



ECONOMICS OF PARTNERSHIP FISHING AMONG FISHERMEN IN RIVERINE AREAS OF EBONYI NORTH AGRICULTURAL ZONE OF EBONYI STATE, NIGERIA

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ABSTRACT

The study examined economics of partnership fishing among fishermen in riverine areas of Ebonyi North agricultural zone of Ebonyi State, Nigeria. Partnership farming as a form of agribusiness organisation is generally assumed to increase output, improve welfare and lead to financial independence. To test this assumption, switching regression model was employed to ascertain the effects of a fisherman switching from participation in partnership fishing, not participating and discontinuing with partnership fishing. Analysis revealed that for all the respondents, joining partnership would raise their income by ₦87.93. Income difference under partnership revealed that partnership fishermen's income was ₦20.84 lower than the average of all sampled fishers; whereas that of former partnership and never partnership fishers' were ₦32.92 and ₦186.44 higher than the average of all sampled fishers, respectively. The partnership fishers' income difference outside partnership was ₦15.50 higher than the average of all sampled fishers; whereas the former and never partnership fishers' income were ₦178.0 and ₦24.48 lower than the average of all sampled fishers, respectively. The study, through the selection equation, identified education, extension visit and group membership to have positive impact ($P < 0.01$) on partnership fishing participation; and age and credit negatively determined fishers' participation in partnership fishing.

Keywords: Economics, Fishing, Partnership, Riverine Areas, Switching Regression.

INTRODUCTION

Due to insufficient funds available to the sole proprietor, it is often necessary for individuals with like minds to pull their resources (capital, labour, and expertise) together to transact business in order to reap 'economies of scale' for profit to be shared among themselves group or partnership farming is a relationship that exists between two or more farmers carrying out agribusiness with a view of making profit. It is formed by between two to twenty (20) persons who share in both risk and profit. Agribusiness partnership agreement may be verbal based on mutual trust or written (deed of partnership) depending on the business (Esheya, 2011). However, two kinds of partnership are common in agribusiness: general and limited partnership. In general partnership, each member has equal rights and liabilities over the assets and liabilities of the business irrespective of the percentage capital contribution. They participate in the management and operation of the business limited partners have no authority in the active management. A limited partner's liability is limited to the amount that he/she contributes to the business (Anyanwuoha, 2000).

Acemoglu (1999) described partnership fishing as a mechanism designed to resolve the trade-off between incentive and insurance. Hobbs and Young (2001) opined that it is "one of the institutions evolved to deal with market failure in an environment of pervasive risks, incomplete market and information asymmetry". It has the potential to link farmers to markets, stimulate agricultural production and, it's central role in reviving Africa's agriculture and trade;



has been endorsed by key players including African Union (AU), New Partnership for Africa's Development (NEPAD), and Common Market for East and Southern Africa (COMESA), and Southern Africa Development Cooperation (SADC) (International Fund for Agricultural Development [IFAD], 2005).

Nigeria as a developing country has not been absolved of the role of partnership in the development of the agricultural sector especially now that the Nigerian economy is fast becoming market-oriented and private sector driven though, with weak market integration. This unfolding scenario, though globally experienced, has caused small scale producers considerable market concerns coupled with "segregated" credit access, quest for modern inputs and high transaction cost arising from weak market integration (Namso *et al.*, 2020). Regardless of the definitions, partnership fishing aids the fishermen to exploit their comparative advantages in natural resources environment. It is an institutional arrangement in the private sector that may eventually help to overcome some of the constraints that befell the sector. The situation is not different in Niger delta and its environs including Ebonyi State of Nigeria.

Partnership fishing arrangements started as demand to cushion the effect of lack of credit and are, as old as the search for investible funds in the fishing business. A survey shows that partnership fishing exist in virtually all the fishing settlements in Ebonyi State (Eaton & Shepherd, 2010). They differ in terms of repayment terms, type of support and the items involved. The fishing models are resource-providing-partnership – addressing failures arising from imperfections in credit markets, inputs and outputs demands (Ovie & Raji, 2016). It involves the highest degree of market intermediary control of the production process at the fishing level with proprietary rights over inputs and outputs. Field survey reveals that informal or verbal partnerships rather than formal partnerships are the norms in all the fishing settlements in the State (Namso and Gabriel, 2018). Like any other informal credit, its existence and persistence signals its acceptability even in the absence of a well-functioning legal institutional framework to enforce it. This has caused it to be based mainly on social capital, trust and reputation (Carnaje, 2007). Thus, the main objective of this study was to examine the economics of partnership farming among fishermen in riverine areas of Ebonyi North agricultural zone of Ebonyi State, Nigeria. The specific objectives were to:

- (i) assess the determinants of partnership fishing participation;
- (ii) analyse the determinants of fishermen's income in terms of partnership and non-partnership participation; and
- (iii) compare the income of these three groups of fishermen if they switch from partnership to non-partnership and vice versa.

MATERIALS AND METHODS

The Study Area

The study area is Ebonyi North Agricultural Zone of Ebonyi State, Nigeria. Ebonyi State which is located in South East region of Nigeria is divided into three agricultural zones namely: Ebonyi North, Ebonyi Central and Ebonyi South Agricultural Zones. Ebonyi North Agricultural Zone consists of four local government areas (LGAs). These local governments are Abakaliki, Ebonyi, Izzi and Ohaukwu LGAs. The State lies in the humid tropical agro-ecological zone of Nigeria within longitudes 70 30'E and 80 30'E and Latitudes 50 40'N and 60 45'N. It has a land area of 5,935 km² with a projected population of 2,253,140 persons (National Population Commission [NPC], 2006). Ebonyi North agricultural zone is drained by three main rivers - Ebonyi, Imoha and Akpatakpa.



Sampling Procedure

Multi-stage sampling procedure was used in selecting samples for the study. First, the four LGAs were selected for the study. The selection was based on the intensity of fishing activities. Information on the fishing intensity in the LGAs was obtained from Food and Agriculture Organisation (FAO, 2005) and reconnaissance survey. Secondly, sampling frame of fishing settlements in each selected LGA was collected from the Fishery Department of Ebonyi State Ministry of Agriculture. From the sampling frame, five (5) fishing settlements were randomly selected from each selected riverine LGAs. The last stage of sampling was the random selection of 12 fishermen each from the selected five fishing settlements. Two hundred and forty (240) questionnaires were administered, out of which 232 were retrieved, giving a response rate of 97%. The 232 were used for the analysis.

Method of Data Collection

Primary data was collected and used for the analysis. The relevant primary data were obtained through survey of the study area. Primary data of interest were type and terms of partnership models engaged by the fishermen, inputs utilized, output of fishermen, sales value, labour supply, number of crews, assets acquired, boat size, and years of experience.

Analytical Techniques

Switching regression was employed to assess the effect of switching from partnership to non-partnership as well as never being on partnership on the income of the fishermen and vice versa. The first step involved estimating the selection equation using a probit function specified as:

$$I_i = 1 \text{ if } \gamma Z_i + \mu_i \text{ and } I_i = 0 \text{ if } \gamma Z_i + \mu_i \quad \dots(1)$$

where;

$I_i = 1$ as selection equation for participation in partnership and $I_i = 0$ for non- participation.

$$Y_{1i} = \beta_1 X_{1i} + \delta_1 P_1 f(\gamma Z_i) / F(\gamma Z_i) + \varepsilon_{1i} \quad \dots(2)$$

where;

$I_i = 1$ as Income equation with partnership.

$$Y_{0i} = \beta_0 X_{0i} + \delta_0 P_0 f(\gamma Z_i) / F(\gamma Z_i) + \varepsilon_{0i} \quad \dots(3)$$

where;

$I_i = 0$ as Income equation without partnership.

When $I_i = 1$ then $I_i > 0$ and if $I_i = 0$ then $I_i \leq 0$. I_i is an underlying index reflecting the likelihood of participation in a partnership arrangement. Z_i is the vector of fishing characteristics that affect fishermen's decision to participate in partnership fishing. X_{1i} and X_{0i} are two vectors of fishing characteristics that affect fishermen's performance under partnership and without partnership; Y_{1i} and Y_{0i} are dependent variables measuring fishermen's income; γ , β_1 and β_0 are vectors of parameters subject to estimation (Okon, 2003). The μ_i , ε_{1i} and ε_{0i} are three random error terms that follow tri-variate normal distribution with mean zero and variance δ^2 . Where δ_u^2 , δ_1^2 , and δ_o^2 are variances of the error terms in the equation 1, 2 and 3, respectively. Given the assumption of the error terms, the logarithmic likelihood for equation 2 and 3 was expressed as:

$$\ln L = \sum I_i \ln(F(\eta_{1i})) + \ln(f(\varepsilon_{1i}/\delta_1)/\delta_1) + (1 - I_i) \ln(1 - F(\eta_{0i})) + \ln(f(\varepsilon_{0i}/\delta_o)/\delta_o) \quad \dots(4)$$

$$\eta_{1i} = \frac{(\gamma Z_i + P_1 \varepsilon_{1i})/\delta}{\sqrt{1 - P_1^2}} \quad \dots(5)$$

where;



P_1 and P_0 are the correlation coefficients of u_i with ε_{1i} and ε_{0i} , respectively. $F(*)$ and $f(*)$ are the cumulative distribution and the distribution function, respectively. The predicted values from the probit function are then used to calculate the inverse mills ratio (f/F evaluated at (γZ_i)). The inverse mills ratio derived from the probit model is to control for the probability of partnership participation and the remaining regressors explains income conditional on a given probability of partnership participation (Green, 1997). Given the linear structure of the equations, a single parameter is estimated for $\delta_1 P_1$ and $\delta_0 P_0$.

RESULTS AND DISCUSSION

Analysis of Likelihood of the Respondents to Participate in Partnership Fishing

Results in Table 1 shows that age, asset and credit are inversely correlated with the likelihood to participate in partnership fishing but only asset value was not statistically significant. Age and credit were statistically significant and by implication, a decrease in either of the variables will increase the likelihood of participation in partnership fishing. It shows that younger fishermen and fishermen with less credit were more likely to join partnership fishing.

Table 1: The Selection Function

Selection model	Coefficient	Std. Error	Z	P>z	Confidence Interval (95%)	
Age	-0.3044***	0.0419	-7.25	0.000	-0.3867	-0.2221
Marital status	0.0383	0.3777	0.10	0.919	-0.7020	0.7787
Education	0.7208*	0.3171	2.27	0.023	0.0992	1.34244
Household size	0.0655	0.0719	0.91	0.362	-0.0754	0.2065
Assets	-2.27e-08	7.44e-07	-0.03	0.976	-1.48e-06	1.44e-06
Extension visits	0.4243*	0.2284	1.86	0.063	-0.0233	0.8720
Group membership	0.6366*	0.2670	2.38	0.017	0.1131	1.1601
Credit	-1.31e-06**	4.89e-07	-2.68	0.007	-2.27e-06	-3.51e-07
Constant	11.5741	1.8169	6.37	0.000	8.0130	15.1352
σ_0	163.9931	10.2341			145.1128	185.3298
σ_1	172.7978	15.5620			144.837	206.1565
ρ_0	0.4620	0.2950			-0.2311	0.8440
ρ_1	-0.3260	0.5230			-0.9025	0.6688

Note: ***, **, * significant at 1%, 5% and 10% level, respectively.

Source: Field survey (2020)

The likelihood of the respondents to join partnership fishing is expected because the rigour of exploiting the hard and dangerous riverine environment could best be withstood by young men with vigour and in their prime. In the same vein, the affluence (fisherman with the necessary fishing gears) among the fishermen would rarely opt for participation in partnership fishing. It is the fishers without the necessary fishing gears /insufficient credit that would participate (Ben-yami, 2000).

Education level, number of extension visits and group membership (Table 1) were positively signed as expected. This implies that more educated fishers who are members of associated groups with frequent extension visits are more likely to join partnership fishing. Education enhances innovations and productivity therefore educated fishers will readily opt to participate in partnership fishing unlike their counterpart. This is in line with the works of Sharma (2008). The coefficient of marital status and household size were positive but statistically insignificant, suggesting that marital status and household size of the fishermen



were not factors in the choice of participating in partnership fishing. This is because partnership participation is a function of mutual trust and not marital status and size of the fisherman's household. The coefficient of asset value of the fishermen was negative as expected but statistically insignificant, suggesting that the fishermen with the least asset value may not even participate in fishing.

Effects of Switching from Partnership to Non-Partnership on Fishermen's Income

The estimated switching regression results for the assessment of income of fishermen in the study area is shown in Table 2. This was estimated based on the income functions with and without partnership. The consequence of the estimation of partnership and non-partnership premiums from joining the partnership and comparison of their income under partnership and outside partnership was made. The result from the income function without partnership estimation shows that, appraised boat value, numbers of crew members in a boat, years of experience of a boat's captain, hours of fishing per trip and years the crew spent working together had the *a priori* expected positive signs with coefficients of 0.0027, 64.2826, 250.086, 15.5858 and 9.3395, respectively. Of the positively signed variables, appraised boat value, hours of labour, experience and number of crew member used were statistically significant at 5% level. The implication is that a unit increase of these variables will increase the income of the non-partnership fishers. Quantity of petrol, kerosene and catch are all negatively signed with coefficients of 9.8711, 32.1936 and 1.5363, respectively. Only quantity of petrol utilized was statistically significant at 5% level. This implies that, a unit increase of this variable will decrease the income of the non-partnership fishers.

Assessment of fishermen's income with partnership reveals that, appraised boat value, number of crew members used, hours of labour at sea, quantity of petrol utilized, quantity of kerosene utilized, quantity of catch per trip and experience are all positively signed with coefficients of 0.0011, 53.8261, 227.6981, 26.4481, 63.8988, 50.1130 and 22.5171, respectively. Of these variables, appraised boat value, crew number used, hours of labour, quantity of petrol, kerosene and catch are statistically significant at 5% level. The implication is that a unit increase of these variables will increase the income of the contract fishers. Experience has the *a priori* sign but is not significant. The only negatively signed variable is year's crew spent working together. It has a coefficient of 259.979 and is statistically significant at 5% level. The implication is that a unit increase of this variable will decrease the income of the partnership fishers.

With regards to income comparison based on switching regression, given the relative risky environment the artisanal fishermen operate and the input credit incurred by them, the artisanal fishermen will be interested in the accrued income from the fishing business. The income of fishermen was analysed using the Switching Regression econometric model. This model is so called because of its ability to capture the present status of a respondent and at the same time forecast the respondent's next status if he/her decides to switch over. The model captured the fishermen's income when they are engaged in partnership as well as when they switches to non-partnership fishing. All estimations were significant at 1% level of probability.



Table 2: Income Functions under Partnership and without Partnership Fishing

Income without partnership	Coefficient	Std. Err.	Z	P>z	Confidence Interval (95%)
Apprentice value	0.0027**	0.0005	5.21	0.000	0.0016 0.0037
Crew number	64.2826**	29.4674	2.18	0.029	6.5275 122.0378
Labor hours	250.086**	14.9083	16.77	0.000	220.8661 279.3059
Petrol	-9.8711**	5.9787	-1.65	0.099	-21.5893 1.8469
Kerosene	-32.1936	26.3409	-1.22	0.222	-83.8209 19.4336
Catch	-1.5363	1.7801	-0.86	0.388	-5.0252 1.9526
Experience	15.5858**	5.5948	2.79	0.005	4.6201 26.5515
Years spent	9.3395	8.8907	1.05	0.293	-8.0860 26.7650
Constant	-195.3283	73.0753	-2.67	0.008	-338.5534 -52.1032
Income with partnership	Coefficient	Std. Err.	Z	P>z	Confidence Interval (95%)
Apprentice value	0.0011**	0.0005	1.88	0.059	-0.00004 0.0022
Crew number	53.8261**	17.8851	3.01	0.003	18.7719 88.8804
Labor hours	227.698**	42.8867	5.31	0.000	143.6415 311.7547
Petrol	26.4481**	12.4156	2.13	0.033	2.1138 50.7823
Kerosene	63.8988**	21.8416	2.93	0.003	21.0899 106.7078
Catch	50.1130**	5.8574	8.56	0.000	38.6326 61.5935
Experience	22.5171	13.8837	1.62	0.105	-4.6945 49.7288
Years spent	-259.979**	52.7846	-4.93	0.000	-363.4346 -156.5228
Constant	-804.2444	203.7147	-3.95	0.000	-1203.518 -404.9709

Note: ***, **, *significant at 1%, 5% and 10% level, respectively.

Source: Field survey (2020)

The result (Table 2) on income premium from joining partnership shows that for all the respondents, joining partnership would raise their income by ₦87.93. However, for only the partnership fishermen, joining partnership would raise their average income by ₦244.47. For the non-partnership fishermen, had they joined the partnership, their income would have been increased by ₦153.51. The possible and conclusive reason is that partnership fishing participation increases income, *ceteris paribus*. For the former-partnership fishermen, on the average, had they joined the partnership, their income would have been ₦153.50 lower than their actual income. The decrease in their average income may not be unconnected with the fishing zeal as they were older in age.

Income difference outside partnership, the sampled partnership fishermen on average had higher income than the sampled former and never partnership fishers. Their average income outside partnership was ₦15.50 higher than the average of all the sample fishers; whereas the former and never partnership fisher's income were ₦178.0 and ₦24.48 lower than the average of all the sample fishers (Table 2). The possible explanation may be that modern fishing is a function of capitalization even as might still be paying their input loan. This finding is corroborated by Carnaje, (2007) who reported of higher income for partnership fishers as compared to non-partnership fishers.



CONCLUSION AND RECOMMENDATIONS

This study identified education, extension visit and group membership to have positive impact on partnership fishing participation while negative determinants were age and credit. Equally, it discovered that, as the educational status, extension contacts and group membership of the fishing household heads appreciates, households heads tend to prefer partnership fishing participation. Income analysis situation of fishermen, using the switching regression model reveals that a partnership fisher made more income than both the former and non-contract fishermen. Analysis reveals that for all the respondents, joining partnership would raise their income by ₦87.93. The conclusion drawn from the result of the switching regression model is that participation in partnership fishing positively affected the income of the fishermen as the partnership fisher's income premium from joining contract was found to be higher than that of former and non-partnership fishers. Non-partnership fisher's income was found to appreciate more if they switch to partnership fishing. Based on the findings, the study recommends as follows:

1. Raising the awareness of the fishermen on the importance of partnership fishing as a quasi-formal credit arrangement and the adverse consequences of not having the right fishing gadgets for exploiting the full potentials of the Nigerian territorial waters. Government and extension agents can play pivotal roles in such campaigns.
2. Factors that could increase assets base and income should be vigorously pursued. This could be in the form of fishing input loan on bigger boats, higher capacity outboard engines or complete market liberalization of the procurement and distribution of fishing inputs.
3. Partnership fishing system should be guided by appropriate legislation, else, some highly placed members may decide to exploit others for short term gains.

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