A PROPOSED INTEGRATED LIVESTOCK-RICE-POULTRY-CUM-FISH CULTURE IN ENCLOSURE SYSTEM

by

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ABSTRACT

Integrated agriculture-cum-fish farming has been practised profitably for ages in the Chinese small scale farming sy stem. There is a great potential for this system by utilizing the vast Nigerian flood plains (approx. 515,000ha). Dogongari Bay in Lake Kainji Basin was identified as a suitable site for this system after some extensive fish culture trials. Polyculture of Clarias spp. Heterotis niloticus and Tilapia was proposed for integration with layers in the poultry house, 2-ha upland rain-fed rice farming and indirect cattle rearing in the 5-ha enclosure site. Cost Benefit Analysis showed that the system will consistently record profit as from the second year of operation. Various complex factors were identified to affect profitability of this mixed farming system. Concerted research approach is needed to fully understand the interrelationships of the various components of this integrated system. Generous funding of research activities is very crucial in this situation.

INTRODUCTION

Agriculture-cum-fish farming is a workable system of integration as exemplified by the well-known Chinese small-scale farming system. Even in Nigeria, it is common for a fisherman to have such livestock as a few heads of cattle or goats; a small flock of chickens or guinea fowls or ducks and at the same time to engage in agriculture cultivating crops like maize, millet, groundnuts and tub ers etc. Through this practice the fisherman (or farmer) obtains a variety of products (sources of energy and protein) to meet the needs of his family and financial obligations. According to Lee (1971), integrated farming generally results in the optimal utilization of resources such as capital, labour and farm land and thus leads to higher returns, higher productivity and a more equitable distribution of farm labour.

The vast undeveloped and underutilized Nigerian flood plains (515,000ha) have great poteintials for use in integrated agriculture-cum-aquaculture system. An example of this type of flood plain is Dogongari Bay located to the west of Lake Kainji and a few kilometers from the Kainji Dam (Fig. 1). Since several ideal sites like this exist along the Lake and in many parts of Nigeria, it is intended in this paper to propose the mode of operation of such an integrated system so as to serve as a guideline for the operation of other similar systems in the country.

BACKGROUND INFORMATION

Otubusin (1983) proposed an experimental approach to the integration of guinea fowl with fish culture considering the greater efficiency in resource utilization exemplified by this farming system in Asian countries. An aspect of this proposal is already operational within the Kainji Lake Research Institute Housing Estate where a poultry house is built on top of the fish reservoir (Ita *et al*. 1986).

Dogongari Fish Enclosure Site

Figure 2 shows the concepts of this proposed mixed farming system. The cleared part of the enclosure is approximately 5ha. The enclosure had earlier been used for an extensive culture of wild stock of fish that came into the enclosure with the flood. Results and experience obtained from these trials metamorphosed into the modifications advanced for an efficient utilization of this flood plain (Otubusin and Opeloye, 1984). Some aspects of these modifications were implemented and promising results were recorded (Otubusin and Opeloye, 1985). This proposal therefore is the most recent approach to an efficient utilization of resources in this enclosure. This mixed farming system proposal was motivated by the fact that:

i) wild fish stock enclosed within the site were observed to have survived and grown appreciably even under extensive culture method (Otubusin and Opeloye, 1985)

ii) during the dry season, Fulani herdsmen regularly brought their herd to drink from the enclosure

iii) before the enclosure fish culture trials commenced on the site, the Agriculture Division of the Institute used to grow upland (rainy season) rice within part of the enclosure site

iv) tipper loads of chicken manure (in addition to cow dung) obtained from a local poultry farm was used in fertilizing the enclosure water for good growth of natural food.

Facilities Proposed for the Site

The enclosure will be bunded as shown such that a 2-metre gate is located along the original flood channel for water management within the enclosure. The water canal about 2 metres wide connects the gate with the fish reservoir on which the poultry house will be built.

The poultry house (15m x 5m) will be built on stilts such that its floor is at least 2 metres above the highest water level within the enclosure. Adequate flooring of the poultry house will be done to prevent humidity or any other physico-chemical factors from affecting the performance of the birds. The floor of the poultry house will be intersperced with 1sq. in battery cage wire on which the birds will lay eggs and through which the poultry waste will drop into the water (fish reservoir). Hanging feeders and water containers will be used in dispensing the feeds and water.

About 2 ha of the enclosure near the bund will be used for rice (upland) cultivation during the rainy season only.

Animals/Crop inputs

Livestock

The direct integration of livestock in this mixed system shall be optional. But herds of cattle, goats, sheep will be allowed in to drink at the enclosure. The area surrounding the enclosure can therefore serve as a range-land for the herds.

Fish

Three fish species viz: *Oreochromis* (= *Tilapia*) *niloticus*, *Heterotis niloticus* and *Clarias* sp. will be stocked in the enclosure at a ratio of 5 : 3 : 2 respectively.

Poultry

2,000 layers will be stocked in the poultry house. Layers mash will be dispensed using hanging feeders. Standard poultry management routine will be strictly followed.

Rice

The rice variety best suited for this environment and season will be planted under rainfed agriculture. The rice will however be fenced off to prevent the animals (cattle etc.) from browsing on it.

Management of the Integrated System

Relevant physico-chemical parameters (e.g. Dissolved oxygen, temperature, relative humidity etc.) of the culture media will be monitored regularly in order to forestall any hazard.

The rice will be given a top dressing of 30 kg N/ha after a basal dressing of 30 kg each of P and K per hectare (Ogo et. al., 1985).

The Wildlife/Range Division of the Institute will be fully involved with proper management of the poultry aspect of this system.

Tight security will be maintained on the farm to prevent poaching or infiltration by marauders.

Harvesting

The fish will be harvested by beach seining and the total yield per species will be recorded.

Eggs will be picked up everyday in the poultry house while old layers will be sold off every two years.

The rice will be harvested on maturity and processed.

INVESTMENT PROSPECTS

Table 1 shows the input-output analysis of operating a mixed farming system incorporating rice farming with poultry and fish production. In this analysis the integration of livestock will be considered as indirect because a larger space is required for a direct intensive livestock (cattle) integration.

A loss of ₦40,260 will be incurred in the first year of operation because only half of the year will be used for actual culture or farming while the first half is used for farm preparation and construction of farm facilities and infrastructure. Profits will consistently be recorded as from the second year of operation onwards. Since several complex factors can affect profitability of this mixed farming system, no strict economic analysis is done in order not to further complicate the complex system. However, it is certain that the mixed farming system gives a higher return on investment than a mono-farming system. Particularly the poultry-fish combination constitutes on the average more than 90% of the total annual returns from the whole system (Table 1). Hopkins (1982) also opined that chicken-fish systems can yield returns more than 90%. Likewise the poultry cost of production especially feed cost looks prohibitive. This may therefore be a major constraint to

integrate livestock-fish farming systems for poor farmers. Invariably, Kaewpaitoon (1982) observed that farms with larger numbers of livestock had a greater tendency to integrate livestock production with aquaculture. These wealthy farmers therefore are able to confine their livestock on or near a fish pond to enable the manure to fertilize the water. These livestock must be fed with relatively expensive, supplementary feed.

In spite of the constraints in this culture system, there are several benefits:

- no inorganic fertilization or supplementary feeds are given to the fish at any stage of this mixed system

- there is maximum and efficient utilization of space and resources

- the two major human food items (starch from rice and protein from fish, eggs and birds) are derivable all at once from the farming system. Milk can also be got from the cattle.

The case of Dogongari enclosure or any other similar enclosure is interesting in that the enclosure is linked directly into the lake and therefore can be regularly flushed. The enclosure can be used all the year round: the excavated fish reservoir (Fig. 1) is supplied with water during the rains and by the black flood during the dry season.

Since this system of farming is still in the experimental stage in Nigeria, concerted efforts towards more research approach is needed in order to understand the interrelationships of the several components of these integrated systems and to formulate management guidelines. The ban on importation of rice into the country coupled with the serious economic recession should give an impetus to generously funding research activities in this farming system. When this system is perfected the end users will include fishing/fish farming companies, fishermen co-operatives and other well organised institutions/ enterpreneurs.

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Table 1 - Production cost and Income for the operation of the Proposed Conceptualised Integrated Rice-Poultry-Livestock-Cum-Fish Enclosure Culture*

ITEMS		AMOUNT/YEAR 1	2	3	4	5
I	Gate and screen etc	2,000	-	-	-	-
II	Clearing, bunding and excavation of enclosure	14,000	-	-	-	-
III	Fish seeds for initial stocking (50,000)	12,500	5,000	5,000	5,000	5,000
IV	2000 layers @ ₦7 per bird	14,000	-	14,000	-	14,000
V	Poultry feed (100 t per year) @ ₦640/ton	32,000	64,000	64,000	64,000	64,000
VI	Rice seeds/fertilizer (rainy season only) 2ha	200	200	200	200	200
VII	Boat	1,500	-	-	-	-
VIII	Outboard engine	2,000	-	-	-	-
IX	Antipoaching devices	5,000	-	-	-	-
X	Beach seine net	2,300	-	-	-	-
XI	Caretaker's hut/farm house/store/working shed	30,000	-	-	-	-
XII	Poultry house and facilities	30,000	-	-	-	-
XIII	Staff salary	6,600	6,600	7,680	7,680	9,000
XIV	Casual Labour	2,000	2,000	2,000	2,000	2,000
	Sub-Total	119,100	77,800	92,880	78,880	94,200
XV	Miscellaneous	11,910	7,780	9,288	7,888	9,420
	Total	131,010	85,580	102,168	86,768	103,620

Table 1 (Continued)

ITEMS		AMOUNT/YEAR 1	2	3	4	5
REVENUE						
i)	Table size fish (10 tonnes/2 ha/year) @ ₦5/kg	25,000	50,000	50,000	50,000	50,000
ii)	Fingerlings (assorted) (50,000/enclosure/year) 25k each	6,250	12,500	12,500	12,500	12,500
iii)	Old layers, 1800 @ ₦10 each	-	18,000	-	18,000	-
iv)	Eggs (240/bird/year for 1800 birds) 432,000 @ 25k each	54,000	108,000	108,000	108,000	108,000
v)	Rice (5t/2 ha/year) @ ₦1,100/ton	5,500	5,500	5,500	5,500	5,000
	Total Annual Return	90,750	194,000	176,000	194,000	176,000
vi)	Net Profit (loss)	(40,260)	108,420	73,832	107,232	72,380

* Based on the following:

1. Production (fish & poultry) for 6 months in Year 1, but 12 months in subsequent years.
2. Livestock (Cattle) optional
3. Poultry house facilities include drinking trays, hanging feeders etc.
4. A maximum of 10% mortality of layers
5. Rice farming in rainy season only.