Marital status	0.69697 (0.463)	0.71794 (0.455)	-0.225[0.822]^{NS}	0.21445	0.20782	1.031[0.934]^{NS}
Education	12.42 (5.26)	13.18 (3.80)	-0.78 [0.435]^{NS}	27.75	14.46	1.918 [0.032]^{NS}
	0.8636^^	0.69697^^	2.069 [0.0384]**			
Household size	6.621 (2.73)	7.435 (2.623)	-1.495 [0.137]^{NS}	7.500	6.883	1.089 [0.787]^{NS}
Experience	5.863 (7.90)	4.74 (2.489)	0.858 [0.392]^{NS}	62.55	6.19	10.09 [1.5e-11]***
Farm acquisition	0.6818(0.469)	0.6154(0.492)	0.687[0.493]^{NS}	0.220	0.242	1.102[0.716]^{NS}
	0.6818^^	0.6154^^	0.692[0.488]^{NS}			
Farm practices	0.6818(0.501)	0.5897(0.498)	0.911[0.364]^{NS}	0.2510	0.2483	1.011[0.990]^{NS}
	0.3939^^	0.2051^^	1.997[0.0457]**			
Rearing for Income	0.3939(0.492)	0.2051(0.409)	2.017[0.046]**	0.2424	0.1673	1.448[0.219]^{NS}
	0.3939^^	0.2051^^	1.997[0.045]**			
Rearing for Cons. & Income	0.3485(0.480)	0.6667(0.477)	-3.287[0.0013]***	0.230	0.228	1.010[0.990]^{NS}
	0.3485^^	0.6667^^	-3.157[0.0015]***			
Non-farm income	0.4393(0.585)	0.2564(0.442)	1.687[0.094]*	0.342	0.195	1.749[0.064]*
Extension contact	0.1061(0.310)	0.1795(0.388)	-1.065[0.289]^{NS}	0.0962	0.1511	1.570[0.108]^{NS}
	0.1061^^	0.1795^^	-1.069[0.284]^{NS}			
Co-operative membership	0.1667(0.375)	0.3333(0.477)	-1.983[0.050]*	0.141	0.228	1.617[0.087]*
	0.1667^^	0.3333^^	-1.965[0.049]**			
Access to credit	0.0758(0.266)	0.1795(0.388)	-1.619[0.108]^{NS}	0.0710	0.1511	2.125[0.0073]***
	0.0758^^	0.1795^^	-1.614[0.106]^{NS}			

Source: Field survey, 2018
Note: * ** *** & NS are 1, 5, 10% and Non-significant, respectively.
Values in ( ) and [ ] are standard deviation and probability level.

Factor influencing income of the fish farmers

The LR chi^2 for both gender categories been different from zero at 10% degree of freedom indicates that the chosen model *viz*. Tobit regression fit the specified equation. In addition, the predictor variables included in the model are different from zero at 10% probability level. Furthermore, the problem of multicollinearity was absent as evident by the variance inflation factors (VIF) of the explanatory variables which were within the acceptable margin of 10.0. However, the model estimations for both gender categories had their residuals not to be normally skewed as indicated by their respective Chi^2 statistics which were within the plausible margin of 10% probability level. Though, non-normality is not considered a serious problem as data in their natural form are not normally distributed. Thus, the estimated model can be use for prediction with certainty and efficiency (Table 3).

The results showed the incomes of men and women fish farmers to be significantly influenced by age, marital status, educational level and household size; and, marital status, rearing for income (market), rearing for both consumption and market, and access to credit, respectively as evident by their respective estimated coefficients which were within the plausible margin of 10% probability level.

For the men folk, the positive significant of age coefficient implies that youthful farmers tend to have higher income due to labour productivity, agility and the quest for materializing. Youthful farmers aimed towards higher income beyond the scope of livelihood survival and re-investment in the fish farming. Thus, the marginal and elasticity implications of an increase in a farmer's age by a year would increase his income by 0.029 and 0.088% respectively. The benefit of dual capital *viz*. social and economic capitals enjoyed by married male farmers gives them the opportunity of having enlarged investment, thus making their income higher than their male counterparts who are single as evident by the negative significant of the estimated parameter for the marital status. Also, married farmers will strive towards a sustainable fish enterprise that will guarantee steady income flow that is a pre-requisite for both sustainability of his household livelihood needs and the going concern of the fish business, thus earning higher income. Therefore, the marginal and elasticity implications of been unmarried will lead to a decrease in a farmer's income by 1.285 and 0.072% respectively.

The positive significant of the education coefficient implies that educated male fish farmers had skilful entrepreneurship in the management of their enterprise, thus giving them high income than uneducated male fish farmers. Globalization of educated farmers *viz*. innovativeness in the adoption of improved fish farm practices and access to market intelligence would enable them to be rational in resource allocation which minimized enterprise production cost and optimized returns, thus yielding high income. Thus, the marginal and elasticity implications of been educated will lead to an increase in a farmer's income by 0.045 and 0.044% respectively. The positive significant of the household coefficient implies that male farmers with large household size earned higher income due to the composition of able bodied people in the household that provide free labour at no cost which reduced the cost of cultivation incurred on the farm. In addition, access of these able-bodied household members to other stream of income sources reduced the household's expenditure incurred by large household farmers, thus enable them to have enlarged investment which yields higher income than their counterparts with small household size. Therefore, the marginal and elasticity implications of a unit

increase in a farmer's household by one person would increase his income by 0.104 and 0.056% respectively.

On the hand for the female folk, the negative significant of the marital status implies that unmarried farmers earned lower income than the married farmers owing to limited capital as compared to the later that had twin capital advantage *viz*. social and economic which is inherent with marriage in the studied area. In addition, single farmers are likely to be less skilful in entrepreneurship as their socio-economic well-being scope is less than that of the married farmers who have family livelihood responsibilities to meet-up with. Therefore, the marginal and elasticity implications of been unmarried will lead to a reduction in a farmer's income by 0.887 and 0.063% respectively. Female farmers with access to credit earned higher income than their counterparts with no access as evident by the negative significant of access to credit estimated coefficient. Credit being a catalyst enabled the women farmers availed with credit the means to acquire addition capital, thus enhanced their investment which in turn yielded higher income. Thus, the marginal and elasticity implications of a female farmer with access to credit will make her income to be higher than that of her female counterparts with no credit access by 1.902 and 0.034% respectively.

The negative coefficient of market-orientation purpose of rearing reveals how diseconomies of size affected the farm enterprise returns, thus affects the income of the female farmers that produced mainly for market purpose. Thus, the marginal and elasticity implications of producing mainly for market purpose will lead to a decrease in a female farmer's income by 1.274 and 0.026% respectively. Also, female farmers who produced for the purpose of consumption and market had low income because more of the fish output is consumed than what is taken to the market as evident by the negative significant of the consumption and market purposes of rearing estimated coefficient. Therefore, the marginal and elasticity implication of rearing fish for both consumption and market purposes will lead to a decrease in a farmer's income by 0.555 and 0.036% respectively.

Table 3. Income Determinants

Variable	Men Group				Female Group			
	Coefficient	**t-stat**	**Elastic.**	**VIF**	**Coefficient**	**t-stat**	**Elastic.**	**VIF**
Intercept	11.398(0.7004)	16.27***			12.844(1.276)	10.06***		
Age	0.0289(0.0146)	1.978**	0.08768	1.591	0.02756(0.0189)	1.455NS	0.09235	2.105
Marital status	−1.2846(0.3025)	4.246***	-0.07154	1.364	−0.8865(0.4150)	2.136**	-0.06294	2.480
Education	0.04447(0.0260)	1.710*	0.04428	1.305	0.04115(0.0576)	0.713NS	0.029700	3.879
HHS	0.10435(0.0532)	1.959*	0.056096	1.479	−0.09347(0.1042)	0.896NS	-0.061172	2.797
Experience	−0.00341(0.0177)	0.191NS	-0.00586	1.375	0.10505(0.0931)	1.127NS	0.03865	2.068
Farm acquis.	−0.28958(0.3174)	0.912NS	-0.01575	1.543	0.24406(0.3806)	0.641NS	0.017284	1.858
Farm practice	−0.16479(0.2720)	0.605NS	-0.00890	1.292	−0.35720(0.4115)	0.867NS	-0.01430	2.358
Rearing for I	−0.51337(0.3231)	1.589NS	-0.01647	1.759	−1.2737(0.3871)	3.290***	-0.02606	4.133
Rearing C&I	0.4059(0.3284)	1.236NS	0.01118	1.728	−0.5545(0.2864)	1.936*	-0.03570	2.978
NFI	0.1133(0.2375)	0.477NS	0.00453	1.343	−0.00396(0.5309)	0.007NS	-0.00357	3.433
Extension visit	0.33019(0.4650)	0.710NS	0.00277	1.447	−0.21669(0.2904)	0.746NS	-0.00122	1.614
Co-op. memb.	0.53085(0.4889)	1.086NS	0.00690	2.342	0.48724(0.4064)	1.199NS	0.01441	2.495
Credit access	−0.38194(0.6163)	0.619NS	-0.00262	1.876	−1.9018(0.4115)	4.621***	-0.03381	2.571
LR Chi^2	**39.87[0.0001]*** **				**103.89[2.91e-16]*** **			
Sigma	**0.967[0.0841]***				**0.824[0.101]NS**			
Normality test	**5.862[0.053]***				**21.83[1.81e-5]*** **			

Source: Field survey, 2018

Note: *** ** * ^{NS}I and CI imply significant at 1%, 5%, 10%, Non-significant, Income (market), and Consumption & Income, respectively. Figures in ( ) and [ ] are standard error and probability level, respectively

Effect(Short-run effect) of Gender Differentials on Income

Since the linear probability model (LPM) yield the same estimated results with the censored regression, its peculiar information on residual sum of squares was used for the estimation of the chow-test statistics. In the short-run, the chow-test result for the effect of gender differential on income showed that there is a significant difference between the income of the male and female fish farmers as indicated by the F-statistics which is within the acceptable margin of 10% degree of freedom (Table 4). In other words, it implies that gender differential has effect on the income of the men fish farmers in the studied area. Thus, it can be inferred that gender inequality *viz*. poor access and control of productive resources which may be associated with gender discrimination and gender stereotype-cultural barriers in the studied area made women fish farmers to be at the receiving end i.e. poor income, thus creating income disparity between them and their male counterparts. Furthermore, the significant of f-statistics at 10% for homogeneity test of slope showed that gender differential owing to gender inequality *viz*. access and control of productive resources brought a structural change or shift between the incomes of men fish farmers from that of their women counterparts. This result confirms heterogeneity of slopes i.e. gender differential lead to income disparity between the male and female fish farmers. In addition, the heterogeneity of the slopes indicates that the income functions are factor-biased. Also, the non-significant of the f-statistic at 10% probability for the test of differences in intercepts implies no differences in the production attitudes of the men farmers from their women counterparts in the studied area.

Table 4. Effect of Gender on Fish Farmers' Income

Items	ESS	DF	Test	F-stat
Male	61.73949	52		
Female	26.48914	25	I	12.68***
Pooled	102.7639	91	II	6.717***
Pooled with dummy	102.5798	90	III	0.161^{NS}

Source: Field survey, 2018

Note: ESS, DF, I, II & III means Error sum of square, Degree of freedom, Test for Effect of Gender, Test for Homogeneity of slope and Test for differences in intercepts, respectively.

Note: *** ** * $^{\&NS}$ means significant at 1%, 5%, 10% & Non-significant, respectively.

Impacts (Long-run effect) of Gender Differentials on Income

Despitethe annual average income of the male fish farmers been higher than that of the female group, all the estimated results showed that gender differential had no impact on the income of the male group as indicated by the ATE estimated coefficients of regression adjustments, propensity score matching and nearest-neighbor matching which were not different from zero at 10% degree of freedom (Table 5). Thus, in the long-run, it can be inferred that women farmers had access and control of productive resources in the studied area as against the old norms where culture limitedtheir access and to productive resources.

Furthermore, the empirical evidences showed equity in income distribution of the male farmers and non-equity in income distribution of the female farmers as indicated by the ATETs for the former and latter which were outside and within the acceptable margin of 10% probability level respectively. Thus, it implies that differentials in access and control of resources within the men folk is inconsequential on their enterprise as it didn't create income disparity while within the women folk it has significant effect, thus created income disparity. Generally, it can be inferred that there is gender non-

equity in income distribution among the fish farmers with female farmers been at disadvantage position with regard to distribution of resources *viz*. extension services, credit in the studied area. In addition, it revealed that there exist to some extent gender stereotype- pre-conceived ideas whereby males and females are arbitrarily assigned roles and characteristics determined and limited by their gender. Therefore, programme aimed at enhancing fish production in the study area should pay more attention to women farmers who engaged in small-scale fish production, thereby stimulating growth and development in the study area as women folk engaged in triple function-farming, home and community activities. Women tend to expend their earned income on both household consumption and re-investment as compared to men farmers with prime aim of re-investment and capital consumption e.g. marrying more wives and materialistic quests.

Table 5. Impact of Gender on Farmers' Income

Items	Regression Adjustment		Nearest –neighbor matching		Propensity score matching	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
ATE	472524.6 (358261.3)	1.32^{NS}	287653.2(218869.3)	1.31^{NS}	137797.1(214250.2)	0.64^{NS}
ATET(M)	283534.3 (357001)	0.79^{NS}	473108.6(342777.9)	1.38^{NS}	256491.6(326997.9)	0.78^{NS}
ATET(F)	-792354.4 (458836.1)	1.73*	26194.3(122466.3)	0.21^{NS}	63070.54(108577.1)	0.58^{NS}
M(mean)	1024057 (351384)	2.91***				
F(mean)	551532.5 (90102.27)	6.12***				

Source: Field survey, 2018

Note: M, F, ATE and ATET mean Male, Female, Average treatment effect and Average treatment effect on treated, respectively.

Note: *** ** * $^{\&NS}$ means significant at 1%, 5%, 10% &Non-significant, respectively.

Figure in ( )is standard error

Effect of Gender on Income Gap of the Fish Farmers

Presented in Table 6 is the gender income gap estimated using Oaxaca-Blinder decomposition model. A perusal of the Table showed the absolute contribution of each variable towards the overall income differential between male and female fish farmers. The empirical evidence showed endowment related factors *viz*. age, marital status, non-farm income and access to credit contribute favourablyto the incomes of male folk; while age, education, household size, farm practices, rearing exclusive for market, rearing for consumption and market, extension contact, co-operative membership and access to credit contribute favourably to the incomes of female folk. Furthermore, the contribution of different factors towards the income difference between the two gender categories arises due to the differences in the coefficients of the predictor variables of the two-income equation.

The empirical evidence revealed that 115.72% of the income differential between the male and female folks was majorly due to structural difference called gender while endowment differences i.e. human capital accounted for -15.72%. With the average annual income of the men and female folks being N886933.30 and N463758.40 respectively, the estimated income gap is N423174.90. Out of the total income difference of N423174.90, the difference due to superior endowment of the men folk is N66536.80, whereas the difference due to gender discrimination is N489711.70 per annum.

Thus, it means that due to gender discrimination the women folk received N489711.70 less in terms of their annual nominal income from the fish enterprise. Therefore, it can be inferred that the overall gap is attributed to discrimination. Without gender discrimination, the annual nominal income of the women folk should be N953470.10. The value of discrimination represents 105.6% of the average nominal annual income received by the women folk;thus exceed the actual total annual income of the women by 5%. It was observed that the estimated income gap is 151.85% (i.e. $ln\bar{Y}_M - ln\bar{Y}_F = 1.5185$), the endowment effect is -23.88% [i.e. $(\bar{X}_M - \bar{X}_F)\hat{\beta}_M = -0.2388$] while the discrimination effect is 175.73% [i.e. $(\hat{\beta}_M - \hat{\beta}_F)\bar{X}_F = 1.7573$] (Figure 1).

Therefore, it can be inferred that income gap between the men and women folks is entirely due to differences in the coefficients i.e. gender discrimination. The negativity of the portion of the income gap that is associated with the endowment effect or differences in the covariates means that relative to the men folk, women folk on the average have more characteristics associated with higher income earnings.

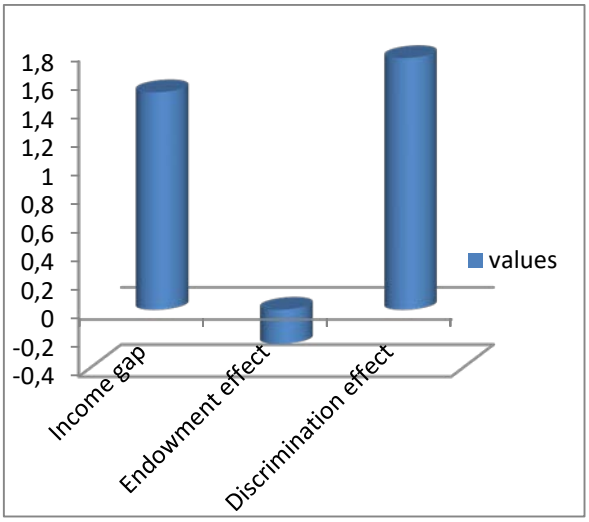

Figure 1. Income Decomposition Gap

CONCLUSION AND RECOMMENDATIONS

Sequel to these findings, it can be inferred that there is moderate feminization in fish farming- moderate increase in women participation in fish farming in the studied area. Furthermore, in the short-run, gender differential had effect on the income as gender inequality due to access ad control to productive resources gave male farmers advantage by earning higher income than the female farmers. However, in the long-run, gender differential has no impact on the income as the gap tends to frizzle out as time passes due to policy interventions, thus making the income variation between both gender categories negligible. Though, within the female category there is inequity in income distribution which owes to variation in the economies of size among the women gender.

The empirical evidence showed that structural difference called gender discrimination was the major factor responsible for income gap between the male and female fish farmers as the effect of endowment effect was marginal.

Therefore, subject to the above inferences, the following recommendations were proffered:

- Female farmers should be encouraged to form and join social organization so as to take advantage of social capital in order to achieve economies of scales- internal and external economies of scale *viz*. pecuniary advantages e.g. bulk discount in inputs, bargaining power in output marketing, access to credit and technical services, access to markets etc. In other words, women folk should build a strong network to optimize the benefits of empowerment to become self-sufficient in all ways, leading to less gender disparity and deprivation and helping them to sustain a quality of life.

Table 6. Income Gap Between Male and Female Farmers

Items	**Male**	**Female**	$\bar{X}_M$	$\bar{X}_F$	$\beta_M(\bar{X}_M - \bar{X}_F)$	$\bar{X}_F(\beta_M - \beta_F)$
Intercept	11.39823	12.84423				-1.446
Age	0.028988	0.027566	38.0303	32.17949	0.169602	0.045759
Marital status	-1.2846	-0.8866	0.69697	0.717949	0.02695	-0.28575
Education	0.044479	0.041157	12.42424	13.17949	-0.03359	0.04378
HHS	0.104354	-0.09347	6.621212	7.435897	-0.08502	1.471014
Experience	-0.00341	0.105058	5.863636	4.74359	-0.00382	-0.51451
Farm acquis.	-0.28959	0.244061	0.681818	0.615385	-0.01924	-0.3284
Farm practice	-0.1648	-0.3572	0.681818	0.589744	-0.01517	0.113469
Rearing for I	-0.51337	-1.27374	0.393939	0.205128	-0.09693	0.155974
Rearing C&I	0.405996	-0.55457	0.348485	0.666667	-0.12918	0.640379
NFI	0.113327	-0.00397	0.439394	0.25641	0.020737	0.030075
Extension visit	0.330194	-0.21669	0.106061	0.179487	-0.02425	0.09816
Co-op. memb.	0.530852	0.487248	0.166667	0.333333	-0.08848	0.014535
Credit access	-0.38195	-1.90181	0.075758	0.179487	0.039619	0.272796
Income	**886933.3**	**463758.4**				
LnIncome	**12.6027**	**12.53018**				
Income Gap	**423174.9**					
LIncomeGap	**0.07252**					
Endowment Difference					**-0.23876**	
Discrimination Difference						**1.75728**
Overall income diff.						**1.51852**
% from overall income diff.					**-15.7232**	**115.7232**
Contribution to Gap (₦)					**-66536.8**	**489711.7**
Without Discrimination					**953470.1**	**953470.1**
% of Discrimination in NI						**105.5963**

Source: Field survey, 2018

L, NI and N mean Logarithm, Nominal income and Naira (Nigerian currency)

$1 = N320 at the time of study

- Policymakers should encourage credit institutions to include aquaculture among the allied activities that falls under agricultural credit. In addition, policymakers should enact an act that makes chattel a security instrument for credit advancement so that women farmers can have access to liquidity, thus enhancing their investment capital base.
- Both government and non-governmental organizations should be gender sensitive in polices and budgeting, thus achieving gender mainstreaming.
- Women entrepreneurship programme initiatives should be made active and not passive across the three tiers of government.
- The programs/schemes, innovations and research projects should be built from a women's viewpoint, taking into account the significant contribution of women to aquaculture and the gender issues they are faced with.

Policymakers should enlighten the society on the potential threat of gender inequality in access and control to productive resources, and gender inequity in income distribution on growth and development of the local economy and the state in general.

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