

Impact of Fishpond for Socio-Economic and Nutritional Improvement: A Case Study of Kalundwa and Kibwaya Villages-Mkuyuni Division in Morogoro-Tanzania

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Abstract: *This study is an assessment of the impact of fishpond for socio-economic and nutritional improvement in Kalundwa and Kibwaya villages in Morogoro-Tanzania. The general objective was to assess the impact of fishpond farming for socio-economic and nutritional improvement to the residents of the village under consideration. The specific objectives were to identify different procedures of raising fish in ponds, to determine the extent to which fishpond can increase farmer's income, to determine the extent to which fishpond contribute to the nutritional improvement in the study area, to identify possible constraints that hamper fishpond farming and to assess the perceptions of farmers on the introduction of fishpond farming in the study area. The researcher adopted a case study research design due to the nature to study. Data were collected from 40 fishpond farmers who were purposively sampled using structured questionnaire and analyzed using Statistical Packages for Social Science (SPSS) programme and presented in Tabular form. The study revealed that fishpond farming contribute about 11.69% of the fishpond farmer's income while crop cultivation contribute 50.11% and 38.20% is contributed by other economic activities undertaken apart from fishpond farming and crop cultivation. Also the findings indicated that the necessary procedures to be followed in order to start fishpond farming include selection of site for making ponds, dig ponds, fertilize ponds and put fingerlings into the ponds. Furthermore, findings have shown that fishpond farmers do not face any constraints after harvesting rather problems such as water shortage during dry season, feeds shortage during farm preparation and lack of good equipment for making ponds. Finally, recommendations are made to the fishpond farmers to follow all good fishpond farming practices so as to produce fish of large size to enable them fetch good markets, organize themselves to form Microfinance Institutions such as Savings and Credits Co-operative Society (SACCOS) or Village Community Bank (VICOBA) in which they can get soft loans to buy tools for improving fishpond farming activities.*

Keywords: Socio-economic, nutritional improvement, fishpond, fingerlings and income

1. Background Information

Fish culture is the rational cultivation of fish in a confined water area. The soil and water management of fish culture practice involves application of organic manure and inorganic fertilizers for the production of microscopic plants, the phytoplankton. This farming system is unique in that the farming system involves cold-blooded animals in a water medium. Although fish farming is approximately 2000 years old, the importance of it has been realized only recently in the face of mounting pressure on land resources and scarcity of animal protein for the ever increasing human population (Kumar, 1992)

From ancient times, fishing has been a provider of employment and economic benefits to those engaged in this activity (FAO, 2000). Today, a fishery is only a small sector of the world economy in most countries. Fisheries are making an ever-growing contribution to supplies of food to the employment and well being of coastal, riverine and lakeside communities and to earning foreign exchange. Fish account for one fifth of the world's supplies of animal protein. It is a highly nutritious food and an ideal supplement to the cereal or tuber-based diets typically consumed in many parts of the world (FAO, 1991)

According to Wheaton (1987), fishpond farming has been in existence for several thousand of years. Ancient cultures in China, Japan and elsewhere in the Far East have practiced fishpond for many centuries. Today fishpond is practiced to some extent in every country of the world with exception of the Antarctic continent. Aquaculture is considered as new growth industry in many countries due to the following factors:

- World population is increasing rapidly. Thus, food production should be increased to feed the increasing population
- Food shortages particularly of cheap, high quality protein have been experienced on an expanding scale in many parts of the world.
- Fisheries production is approaching the maximum sustainable yield
- Agricultural production is not as fast as population in many segments of the world (Wheaton, 1987)

According to FAO (1991) fishpond farming provide economic and nutritional benefits to many regions of the developing world. It can also lead to improvement of nutrition and high levels of income among the rural people (FAO, 1997)

In 1984 the first Tanzanian fishpond farming project piloted by Lutheran Missionary couple, was introduced as a method of food production to improve the nutrition and health of people

in rural areas. New farmers were provided with small initial stock of 2-inch fingerlings and instructions on how to comet a fishpond. With good care and management, farmers can harvest 8 to 12 ounce fish in six to eight months and from each small pond (about 30 feet by 45 feet) a family can harvest 75 to 100 pounds of fish per year (Henkvan, 1992)

Apart from Lutheran Missionary couple, Uluguru Mountain Agricultural Development Project (UMADEP) in collaboration with FAO-ALCOM initiated fishpond farming project in Morogoro region. The project started with sixteen farmers and the number is increasing everyday (FAO, 1999). The project was seemed to be crucial because the area has no water bodies such as lakes and dams to allow free fishing activities. At the beginning of the project, farmers were trained on how to make ponds, how to feed fish in ponds and other important procedures of fishpond farming. After farmer's training through study tour, farmers made ponds. The ponds are located close to the farmer's houses for security purposes. Through proper management of ponds fish growth is good with some individuals reaching over 200 grams in six months. These promising first harvests have encouraged fishpond farmers to expand their fish culture operations and motivated others to start (Henkvan, 1992)

Fishpond farmers in Mkuyuni Division have organized themselves in groups, which meet once per month. Ideas and experiences are exchanged during these meetings. The UMADEP Agricultural Extension Officer uses these meetings as a forum to discuss aquaculture issues. However, Tanzanian Government had been trying her best to promote aquaculture through pond culture especial to small scale farmers so as to improve their income and nutritional status (Leonnida, 2001)

Although, fishpond farming is seen to have positive impact on the socio-economic and nutritional improvement to the farmers, fishpond farming in Kalundwa and Kibwaya is not yet assessed to reveal its. This paper, therefore intended to assess the impact of fishpond for socio-economic and nutritional improvement in the said study area.

2. Methodology

The study was conducted in two villages of Kalundwa and Kibwaya in Mkuyuni Division-Morogoro region, Tanzania. The villages were selected due to the factor that most of fishpond farmers are found in these villages and farmers in these villages are not keeping animals such as cattle, thus fishpond farming is considered to be a source of protein to the farmers. Stratified random sampling was used where fishpond farmers were listed according to their sex and age, the fishpond farmer's family names were alphabetically listed and a table of random numbers was used to select the respondents. A total of 40 fishpond farmers were selected out of the 70-fishpond farmers present in the two villages. The number of women participating in fishpond farming was small and, hence their small numbers in the sample.

Both primary and secondary data were collected, primary data were collected using both closed and open interviews whereas documentary review was used to collect secondary data. The interview method was thought forth due to the fact that it provides an opportunity for clarification of issues in case arises from the respondent. These data were coded and analyzed using Statistical Package for Social Science (SPSS) programme. In this Statistical package descriptive statistics such as frequencies and percentages were calculated.

3. Results and Discussion

3.1. Fishpond farmers characteristics

Among the more important fishpond farmers characteristics dealt with in this study were age, gender, education level, marital status and number of individuals in the household. These characteristics were assessed purposely as they have an impact on the study topic, for example number of individuals in the household can determine whether fish harvested from ponds are used as a source of nutrition to the family, marital status was assessed to see whether fishpond farming was carried out by both a husband and wife to satisfy their socio-economic and nutritional improvement

3.1.1. Fishpond farmer's age

The distribution of respondents practicing fishpond farming by age is presented in Table 1. Age grouping was based on the idea that there were young fishpond farmers and old fishpond farmers. The findings revealed that 55% of the respondents were between 36 – 85 years old; this age category represents old people which foretell the importance of convincing young farmer to start fishpond farming

3.1.2. Gender

The summary in Table 1 shows that 82.50% of respondents were male and only 17.50% female. This indicates that very few female practice fishpond farming compared to male fishpond farmers

3.1.3. Marital Status

The results as shown in Table 1 indicate that most fishpond farmers are married, this account 90% of the fishpond farmers interviewed. These results suggest that fishpond farming activities might be carried out in co-operation between a wife and a husband for the purpose of increasing the family income and nutritional improvement

3.1.4. Education level

Table 1 also indicates that majority (72.50%) of fishpond farmers interviewed had primary school as their highest education level and very few had secondary education as their highest level of education. These data shows that a reasonable number of respondents were able to read and write, thus an advantage in training particularly when using posters leaflets as teaching materials

3.1.5. Household size

Also data presented in Table 1 indicates that 50% of fishpond farmers have household members between 6 and 11 and very few (5%) came from household with members between 18 and 33. The predominance of large household size in this study area implies adequate labour and necessity of the family to participate in production activities effectively so as to increase their income and get enough food for the whole family

Table 1: Distribution of fishpond farmer's characteristics (n = 40)

Category	n	%
Age		
18 - 35	18	45.00
36 - 85	22	55.00
Total	40	100.00
Gender		
Male	33	82.50
Female	7	17.50
Total	40	100.00
Marital Status		
Single	4	10.00
Married	36	90.00
Total	40	100.00
Education Level		
Primary School	29	72.50
Secondary School	3	7.50
No formal education	8	20.00
Total	40	100.00
Household size		
00 - 05	8	20.00
06 - 11	20	50.00
12- 17	10	25.00
18 - 23	2	5.00
Total	40	100.00

3.2. Procedures to follow in order to start fishpond farming

The study revealed that selection of site, digging pond(s) and collection of fingerlings are the necessary procedures to be followed in order to start fishpond farming activity. Most of respondents started fishpond farming between 1997 – 1998, which is 60% of the respondents. The results indicate that 60% of respondents imitated fishpond farming from progressive farmers, 2.5% self decision and 40% of the respondents had been convinced by UMADEP to practice fishpond farming. All respondents said reasons for starting fishpond farming were both food and cash, purposely to improve their nutritional status as well as generating income for their families.

In order to ensure that fishpond farmers produce fish of large size, agricultural advice from extension officer is important. The study revealed that majority of respondents 97.5% agreed to have been visited and advised by agricultural extension workers on fishpond management. They were advised on selection of sites for pond(s) making i.e. the site should have clay soil which has capacity to holds water. They were also advised on how to dig pond(s), how to fertilize pond(s) by the use of manure and how to put fingerlings into the pond(s). However, 2.5% of the respondents said agricultural extension worker had never attended him since she/he started fishpond

farming. This implies that she/he continue practicing fishpond farming by just observing what progressive fishpond farmers are doing. These findings are as shown in Table 2

Table 2: Distribution of respondents when asked about agricultural extension workers' advise and visits (n = 40)

Respondent's response	n	%
Yes	39	97.50
No	1	2.50
Total	40	100.00
Kind of advice given by agricultural extension worker		
Selection of place to make ponds		
Dig ponds		
Fertilize ponds		
Feed fish in ponds		
All the above	40	100.00
Total	40	100.00

All respondents agreed at an accuracy of 100%, that the advice provided by agricultural extension officer helped to get fish of large size and high quality. In this case fishpond farmers were able to increase their income when selling fish and improve their diet when using them as source of food. Apart from fishpond farming agricultural extension officer advised fishpond farmers on growing some crops. 62.50% of the respondents said that they were advised on vegetable, 10% on trees and 2.5% on paddy rice while 25% were not advised in any crop as indicated in table 3. INADES (2001) a fishpond farmer may transplant irrigated rice in the bottom of the pond when it is empty since the mud of the pond is rich in humus and then bring in the water just for any other rice. In this case we say fishpond farming can be integrated with other crops.

Table 3: Distribution of respondents by crop advised to grow around the ponds (n = 40)

Crop advised	n	%
Not advised to grow any crop	10	25.00
Paddy rice	1	2.50
Trees	4	10.00
Vegetables	25	62.50
Total	40	100.00

The reasons for growing such crops include effective utilization of water in ponds, use of vegetables to improve their dishes and conserving sources of water. INADES (2001) contends that, although the purpose of making ponds is for raising fish, yet water from the ponds can be used to irrigate rice or to water the garden around the pond and mud at the bottom of the ponds is good manure.

3.3. Extent to which fishpond increases the farmers income

Fishpond farming involves a number of activities from digging ponds, putting fingerlings into the ponds and ponds management. When a fishpond farmer is doing all these activities aim at food or cash or both food and cash after harvest and selling the harvests. Usually fish are harvested after six to eight months since a fishpond farmer put fingerlings into the ponds. When harvesting for the second

time, a fishpond farmer has to consider the number of fish as compared to the pond size and it can take place after four to six months from the first harvest (FAO, 1999).

Majority (50%) of the respondents in the study area harvest fishes six months after last harvest as indicated in Table 4. This is the time in which fishes have attained maximum size that enables a farmer to score good price in the market, this findings is supported by Kumar (1992), harvesting is influenced by the size of fish, condition of the pond, market demand desired, market size and availability of fingerlings.

Table 4: Distribution of respondents by interval for harvesting fish from one pond (n = 40)

Interval of harvesting	n	%
Three months after last harvest	1	2.50
Four months after last harvest	8	20.00
Five months after last harvest	11	27.50
Six months after last harvest	20	50.00
Total	40	100.00

Selling follows after harvesting, Table 5 shows that majority (50%) of respondents sell their fish in the market and the rest sell the harvested fish in various places. Also the findings in Table 5 indicate that 50% of the respondents use retail selling style. These findings suggest that harvested fish can be fetch good market at any place.

Table 5: Distribution of respondents by places where harvested fish are sold and style of selling them (n = 40)

Category	n	%
Place where harvested fish are sold		
Market	18	45.00
On the spot after harvesting	12	30.00
Neighbors	10	25.00
Total	40	100.00
Style of selling harvested fish		
Retail selling	20	50.00
Whole selling	9	22.50
Contract selling	11	27.50
Total	40	100.00

In the first season of harvest, the study revealed that 50% of the respondents earned an income of Tanzanian shillings between 20001/= and 30001/= from selling harvested fish. These findings suggest that if fishpond farming is properly done it can be a very good source of income to the farmers. It was also revealed that in the same season 65% of respondents earned an income of Tanzanian shillings between 50000/= and 149999/= as shown in Table 6

Table 6: Amount of Income earned from selling harvested fish and crops (n = 40)

Income earned	n	%
Amount of Income earned from selling harvested fish in Tshs		
10000 - 20000	17	42.50
20001 - 30001	20	50.00
More than 30001	3	7.50
Total	40	100.00
Amount of income earned from crops in Tshs.		
Less than 50000	11	27.50
50000 - 149999	26	65.00
More than 249999	3	7.50
Total	40	100.00

Also some fishpond farmers engaged to other income generating activities apart from fishpond farming and crop cultivation. The activities in which most of the farmers engaged were business and casual labour. About 26 among the respondents engaged themselves in casual labour and business activities. In the first season majority 30.78% earned Tanzanian shillings between 80000/= and 109999/= as shown in Table 7.

Table 7: Amount of income earned from casual labour and business (n=26)

Amount of income earned from casual labour and business (Tshs.)	n	%
20000 - 49999	4	15.38
50000 - 79999	7	26.92
80000 - 109999	8	30.78
More than 109999	7	26.92
Total	26	100.00

By calculating the average income in Table 6 and Table 7, the study revealed that fishpond raises the farmer's income at 11.96%, crop cultivation at 50.11% while other sources of income contribute 38.20% total of fishpond farmer's income as shown in Table 8. These results indicate that crop cultivation is the main source of income in the study area where the major cash crops are banana, pineapples and paddy rice is for both food and cash.

Table 8: Average income earned from various sources in (Tshs)

Source of income	Average income earned	%
Fishpond farming	23,334	11.69
Crop cultivation	100,000	50.11
Casual labour and business	76,250	38.20
Total	199,584	100.00

3.4. Constraints that hamper fishpond farming in the study area

During the study, fishpond farmers were asked whether they face market problems in selling their fish. In responding, all respondents said they don't face market and fish spoilage problems after fishing, rather they face problems such as dry of water sources during dry reasons, shortage of feeds during farm cultivation and lack of modern equipments for making ponds. These problems have contributed to the low adoption of

fishpond farming and consequently low production of fish in the study area

3.5. Perceptions of farmers on fishpond farming

Farmer's perceptions on fishpond farming were determined by asking the respondents how they perceived fishpond farming project when it was introduced in their village. Almost all respondents were happy after the importance and value of the fishpond project was explained, particularly increasing their income and improve their nutritional status. Other important advantages of fishpond farming are that the production is easy reach of consumers, thus minimizing distribution problems and spoilage, also harvesting can be adjusted according to demand (Kumar, 1992). Researchers have found that the risk of sudden death from heart attack decreased by as much as 81% for people who ate fish regularly cited in Thursdays New England Journal of Medicine (Daily News, 2002)

4. Conclusion and Recommendations

4.1. Conclusion

The study concluded that fishpond farming contribute small amount of income to the farmer's total income in which much of it is contributed by crop cultivation . Fishpond farming contributes only 11.69% while crop cultivation contributes 50.11% while other sources contribute 38.20% of the total fishpond farmer's income. However, income generated from fishpond farming can be raised if at all farmer's will increase the number of ponds as well as applying all modern techniques of fishpond farming as advised by agricultural extension officer.

When assessing nutritional status of the respondent particularly on fish consumption, the findings indicated that almost all respondents practiced fishpond farming for both income generation and nutritional improvement. It was also revealed that fishpond farmers do not face fish spoilage and market problems after fishing rather problems like water shortage during dry season, inadequate of equipment for digging ponds feed shortage during farm preparations.

4.2. Recommendations

Based on the findings the following recommendations were made:

- 4.2.1. Fishpond farmers should follow all good fishpond farming practices such as proper feeding of fish in ponds and fertilize their ponds so as during harvesting produced fishes become of large size to enable them fetch good markets and high price hence increase the farmer's income.
- 4.2.2. Fishpond farmers should organize themselves to form Microfinance Institutions such as Savings and Credits Co-operative Society (SACCOS) or Village Community Bank (VICOBA) in which they can secure soft loans to buy tools for improving fishpond farming activities.

4.2.3. Fishpond farmers should plant trees around water sources for environmental conservation hence avoid water shortage

4.2.4. The government should support fishpond farmer's effort so as to promote fishpond farming activities as it is a very good source of income and protein to these farmers since they are not keeping animals like goats and cattle for easy attainment of protein in their diets.

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