

POTENTIAL MERIT OF AQUACULTURE IN RURAL POVERTY ALLEVIATION IN TANZANIA.

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SUMMARY.

Review of prices for economically important farm crops was conducted. Literature review was done for mean yields per hectare of such crops under optimum crop management practices. Mean yield of beef per hectare was also reviewed under tropical beef management system.

Comparable economic returns were then computed for these farm crops and beef in contrast to aquaculture products, especially tilapia fish. Mean yields/ha/yr were 7t., 7.5t., 1.5t., 0.83t., 2t., 1.2t., 0.16t and 9.6t. for maize, rice, beans, cashew-nuts, cotton, coffee, beef and fish respectively. Comparable monetary returns /ha/yr. were 0.5-0.7m., 1.9-2.2m, 0.4-0.7m., 0.2-0.4m., 0.4-1.0m., 0.08-0.5m. and 4.8-9.6m for maize, rice, beans, cashew-nuts, cotton, coffee, beef and fish respectively.

It was concluded that, wherever environmental factors favors the aquaculture production, mean yields and hence returns per unit area from fish farming by far exceeded that of conventional farm crops and beef production. This implied that pisciculture had enormous potential merit in poverty alleviation in Tanzania.

INTRODUCTION.

Attempts to introduce more conventional forms of aquaculture in Africa were made during the colonial period. Traditional European trout farming was first introduced in the late 1920's in high altitude areas. The first successful pond production of tilapia in Southern Zaire dates back from 1946 (Henk and Jennie 1998). They further noted that in the 1960's, classical fish farming technology was introduced in various African countries and developed steadily. By the late 1950's some 300,000 fish ponds were in operation (Satia 1989).

During the 1960's many ponds were abandoned, nonetheless aquaculture started again in the late 1960's, this time with increased technical assistance financed by foreign donors.

Southern Africa's current share of the world fresh water aquaculture production is small. Coche et al. (1996) estimated that in 1990 its production was equivalent to about 0.06 percent of the world production. Fresh water tilapia fish and trout make up about 40% of the total aquatic production in the southern African countries (Table

1). Most of the fresh water fish production originates from the small-scale farmers who practice extensive tilapia culture in small earthen ponds (< 300 m²), with individual annual production ranging from 20 to 500 kg/yr. The total aquaculture production has been stagnant, at around 15,000 tonnes, during the early 1990 or has even gone down in some countries (Mozambique, Namibia and South Africa). Production has increased only in Zambia and Tanzania (Henk and Jennie 1998).

Fish culture in artificial waters is one of the best ways of increasing the availability of food rich in protein. Protein is the known most expensive component of any foodstuff, it being for animals or humans (Maynard and Loosli 1977). One of the advantages of fish farming is that the protein it

produces is generally more economical than that from agriculture, which calls for nitrogenous fertilizers for fodder production and or protein concentrate supplements for feeding livestock, e.g. cattle, pigs poultry. Furthermore, the animal protein produced in fish ponds may exceed the production from agriculture on an equal area basis. That animal protein produced in ponds cheaply and in large quantities is important to a household as well as a national economy. Low production costs means low food prices, which in turn, influences the general cost of living by enhancing individual's purchasing power. This situation is what is often referred to as poverty alleviation. Besides, nutrition experts agree in principle that, fish meat with a variety of vegetable products, constitutes a completely balanced diet.

Table 1: Aquaculture production by category in Southern Africa for 1994 (in tonnes)

Country	Fresh water fish	Trout	Marine fish	Crustaceans	Molluscs	Misc. Aquatic animals	Aquatic plants	Total
Lesotho	13	5						18
Malawi	221			5				226
Mozambique		6						6
Namibia	4			45		1300		1350
South Africa	137	1020	20	53	3222	70	300	4822
Swaziland	25							25
Tanzania	150						5000	5150
Zambia	4930							4930
Zimbabwe	30			100		15		145

MATERIALS AND METHODS.

Records and information used for this write-up were obtained from the Bureau of Statistics in the Ministry of Agriculture and Cooperatives, (DSM), Morogoro District Agriculture Development Office as well as personal communication with cereal grain traders in the Morogoro market. The optimum crop yields were reviewed from the famous text, East African Crops by Acland (1975). Performance records on the fish yields for fish farmers in Mkuyuni division under SUA-TU linkage project were also consulted.

RESULTS

Mean Yield:

From table 2, highest yields from farm crops were those for rice (8-9t/ha) followed by maize (6-8t/ha). However, the yield from fish farming were 4.8-9.6t/ha (Table 5).

Prices:

Whereas price per kg for beef was close to that of fish i.e. Tsh. 750-900/= or 1000-1200/- (Table 3) compared to Tsh. 1000/= for fish (Table 5), the prices for most of the farm crops were less than Tsh. 500/= (Table 3).

Gross Monetary Returns:

From table 4, the highest Gross Monetary Returns (GMR)/ha were Tsh. 1.92-2.16m for rice followed by that of maize i.e. Tsh. 0.52-0.69m, while the rest of the farm crops recorded GMR/ha of less than Tsh.0.40m. On the other hand, the GMR/ha from fish farming was Tsh. 4.80-9.60m.

DISCUSSION.

Results are summarized and presented in Tables 2, 3, 4 and 5

Mean Yield:

It is apparent from these data (Table 2 and Table 5) that, the mean yields for the farm crops were comparably less than those from fish farming. Even in cases, where yields appeared to be high, i.e. maize and paddy, these yields are not that much reliable and consistent over years. This is due to the fact that farm crop production succumb to what we term herein as "CDR-syndrome" ,i.e. complex, diverse and risk prone phenomenon. For instance, maize production calls for timely planting, timely and multiple weeding, necessary N-fertilizer application, substantial amount and good pattern of rainfall, and prompt harvesting upon maturity. Short of which maize yields may drop from 100% to 0% in that cropping season. With such a low dressing percentage of cattle, coupled with delayed market weights, meat from domestic animals has apparently, a long way to go to satisfy the domestic meat and or protein demand.

Prices:

Generally, the producer prices for farm crops (Table 3), were relatively low except for beef which was closer to that of fish (Table 3 and Table 5). Nevertheless, these prices are inflexible in relation to production pattern, i.e. if there is a change in prices, it being a rise or fall, during the cropping season, this change cannot be accommodated in the expected

harvests so as to influence the market forces of demand and supply. For that matter, the continued dependence on conventional farm crop production

as the sole strategy in poverty alleviation will remain to be a "nightmare".

Table 2: Reviewed yields of different crops under optimum agronomic management (kg/ha) and beef production based on the (A.U./ha).

Crop/Product	Yield (Kg/ha)
Maize (<i>Zea mays</i>)	6000 – 8000
Rice (<i>Oryza sativa</i>)	8000 – 9000
Beans (<i>Phaseolus vulgaris</i>)	1100 – 2000
Cashewnuts (<i>Anacardium occidentale</i>)	560 – 1100
Cotton (<i>Gossypium hirsutum</i>)	1300 – 1600
Coffee.	
a. Robusta (<i>Coffea canephora</i>)	500 – 1900
b. Arabica (<i>Coffea arabica</i>)	630 – 1200
Tobacco (<i>Nicotiana tabacum</i>)	
a. Flue-cured	1800 – 2200
b. Fire-cured	560 – 900
Beef from 0.2-0.5 a.u./ha & 55-65% DP	90 - 225

Table 3: Reviewed prices of different crops and beef.

Crop/Product	Price. (Tsh.per kg)	Sources.
Maize	86.55	Bureau of Stat. MAC
Rice	240.00	-do-
Beans	336.95	-do-
Cashewnuts	340.00	-do-
Cotton	190-210	Morogoro ADO
Coffee *Robusta	550.00	-do-
*Arabica	750-900	-do-
Beef + Steak	1000-1200	Morogoro meat markets
+ Mixed	750-900	-do-

important crops and beef.

Crop/Product	Monetary Returns. (Tsh/ha)
Maize grain	519 000 - 692 400
Rice (Paddy)	1 920 000 - 2 160 000
Beans	370 000 - 673 900
Cashewnuts	190 000 - 374 000
Cotton	260 000 - 320 000
Coffee	
* Robusta	275 000 - 1 045 000
*Arabica	519 000 - 1 031 000
Beef	
+ Steak	90 000 - 108 000
+ Mixed	67 500 - 81 000

Table 5: Yield and Economic return for Tilapia fish (tonnes/ha/yr)

Aquaculture product (fish).	Monetary returns (Tsh./ha)
Yield/ha = 30000 x 0.8 x 0.2 = 4800kg x 1000 = 4 800 000 4800kg/ha	
Yield/ha/yr = 4800 x 2 circles per year = 9600kg x 1000 = 9 600 000	

Important calculation formula is:

a. Fish yield is computed from : $Y = P \times (\% S) \times Wg \times R$.

Where: Y = Fish yield in kgs. P = No. of fingerlings stocked.

% S = Survival rate up to harvesting. Wg = Fish weight or biomass yield/fish

R = No. of production circles/yr.

b. Animal Unit (A.U.) as a measure of carrying capacity in beef production. An animal unit is taken to be equivalent to a mature cattle weighing 450kg. In Tanzania different ecological zones have different carrying capacities as summarized below.

i. Coastal areas - 5ha/A.U. ii. Central regions - 5-10ha/A.U.

iii. Drier areas - 10-15ha/A.U. iv. High potential areas < 5ha/A.U.

Gross Monetary Returns (GMR):

From the data (Table 4 and Table 5), it is apparent that the GMR per unit area from fish farming, surpassed those of other farm products, i.e. crops and beef. In view of this, it can be noted that with serious engagement in pisciculture, even at subsistence level as observed for the SUA-TU fish farmers in Mkuyuni division, there is a bright future towards poverty alleviation for Tanzanian rural communities. If the variable costs and operational expenses were considered, especially the chemical fertilizers and improved crop seeds, then the net return differences between the farm crops and fish sales could have been even greater.

The farmers in the project, had previously no other dependable income generating activities, other than seasonal fruit sales. However, out of their backyard ponds, measuring 300m², they have been able to produce on average of 288kg/yr, worth Tsh. 288, 000/= at market value. It should be noted further that this sum of money realized, excludes the volume of fish which were domestically consumed and those harvested to meet some emergencies, like medical expenses and school fees.

This review has revealed that, wherever the physical or environmental conditions permits for pisciculture undertaking, the yields and hence the economic returns were appreciably high. It is concluded that aquaculture has a potential role to play in the efforts to alleviate poverty in Tanzania.

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