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Economic Support for Agricultural Wellbeing in Rural Water Delivery by Local Empowerment and Environmental Management Project in South-east Nigeria

Onyenweze Lawrence Nnabuike
Director, Planning Research and Statistics,
Enugu State Economic Planning Commission, Nigeria
Arene, C. J.
Lecturer, Department of Agricultural Economics,
University Of Nigeria, Nigeria
Udensi. E. O
Lecturer, Department of Agricultural Education,
Enugu State University of Science and Technology, Nigeria

Abstract:
This paper studied the economic support of agricultural wellbeing in rural water delivery of Local Empowerment and Environmental Management Project (LEEMP)in southeastern Nigeria. Data sources were primary and personal observations of the authors, and were also incorporated into the study. The study adopted survey design. Simple Random Survey (SRS) was used with names in hat balloting method for each community studies. One hundred and eighty farmers (180 farmers) were randomly selected from the purposefully selected communities of Enugu and Imo states farmers that benefitted from LEEMP micro-project water-borehole delivery support. The farmers comprised 43% females and 57% males. About 31% of the farmers had tertiary education; 29% of the farmers had secondary school education. 27% had only primary education while 13% had no education. Most of the farmers were within the age bracket of 36-49 years.The data were analyzed using percentages, regression analysis, and marginal analysis model. The paper concluded that the water delivery support was generally positive on agricultural, economic and social development and, made living and livelihood to be attractive within the water micro-project recipient communities. Poverty was reduced by 67%. The micro-project water delivery benefitting communities had on the average 42 minutes timeliness of farm operation, thereby generating employment. The water delivery support significantly ($p < 0.05$) increased income in dry season poultry and fishery. However, greater number of farmers in water benefitting communities still had inadequate participatory capacities to effectively utilize the water support for livelihood agricultural earnings since the 6% score on water volume used by small scale farmers as against 81% for large scale farmers indicated differential participation by the two categories of livestock farmers. The study therefore recommends collaborative support of agricultural extension in water benefiting communities by partnering the States' Agricultural Development Programmes (State ADPs). Also, there should be greater expansion of LEEMP/CSDP water delivery support to all water-stressed communities.

***Keywords**: Rural water delivery support, local empowerment and environmental management project, agricultural wellbeing in South-East Nigeria*

1. Introduction

Rural agricultural wellbeing is all about the attractiveness of living in rural areas on engagement in agriculture and related activities for livelihood. One of the enabling resources for attractive livelihood in the rural community is water for drinking and for homestead agricultural support. Three quarter of the world's poor live in the rural areas of developing countries and depends mainly on agriculture and related activities for their livelihood (UN, 2003). It becomes clear that statistics for rural area must go beyond agricultural and cover many economic, social and environmental parameters for rural residents' business and supportive resources (Canberra Group, 2001). Supportive resources of a minimum set of services should include provision of easy access to education, health care, water for drinking and supportive water for agricultural use, culvert for road transportation; agricultural processing plant and modern market stall to enable rural community population maintain the attractiveness of living in the rural area. Availability of safe water supply can support sustainable livelihoods (UNICEF Nigeria, 2012).Sustainable dry season homestead agricultural production can facilitate access to social need, access to credit facilities, education for children, access to communication facilities, access to health facilities and enablement to pay for counterpart funds contribution on new investment(s)Many communities stressed by frequently occurring dry season drought chose water delivery from the micro-project rural support of Local Empowerment and Environmental Management Project (LEEMP) LEEMP started the first phase field operation in Nigeria in 2004 and had project support units at federal and state levels with 3 local government areas in each LEEMP participating state of the federation but increased to 18 in 2006, and with only participating southeastern states as Enugu and Imo. LEEMP is an agency of International Development Association (IDA) in development partnership with Nigerian government. Since March 2009, LEEMP has acquired a new name, in its second phase, as Community and Social Development Project (CSDP), but the micro-project target is still on Local Empowerment and Environmental Management. The broad objective of LEEMP/CSDP is double-barreled. The first part is in strengthening the institutional framework at the federal, state and local government levels to support environmentally sustainable and community socially inclusive participatory development. The second is in assisting beneficiary communities of LEEMP to have planned, co-financed and implement-able micro-project(s) (Ugwuoke, 2006). LEEMP/CSDP has the following specific objectives namely: (i) Raising the standard of living. (ii) Reduction of poverty through five components as follow: education through social inclusiveness to bring better method and increase in the income of the people; increasing the number of man-hours and man- days of business engagement; reduction of risk and, provision of security and safety of project through provision for operations and maintenance committee for each project; reduction of cost of production; mobilizing communities to invest in livestock fattening, fishery, agricultural processing activities and provision of safety net credit to communities' organized needy and vulnerable groups, with a view to reducing consumption expenditure (FPSU and MacMatts Consultants, 2006). LEEMP uses IDA funds to finance micro-project supports for rural communities that chose investments in water delivery. It is expected that a community borehole project would receive N6.5 million worth of support from LEEMP (Eze, 2005). On entry activities, LEEMP is intervening with micro-project support in states such as Adamawa, Bauchi, Bayelsa, Benue, Enugu, Imo, Katsina, Niger and Oyo (FPSU, 2006). Among the electable nineCPMC members, the chairman, the secretary, the financial secretary and the treasurer man the accounting process of the receipt and use of the micro-project(s) funds and also negotiate with other CBOs (Community Based Organisations) such as supporting rural banks. Moreover, the members of CPMC would be accountable /answerable to the town union and to the leader (Chief, Emir, or Igwe). Enugu and Imo, the southeast LEEMP phase one participating states had a total of 18 LEEMP local government areas (LGAs) each with 194 LEEMP benefitting communities (Enugu 92; Imo 102). The population size of each LEEMP benefiting community is about 1500 to 3000 (FPSU, 2004). According to Enugu State MOA (2013); and Imo State MOA (2013) the population of fish farmers is 825 for Enugu; and 939 for Imo state. Also, the population of poultry farmers for Enugu State is 1583; and Imo State is 1577 (Avian Influenza Project, 2008); However, there are dynamic yearly entry and exit from this population. Therefore, it becomes necessary to find out how the water delivery support has helped to improve the agricultural wellbeing of rural farmers in the water stressed communities of southeastern Nigeria by reducing wastage of rural man-hours/man-days and by improving income generation through utilization of water delivery support.

2. Dry Season Water Need for Agriculral Weelbeing: An Overview

The need for natural resource integration management in rural economic growth necessitates the rural support programme in water delivery. Konyebagu (2010), showed that the Federal Government of Nigeria has had a framework for water and water sector development but there is a problem of continuity. Previously, there had been blueprints for National State and even UrbanWaterSupply Development in different parts of the country. However, never had any blue print been followed to a logical conclusion; for example there was 11 (Eleven) River Basin Development Authority (RBDA) meant to develop the nations water resources; there was the UNICEF mandated International Drinking Water Supply and Sanitation Decade (1981 – 1990), with a lot done, but the water goal was not achieved due to top-down project management (Konyebagu, 2011). Other researchers on water are concerned with Surface and Groundwater Quality of Enugu Urban Areas; Residential Water Demand and Supply in Nsukka Urban Area of Enugu State, Nigeria; Comparative Quality Evaluation of Sources of Domestic Water Supply in Enugu Urban Area, Environmental Review; Urban Water pollution in Aba, Nigeria (Ezemonye, 2009; Ibeziako, 1985; Mong, 1984; Nnodu & Ilo, 2000; Udeze, 1988). However, none of the research studies addressed rural water delivery nor bottom-up management process of water delivery. It is the use of bottom-up (CDD) provided water used in rural agricultural production and household chores: in livestock and potable water supply and how it influenced the efficiency of rural productivity that is the focus of this study. Arene, (2010) showed that while allocative inefficiency leads to increased costs, efficiency of labour time brings minimization of cost and reduced waste of time, and effort. The study therefore, aims to examine how the water delivery support has helped to make water supply nearer, reduced labour time and economically reduced cost of production for any dry season agricultural enterprise. Also, to trace the influence of CDD water delivery on the income level of a given agricultural enterprise and levels of participation.

3. Material and Method

The study adopted survey design. Balloting method was used in selecting the respondent farmers in each community studies. Multy-stage sampling method was used for the data collection. Firstly, Enugu and Imo states were purposively selected because they were the first two southeastern states within the period that participated in LEEMP rural support programme. Secondly, three LGAS were purposely selected from each state according to the three senatorial zones that participated. Thirdly, twenty livestock farmers (poultry and fishery farmers) were randomly selected from each community. A random sample of 180 farmers was selected. The livestock farmers were identified during the Focus Group Discussion (FGD) and Key Informant Interview was used in collecting the needed information, with the aid of two research assistants, in a structured questionnaire from every selected farmer. To ascertain the reliability of the questionnaire, 30 copies were trial tested in Nkanu West and East LEEMP water support benefitting farmers, and a reliability coefficient of

0.74 was obtained using Cronbach Alpha Technique. The questionnaire was validated accordingly. Data were analyzed using percentages, regression analysis and marginal analysis model.

3.1. Regression Analysis Model

For purposes of this study the implicit multiple regression function would be:

$Y = f(X_1, X_2, X_3 \ldots Xn, U)$,and

the explicitlyfunction as:

$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 \ldots bnXn + U$

Where,

Y = Income(in₦)

X_1 = quantitative use of CDD support investment (water volume in Litres)

X_2 = daily farm man-days (in hours)

X_3 = farm support services (farm expenditures in ₦)

bs = coefficients which measure the elasticity

{U = Hs, Ag, Ms, Pa, Cn, Rb and Ed}

Hs = household size

Ag = age

Ms = marital status

Pa=Position among community leader

Cn = number of children

Rb = religion

Ed = level of education

b (i). Marginal Analysis Model

The condition of least cost production, according to Bishop and Toussaint (1958) and Taylor (2009), was that the marginal products of the inputs are proportional to the prices of the input: $(\Delta Y_1/\Delta X_1)/Px_1 = (\Delta Y_1/\Delta X_2)/Px_2 = - - - (\Delta Y_1/\Delta X_n)/Px_n$

Where: ΔY_1 = volume of water used from the LEEMP water delivery support borehole (in Litres)

ΔX_1 = Man-hours spent in fetching water from LEEMP support borehole (in man-days).

ΔX_2 =Man-hour spent in fetching water from the stream undesired alternative(in man-days),

Px_1= price of a man- day for fetching water from water delivery support borehole (in ₦),

Px_2 = price of a man-day for fetching water from a stream or any undesired alternative (in ₦)

Px_n = price of any other undesired alternative source of water delivery (in₦)

$\Delta Y_1/\Delta X_1$ = marginal product of LEEMP water delivery support

$\Delta Y_1/\Delta X_2$ = marginal product of stream water delivery.

But, thedry- season Marginal Revenue Function to compare efficiency of input pricesis:

$$Px = \frac{Py\Delta Y}{\Delta X}$$

b (ii) Revenue**:** (i) Fishery income = Sales – Variable cost of inputs (cost of fingering, water, feed, transport, Labour and interest rate),

(ii) Poultry Income = Sales – Variable cost of inputs (cost of day-old chick, inoculation, Vaccination, water, feed, transport, labour and interest rate).

4. Results

School Training	Number of Respondents	Percentage (%)
No Education	24	13
F. S. L. C. (Primary)	48	27
WASC/TCII	52	29
OND/NCE	38	21
Degree	18	21
Total	180	100

Table 1: Distribution of Respondent Water Users According to Educational Levels

Source: Field Study

Age	Size	Size	Size	Size
Bracket	1-3	4-6	7-9	Total
22-35	15(8.3%)	30(16.7%)	5(2.8%)	50(27.8%)
36-49	33(18.3%)	59(32.8%)	9(5%)	101(56.1%)
50-63	10(5.6%)	16(8.9%)	3(1.6%)	29 (16.1%)
Total	58(32.2%)	105(58.4%)	17(9.4%)	180 (100%)

Table 2: Distribution of Household Size According to Age Brackets
Source: Field Survey

Weekly Fattening Water use (Litres)	Average Farm Expenditure (₦m)	H/hold Size (π)	Age (yrs) (π)	Marital Status (π)	Position among Leadership (π)	Number of Children (π)	Religion (π)	Level of Education (π)
a. Poultry:								
≥100	0.4689	3	37	15	1	4	2	2
≥200	0.8070	4	48	12	1	4	2	2
≥300	1.2815	5	56	10	1	4	3	3
≥400	2.4050	6	46	8	1	5	3	3
≥500	3.4363	5	52	8	4	5	2	4
Total (π)	8.3987	5	48	10	2	4	3	4
b. Fishery:								
≥100	0.0248	4	44	15	1	4	2	3
≥200	0.0552.	5	42	10	1	4	2	3
≥300	0.0655	5	36	5	1	4	3	3
≥400	0.0700	4	33	5	1	5	3	4
≥500	0.3150	4	37	5	1	2	3	4
Total (π	0.5305	4	38	8	1	4	3	4

Table 3 Distribution of Socio-Economic Factors of Livelihood Demand for Water and Agric Credit
Source: Field Survey

Distance To Site (km)	Duration of water Delivery	Number of Farmers	Total H/hold Weekly Water Used (litres)	Percentage Water Used (%)	Average Daily H/hold Water Used (litres)
0.09-0.04	15-29Min	75(41.7%)	72,200	45	212
0.05-0.09	30-44	59(32.8%)	50,800	32	201
1.0-1.4	45-59	23(2.8%)	18,600	12	198
1.5-1.9	60-74	19(10.6%)	14,000	9	198
2.0-2.4	75-89	4(2.2%)	4,000	2	198
Total	90min	180(100%)	159,000	100	1,007

Table 4: Distribution of Farmers According to Distance, Duration and Level of Water Use
Source: Field Survey

Mark-up of water Vendor Intensity Per Litre sales (₦)	Water Cost at N 10/25L	Transport Cost ₦	Total Cost Per Litre ₦
0.5 (at 0.51km)	0.4	-	0.9
0.4 (at 1.21km)	0.4	0.2	1.0
0.3 (at 1.61km	0.4	0.4	1.1
0.2 (at 2.01km)	0.4	0.6	1.2
0.1 (at 2.41 km)	0.4	0.8	1.3

Table 4: Distribution of Cost of Water Delivery
Source: Field Survey

Proportion of Water Used By Distance (k)	Average H/hold Volume of water Used Daily (X in Litres)	Cost Per Litre (PX)	Total Product Cost (₦) k (XPx)	Marginal Cost (ΔXPx)	Total Revenue @ ₦25/25L k(YPy)	Marginal Revenue (ΔYPy)
0.45 (at 0.51km)	212	0.9	86	-	95	-
0.32 (at1.21km)	201	1.0	64	22	64	31
0.12 (at 1.61km)	198	1.1	26	38	24	40
0.09 (at 2.01km)	189	1.2	20	6	17	7
0.02 (at 2.41km)	189	1.3	5	15	4	13

Table 5: Distribution of Water Delivery Marginal Cost and Marginal Revenue
Source: Field Survey, 2012

Yr	Volume of Water used Y_1 (Litres in milliom)	ΔY_1	Man-days vendor(X_1) (LEEMP)	ΔX_1	Man-days vendor(X_2) (Stream)	ΔX_2	Farm time Saved (Man-days)	Daily Timeliness per unit of LEEMP water delivery (hr: min)
2008	2.8370		4,962		9,764		4,802	41 min
2009	3.1918	0.35	5,056	94	9,878	114	4,822	42 min
2010	3.5464	0.35	5,126	70	9,958	80	4,832	42 min
2011	3.9010	0.35	5,186	60	10,034	76	4,848	42 min
2012	4.2558	0.35	5,222	36	10,094	60	4,872	42 min
Total	17.7320		25,552		49,728		24,176	1hr:45min

Table 6: Distribution of Time Saved, Marginal Product and Marginal Cost of Water Delivery
Source: Field Survey

Method Used in Evaluating Dry Season Poultry Income									
Model (Income)	**Linear Model**			**Semi-log**			**Double-log Model**		
Variable	Coefficient	T-statistics	Pro.b	Coefficient	T-statistics	Pro.b	Coefficient	T-statistics	Pro.b
Qty of Water used	18.15	0.62	xxx	621217.6	0.31	xxx	0.22	0.14	xxx
Man-days (LEEMP)	0.20	– 1.24	Ns	– 1380591.0	–1.14	Ns	– 0.59	– 0.63	xxx
Man-days (Stream)	3059.50	1.04	Ns	295582.1	0.74	Ns	0.24	0.78	Ns
Farm Expenditure	5.58	0.44	xxx	898349.3	0.55	xxx	1.18	0.92	Ns
Household Size	476.34	0.03	xxx	61223.0	0.02	xxx	0.17	0.82	Ns
Age	–3321.35	–1.61	Ns	–444240.4	–1.69	Ns	– 0.58	– 2.84	Ns
Leadership position	–1478.48	–0.86	Ns	– 68988.6	– 0.84	Ns	– 0.04	– 0.55	xxx
Religion	–2909.12	–0.10	xxx	7325.1	0.03	xxx	0.42	– 0.90	Ns
Level of Education	17487.01	0.99	Ns	90781.2	0.60	xxx	– 1.12	3.55	Ns
Marital status	7509.28	0.56	xxx	45581.0	0.23	xxx	0.56	– 0.76	Ns
R–square		0.26			0.2418			0.8055	
Adjusted R-square		0.20			0.1584			0.7841	
Prob> F0.00		0.00			0.0024			0.00	
Root MSE 1.4e+05		1.4e+05			1.6e+05			0.1279	

Table 7: Parameter Estimate of Multiple Regression Models by Ordinary Least Square
NB: (xxx) = figures significant at $p \leq 0.05$;
Source: Analysis of output Data by Researcher.

Method Used in Evaluating Dry Season Fishery Income									
Model (Income)	**Linear Model**			**Semi-log**			**Double-log Model**		
Variable	Coefficient	T-statistics	Pro.b	Coefficient	T-statistics	Pro.b	Coefficient	T-statistics	Pro.b
Qty of Water used	4.97	26.4	Ns	– 1.2	– 32.0	Ns	1.99	50.8	Ns
Man-days (LEEMP)	– 7067.85	–88.1	Ns	– 4089201.0	– 25.3	Ns	0.12	7.3	Ns
Man-days (Stream)	9067.03	83.7	Ns	8203811.0	26.0	Ns	– 0.20	– 6.3	Ns
farm Expenditure	1.27	51.5	Ns	8545140.0	29.8	Ns	– 0.87	–29.8	Ns
Household Size	0.80	0.1	xxx	39439.4	2.8	Ns	– 0.00	–2.8	Ns
Age	– 0.21	– 0.3	xxx	– 6439.4	– 0.7	Ns	0.00	0.7	Ns
Leadership position	–20.07	– 2.3	Ns	– 22009.0	– 1.4	Ns	0.00	1.4	Ns
Number of children	9.39	1.0	Ns	– 13262.8	– 1.5	Ns	0.00	1.5	Ns
Religion	– 18.58	–1.9	Ns	– 16162.4	– 1.2	Ns	0.00	1.2	Ns
Level of Education	– 14.16	– 2.5	Ns	– 11415.5	– 1.3	Ns	0.00	1.3	Ns
Marital status	– 20.96	– 4.3	Ns	– 77543.5	– 14.6	Ns	0.00	14.6	Ns
R –square	1.0000			0.9997			1.0000		
Adjusted R- square	1.0000			0.9994			1.0000		
Prob> F	0.0000			0.0000			0.0000		
Root MSE	19.368			2690.5			0.00027		

Table 8: Parameter Estimate of Multiple Regression Models by Ordinary Least Square
NB: (xxx) = figures significant at $p \leq 0.05$;
Source: Analysis of output Data by Researcher.

Method Used in Assessing the CPMC Credit Programme of LEEMP for Poultry									
Model (Income)	**Linear Model**			**Semi-log**			**Double-log Model**		
Variable	Coefficient	T-statistics	Pro.b	Coefficient	T-statistics	Pro.b	Coefficient	T-statistics	Pro.b
Intr Amount Paid	0.33	4.3	Ns	4.46e	1.4	Ns	0.17	2.0	Ns
Farm Expenditures	– 0.70	– 1.0	Ns	1.35e	0.5	xxx	0.37	1.1	Ns
Farm prodct Size	633.92	4.2	Ns	0.00	1.6	Ns	0.10	0.3	xxx
Savings	– 0.18	–1.1	Ns	2.19e	2.6	Ns	0.12	1.1	Ns
Household Size	– 2204.63	– 0.6	xxx	– 0.18	–1.0	Ns	– 0.15	– 0.6	xxx
Age	746.63	2.1	Ns	0.00	1.5	Ns	0.27	1.2	Ns
Leadrship positn	– 8002.70	– 2.8	Ns	– 0.01	– 1.1	Ns	– 0.06	– 0.9	Ns
Number of children	–2526.22	– 0.7	Ns	0.00	0.1	xxx	– 0.04	– 0.3	xxx
Religion	4741.98	0.7	Ns	– 0.02	– 0.5	xxx	0.14	– 0.7	xxx
Level of Education	1903.52	0.5	xxx	0.07	4.2	Ns	0.50	4.2	Ns
Marital status	3942.43	1.5	Ns	0.00	0.2	xxx	–0.14	– 1.1	Ns
R –square	0.7616			07877			0.8005		
Adjusted R-square	0.7421			0.7617			0.7691		
Prob> F	0.0000			0.0000			0.0000		
Root MSE	28639			0.11171			0.11279		

Table 9: Parameter Estimate of Multiple Regression Models by Ordinary Least Square
NB: (xxx) = figures significant at $p \leq 0.05$;
Source: Analysis of output Data by Researcher.

5. Discussion

Among the farmers, 42% of the them had higher level of educational empowerment, 29% had secondary school education. 27% had only primary education while 13% had no education. Therefore, 40% of the respondents were rather to be carried along during the participatory sensitization activities of the demand supportive organizations. This agrees with the observation of DFID in Enugu State that Constructive Participation is still low (DFID, 2005).Greater number of farmers are within the age bracket of 36-49 and they had smaller household sizes. Therefore, the efforts towards poverty reduction are not likely to be dissipated on unproductive population. This finding seems to negate the common notion that farm households in developing countries have larger household sizes (Chaudhry, Malik and Hasan 2009; Pablo and Jose, 2009). The regression analysis of socio-economic influencing factors of marital status, number of children, leadership position, religion and level of education on utilization of dry season water and on credit support for poultry and fishery income showed that economic statistics of the number of children, the leadership position and religion significantly ($p \leq 0.05$) influenced poultry credit while household size and age significantly ($p \leq 0.05$) influenced income from fishery. The 89% of the water used were from a distance of 1.5km (3km to and fro) and by a greater number, 87.9% of farmers. This revelation shows that LEEMP has made water delivery to be nearer and easy for the respondent farmers. The Focus Group information showed that 25 litres water jerry-can sells at ₦10 in most water delivery gates. The vendors most often sell the same 25 litres at ₦25. The added mark-up, ₦10 was due to the cost of efforts (intensity value addition of water delivery) and cost of distance covered (transportation). Within the distance of 0.5km, the transport cost was negligent but rather increased with increase in distance. The water vendor intensity, as in concentrating labour or capital to produce large quantity of output, decreases inversely with distance (Chambers, 2000; Oza, 2004; Beister, Stewart and Jones, 1980). Therefore, when a farmer takes it upon self to travel that distance (above 4.82km: to and fro) to fetch water it amounts to inefficiency of production and a heavy cost on the farmer's man-hours and man-day. Then, the intensity mark-up was reduced from 50 kobo per liter to 10 kobo (table 4). When taking delivery of water above a distance of 2.41km (above 4.82km; to and fro) it was very costly to the farmer, who bore the cost of vendor water delivery, since the marginal cost ₦15 outweighed the marginal revenue ₦13 (table 5) at that distance, translating into diminishing return. Under this condition of diminishing returns the marginal product decreased as inputs were added. At a point like this, the increased price of input relative to the price of the product require a reduction in the number of inputs used and a reduction in the number of outputs produced if net revenue is to be maximized (Bishop and Toussaint, 1958). Thus, the poverty reduction was in switching over from stream undesired alternative to LEEMP delivery support. The poverty reduction for water users in switching over from stream undesired alternative to LEEMP delivery support was 67% (table 6). The poverty reduction was determined thus: The price of a ma-day of fetching water is currently ₦1000, (ENADEP, 2012).

Therefore, $(\Delta Y_1/\Delta X_1)/Px_1 = (0.35m/36)/1000$

$= 350{,}000/36 \times 1/1000$

$= 9.72$

╨ 10

Similarly, $(\Delta Y_1/\Delta X_2)/Px_2 = (.35/60)/1000$

$= 350{,}000/60 \times 1/1000$

$= 5.85$

╨ 6

The marginal product of LEEMP water delivery support was higher than the stream undesired alternative by a ratio 10 : 6. So, $(10 - 6)/6 \times 100/1 = 67\%$. Also, the daily timeliness of LEEMP water delivery was 42 minutes (table 6) on the average, but generally it was between 40 minutes and 50 minutes due to variation in the levels of water use in the farm. Linear Model, semi-log model and double log model were applied to the output data from the field of study to determine the influence of independent variables on fishery fattening income. The R-square of the linear model was found to be the highest and was selected. Then, household size and age were significantly influencing the fishery income. Parameter Estimate of Multiple Regression Models by Ordinary Least Square Method used in evaluating Dry Season Poultry Income showed that R- square of the double log was the highest and therefore was chosen. Then, utilization of CDD water delivery of LEEMP significantly enhances livestock dry season agricultural income. The 89% of the water used were from a distance of 1.5km (3km to and fro) and by a greater number, 87.9% of farmers. This revelation shows that LEEMP has made water delivery to be nearer and easy for the respondent farmers. The Focus Group information showed that 25 litres water jerry-can sells at ₦10 in most water delivery gates. The vendors most often sell the same 25 litres at ₦25. The added mark-up,

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Therefore, $(\Delta Y_1/\Delta X_1)/Px_1 = (0.35m/36)/1000$

$$= 350{,}000/36 \times 1/1000$$
$$= 9.72$$
$$\cong 10$$

Similarly, $(\Delta Y_1/\Delta X_2)/Px_2 = (.35/60)/1000$

$$= 350{,}000/60 \times 1/1000$$
$$= 5.85$$
$$\cong 6$$

The marginal product of LEEMP water delivery support was higher than the stream undesired alternative by a ratio 10 : 6. So, $(10 - 6)/6 \times 100/1 = 67\%$. Also, the daily timeliness of LEEMP water delivery was 42 minutes (table 6) on the average, but generally it was between 40 minutes and 50 minutes due to variation in the levels of water use in the farm. Linear Model, semi-log model and double log model were applied to the output data from the field of study to determine the influence of independent variables on fishery fattening income. The R-square of the linear model was found to be the highest and was selected. Then, household size and age were significantly influencing the fishery income. The parameter Estimate of Multiple Regression Models by Ordinary Least Square Method Used in Evaluating Dry Season Poultry Income showed that R- square of the double log was the highest and therefore was chosen. Then, utilization of CDD water delivery of LEEMP significantly enhances livestock dry season agricultural income.

6. Conclusion: Lessons Learnt and Alternative Approaches

This study demonstrated that agricultural wellbeing of farmers in water stressed communities of Nigerian, African and indeed other needy countries can be improved upon to a greater extent with participatory water support for efficiency of production translating to affordability of necessities of life such asaccess to social need, access to credit facilities, education for children, access to communication facilities, access to health facilities and enablement to pay for counterpart funds contribution on new investment(s). The problems of scarcity of potable and needful agricultural water, wasteful man-hours during search of needful water, and inefficient use of resources can be cleared leading to incremental capital ratio and income. In the LEEMP rural water micro-project support programme, 40% of the lowly educated farmers were carried along in decision making of choice of water delivery. Development partners comprising the researchers, State Agricultural Development Programmes (ADPs), Non-government organizations, Local government councils, State government, Federal government and the World Bank should collaboratively reach a harmony and develop appropriate agricultural extension programme and funding mechanism to support fishery and poultry improvement. Dry season water supported livestock fattening can help to control high cost of food and to generate rural employment all year round.

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