VERTICAL INTEGRATION IN FISH CULTURE BUSINESS IN RIVERS STATE, NIGERIA: PANACEA FOR FOOD SECURITY.

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Introduction

Rivers State is a coastal state located in the Niger River Delta of Southern Nigeria and therefore has great potential for sustainable aquaculture development (Anyanwu*et al*, 2007). In spite of the different pond systems adopted in Rivers State, which are supported by the present of water, the fish farmers cannot supply the required quantity of fish at affordable price due to the cost of fingerlings, feeds and drying of fish (Ozigbo *et al,* 2014). The World Food Summit of 1996 stressed that "food security occurs when all people at all times have physical and economic access to sufficient, safe and nutritious fish to meet their dietary needs and fish preferences for an active and healthy life". The desired cost-saving can be achieved through vertical integration in fish culture business (Ouden den *et al*, 1996).This paper looks at vertical integration in fish culture business in Rivers State as a strategy of achieving food security. The specific objectives were to:

1. Assess the characteristics of vertically integrated and non-vertically integrated fish culture farms, and
2. Estimate the costs and returns of vertically integrated and non-vertically integrated fish culture farms.

Methodology

In order to embark on this study, data for the study were obtained from 37 and 119 vertically and non-vertically integrated fish culture farms. Vertical integration occurs when a single firm can produce complementary products and services more profitably than a number of firms. It involves the combination of two or more stages of a production marketing chain under single ownership (Bamiro *et al*, 2006). Vertically integrated fish culture farms in this context were those farms that produced fingerlings, feeds, and dried fish using smoking kilns, while non-vertically integrated fish culture farms buy fingerlings and feeds from independent suppliers but dried fish using firewood (Dobashi *et al*, 1999). Purposive sampling was used for the vertically integrated fish culture farms as they were few in number, while multi-stage sampling was used for the non-vertically integrated fish culture farms because a long list was involved. The characteristics and costs and returns involved in vertically and non-vertically integrated fish culture farms were compared and analysed using descriptive statistics, annual depreciation and budgetary and profitability indices.

AD= (OC–SV)/(UL)……..... Equation 1

Where: AD=Annual depreciation
OC=Original cost at the time of purchase
SV=Salvage Value
UL=Useful life

The profitability of the aquaculture farms in the study area was therefore determined using the following model specifications:

$\prod$ = TR–TC ……..... Equation 2
TR = PQ……..... Equation 3
Net Farm Income = Gross Farm Income –Total Cost……..... Equation 4
Value added as a percentage of sales =100 [(TR–TVC)]/TR……..... Equation 5
Rate of Return on Investment = [100 (Net Farm Income)]/ [Total Revenue]…..... Equation 6
Rate of Return on Fixed Cost = [100 (Net Farm Income)]/ [Total Fixed Cost]…..... Equation 7

Where:

$\prod$ = Profit (N)
TR = Total Revenue from the sale of fish (N).
TC = Total Cost of fish production (N)
TVC = Total Variable Cost of fish production (N)
TFC = Total Fixed Cost of fish production (N)
NFI = Net Farm Income (N)
Q = Total quantity of fingerling bought/ mature fish sold (N)
P = Price per fingerling/mature fish sold (N)

Table1: Characteristics of the Fish Culture Farms.

Characteristics	N = 37 Vertically integrated		N = 119 Non-vertically integrated	
	No	%	No	%
Year of Establishment				
One year old	0	0.0	30	25.2
Two years old	0	0.0	71	59.7
Three years old	6	16.2	12	10.0
Four years old	11	29.7	04	3.4
Above five years	20	54.1	2	1.7
Type of Pond				
Earthen pond	6	16.2	16	13.4
Concrete tank	19	51.4	86	72.3
Plastic trough	5	13.5	8	6.7
Flow-through system	3	8.1	0	0.0
Re-circulatory water system	4	10.8	9	7.6
Number of Workers Employed				
One	0	56.8	82	68.9
Two	2	37.8	30	25.2
Three	14	5.4	7	5.9
Above three	21	0.0	0	0.0
Status of Staff Employed				
Regular	30	81.1	7	5.9
Hired	7	18.9	93	78.2
Both	0	0.0	19	15.9
Distribution by Pond Size				
1 – 11m²	0	0.0	83	69.7
12 – 22m²	4	10.8	22	18.5
23 – 33m²	10	27.0	4	3.4
Above 33m²	23	62.2	10	8.4
Stocked Size (Fingerlings)				
1000 – 3000	4	10.8	93	78.2
3000 – 5000	10	27.0	22	18.4
5000 or more	23	62.2	4	3.4
Species of Fish Stocked				
Cat fish	24	64.9	94	79.0
Tilapia	10	27.0	21	17.6
Both	3	8.1	4	3.4

Source: Field Data (2018)

The study revealed that the vertically integrated fish culture farms in the study area employed more than three workers who were mostly regular staff to raise large number of fish, while the non-vertically integrated fish culture farms hired just one staff to raise a relatively small number of fish. The implication is that the regularity of enough staff will increase production which reduces cost of production as the few factors of production are shared amongincreased output, thus ensuring food security. This is in agreement with the findings of Bamiroet al (2009) in Ogun and Oyo States who reported that adequate staffing helps the effective execution of the poultry business .The study also revealed that the vertically integrated fish culture farms used large pond size to stock more fish, while the non-vertically integrated fish culture farms used relatively small pond size to stock small quantity of fish. This resulted in low cost of production among the vertically integrated fish culture farms,as the cost associated with large scale production is shared among the few factors used in fish production; thereby enhancing food security.

Table 2: Costs and returns of fish production in vertically integrated and non-vertically integrated fish culture farms.

	Extent of Integration							
	Vertically integrated				Non-vertically integrated			
	Unit cost	Quantity	Amount	Share	Unit cost	Quantity	Amount	Share
	₦		₦	%	₦		₦	%
Revenue								
Costs								
A. Gross Revenue			1,086,800.00	100.0			1,128,000.00	100.0
Fingerlings (N)	11.0	2,470	27,170	3.38[5]	19.0	1,880	35,720	3.81[5]
Liming/Fert. (kg)	1,200	255	6,985	0.87[6]	1,200	255	6,100	0.65[7]
Feed (kg)	1,987.96	165	328,013.4	40.79[1]	4,423.29	132	583,874.28	62.35[1]
Veterinary (g)	34.27	200	6,854	0.85[7]	34.19	200	6,838	0.73[6]
Labour (man days)	499.69	301	150,405.4	18.70[2]	494.18	301	148,748.18	15.88[2]
Water (litres)	10.00	3,126.1	31,261.3	3.89[4]	10.00	3,790.7	37,907.	4.05[4]
Transportation (km)	10.00	309.2	3,092	0. 38[8]	10.00	477.9	4,779	0.51[8]
Repair of plumbing		37	2,691	0.33[9]	3,445	119	3,445	0.37[9]
Facilities (N)								
Drying (N)	48.22	2,470	119,103.4	30.81[3]	58.00	1,880	109,040	11.64[3]
B. TVC			675,575.60	79.52			936,451.46	93.00
C. TFC			173,939.11	20.48			70,461	7.00
D. TC (B+C)			849,514.71	100.0			1,006,912.46	100.0
E. GM (A-B)			411,224.40				300,309.6	
F. NFI (A-D)			277,285.29				229,848.6	
Profitability Indicators								
Value Added/Sale Ratio (%)				37.84				16.98
Rate of Return on Investment (%)				20.91				20.38
Rate of Return on Fixed Cost (%)				130.7				326.2

Note: Figures in the superscripts denote the rank of cost share in an average fish culture farm. Mean differ because of mortality rate and difference in price

Source: Field data (2018)

The average cost ofN11 and N19 was incurred per fingerling as well as N1,987 and N4,423 per bag of feed by the vertically integrated and non-vertically integrated fish culture farms, respectively. The average cost of N260 andN531 per kg of fish was incurred by vertically integrated and non-vertically integrated fish culture farms. The vertically integrated fish culture farms could sell fresh fish at N440 per kg and still make more profit than the non-vertically integrated fish culture farms that sold per kg of fresh fish at N600. The vertically integrated fish culture farms also sell dry fish at lower cost than the non-vertically integrated fish culture farms which made fish economical and affordable, thus enhancing food security.

Conclusion/Recommendations: Vertically integrated fish culture farms reduce cost of fingerling and feed production as well as the drying of fish when the farms are old in age. At this time, the annual depreciation of the machines used in feed processing and drying of fish is low compared with the time when it is newly established; which brings down the cost of fish thus enhancing food security in the study area. If electricity and loans were made available to the non-vertically integrated fish culture farms in the study area by the government, many of them will vertically integrate; as a result reduce the high cost of fish production which discourage food security.

REFERENCES

Anyanwu, P.E, Gabriel,U.U, Akinrotimi, O.A, Bekibele, D.O and Onunkwo,D.N (2007). Brackish Water Aquaculture: A veritable tool for the empowerment of Niger Delta Communities. *Scientific Resource Essay* 2:295-301.

Bamiro, O.M, Phillip, D.O.A, and Momoh, S (2006). Vertical integration and technical efficiency in poultry (egg) industry in Ogun and Oyo States, Nigeria. *International Journal of Poultry Science* 5 (12): 1164-1171

Bamiro, O.M, Momoh, S, and Phillip, D.O.A (2009).Vertical integration and profitability in poultry industry in Ogun and Oyo States, Nigeria. *International Journal of Poultry Science* 5 (12): 1164-1171.

Dobashi, I.J. Fallon, F.C. Eizmendi, M. Loureiro, K. Matchett, R. Parrish and Raquet, B (1999). *The Value Chain for Poultry.* Pacific Basin Economic Council Working Committee on Food Products, March. pp. 1-2

Ouden Den, M, Dijkhuizen, A. A, Huirse, R.B.M and Zuubier, P.J.P (1996). Vertical cooperation in production marketing chains with special reference to product differentiation in pork. *Agribusiness* 12 (13): 277-290.

Ozigbo, E, Anyadike, C, Adegbite, O, and Kolawole, P (2014). Review of aquaculture production and management in Nigeria. *American Journal of Experimental Agriculture* 4 (10):1137-1151

The World Food Summit of 1996