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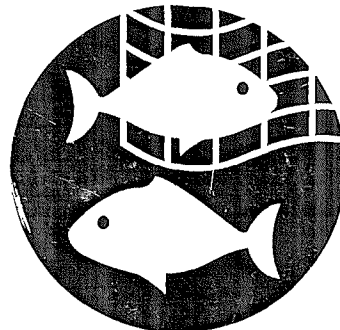
# **ALTERNATIVE INCOME IN KAINJI LAKE AREA: INTRODUCTION OF IMPROVED COCKS TO FISHERFOLK**

by Dr. J.S.O Ayeni and M. Mdaihi

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**Nigerian-German (GTZ)  
Kainji Lake Fisheries  
Promotion Project**



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**September, 1997**

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New Bussa  
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Dr. J.S.O. AYENI AND M. MDAIHLI

NIGERIAN-GERMAN KAINJI LAKE FISHERIES PROMOTION PROJECT

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## 1. INTRODUCTION

### 1.1 Background

The Kainji Lake Fisheries Promotion Project (KLFPP) aims at sustainable exploitation of the fisheries resources of Kainji Lake. For the lake fisheries management purposes the project established the Kainji Lake Fisheries Management and Conservation Unit (KLFMCU) with members drawn from the fisherfolk, the traditional authorities, the State Fisheries Divisions and the National Institute for Freshwater Fisheries Research, New Bussa.

Major responsibility of the Unit is to implement the Fisheries Edict and Fisheries Rules and Regulations that were signed into law by the State Governments recently, following recommendations made by the project. The approach chosen for implementation of the new edict, rules and regulation involves the fishing communities through their representatives, ensuring maximum cooperation.

To manage the fishery of Kainji Lake on a sustainable basis the new Fisheries Edict, Rules and Regulations contain measures that aim at reduction of fishing effort, resulting in a reduction of individual income from fishing, at least in the short term.

To further ensure cooperation of the fishing communities, to compensate for possible short term income loss, but also to boost income from alternative sources, the KLFPP identified "improved poultry keeping" as suitable for introduction around Kainji Lake (Ayeni and Mdaihi, 1996).

In the long term, the programme will assist to increase especially the income of female members of fishing families, since poultry is kept in the villages mainly by women.

### **1.2. The Strategy Chosen**

The strategy chosen for the improvement of the local stocks aims at upgrading in both adult sizes and egg production of local domestic chickens (Gallus Gallus domesticus) through crossbreeding of the slow growing and less productive local hens with the fast growing, improved stock of commercial cockerels (Akinokun and Dettmers, 1979; Ayorinde, 1991; Omeje and Nwosu, 1984 and 1986). Such breeding strategy for improvement of local poultry stocks requires a gradual replacement of native males by locally adapted and genetically improved males.

## **2. THE "IMPROVED POULTRY KEEPING PROGRAMME" - INITIAL STAGES**

### **2.1 Cockerel Brood Husbandry**

About 1,000 improved cockerels of ages from day old to two weeks old were bought from the National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Zaria between December 1996 and January 1997. In addition, thirty five cockerels were supplied as bonus by NAPRI to the Project to compensate for birds likely to die during transportation.

During transport and due to transport related stresses after arrival the project lost 68 birds of the total (6.6%).

During the brooding phase throughout January, 14 cockerels died as a result of large diurnal variation in air temperatures resulting from electric power failures at night during the Harmattan winds. The zinc roofed brooder room at the Project aviary site had no ceiling, consequently the January harmattan nights were particularly too cold for the chicks. High voltage electric light bulbs which were run on a stand-by generator subsequently provided the warmth needed in such nights.

#### **2.1.1 Feeding of the Brood**

Between December 20th, 1996 and January 31st, 1997 the brood were fed ad libitum day and night. On the average, the birds consumed 18.5 kg feed per day, and the average weekly weight gained was 50g per bird. The chicks were fed on standard formulated commercial rations bought from Pfizer and Guinea Companies in Ilorin.

#### **2.1.2 Health and Medication of the Brood**

Advisory instructions on management of the improved cockerels were obtained from NAPRI and adhered to. Monitoring of the broodstock followed the schedule on Table 1.

Four cockerels died of stress following the administration of vaccines on the birds. Another five birds died of inappetence and anorexia. Diarrhoea was the major sickness in the brooder house and antidiarrheal drug, Neoceryl<sup>R</sup> was used to control the outbreak. Hygiene of the brooder room was improved by placing the feeding troughs on slightly raised platforms of 1.5 ft<sup>2</sup> sizes.

Table 1: Poultry Production Unit Vaccination/Medication Schedule

Hatch No	1	2	3	4	5
Date Hatched	4.14.96	11.12.96	18.12.96	26.12.96	02.01.97
Age of Bird	Dates of Vaccination or Medication				
Vaccination/Medication	1	2	3	4	5
Day 1	NDV(1/0) + Marek's	11.12.1996	18.12.1996	26.12.1996	02.01.1997
Day 1 - 15	Anti-Stress	11.12.1996	18.12.1996	26.12.1996	02.01.1997
Day 10	IBDV 1st dose	28.12.1997	04.01.1997	11.01.1997	18.01.1997
Day 21	IBDV 2nd dose	05.01.1997	12.01.1997	19.01.1997	26.01.1997
WK3 (for 5 days)	Coccidostat	03.01.1997	16.01.1997	17.01.1997	24.01.1997
WK4	NDV(L)	02.01.1997	16.01.1997	23.01.1997	30.01.1997
WK6 (for 5 days)	Coccidostat	17.01.1997	31.01.1997	07.02.1997	14.02.1997
WK7	NDV(K) 1st dose + FPV	23.01.1997	06.02.1997	13.02.1997	20.02.1997
WK8	Dewormer	30.01.1997	13.02.1997	20.02.1997	27.02.1997
WK9 (for 5 days)	Coccidostat	07.02.1997	21.02.1997	28.02.1997	07.03.1997
WK12 (for 5 days)	Coccidostat	28.02.1997	07.03.1997	21.03.1997	28.03.1997
WK13	Debeaking	07.03.1997	14.03.1997	21.03.1997	03.04.1997
WK16	NDV (K) 2nd dose + FPV	27.03.1997	03.04.1997	17.04.1997	24.04.1997
WK17	Dewormer	03.04.1997	10.04.1997	24.04.1997	01.05.1997

## Key:

NDV = Newcastle Disease Vaccine

IBDV = Infectious Bursa Disease (Gomboro) Vaccine

K = Komarov

i/o = Intraocular

L = Lasota

FPV = Fowl Pox Vaccine

This prevented the birds from contaminating the feed with saw dust and faecal droppings, while at the same time reducing the rate of wastage by spreading of the feed into the saw dust.

## **2.2 Cockerel Husbandry During Grow-out Phase**

At about 6-8 weeks old, from February 1st, 1997 the cockerels were transferred out of the brooder room to begin the grow-out phase. The stock of birds was culled to separate the malformed cockerels (24) from the rest. During the grow-out phase the cockerels were allowed adequate floor space per bird and were further separated and raised in batches in pens/cages according to the following 5 age groups and numbers: 14 weeks old (70), 13 weeks old (50), 12 weeks old (400), 11 weeks old (110) and 10 weeks old (311).

The birds were again fed ad libitum, but only so during the daylight hours. This allowed the cockerels to rest at night and to utilise the feed better to put on flesh. The grow-out feed was locally formulated by the Project to acquaint the birds with local feeding conditions.

The schedule of medication and vaccination on Table 1 was again strictly adhered to during the grow-out phase. Only six (0.6%) cockerels died throughout the month of February out of 941 birds that reached the grow-out age.

## **2.3 Adult Cockerel Husbandry**

By the end of March, 1997 cockerels reached sexual maturity and were ready for distribution to the fisherfolk.

Unfortunately, the stock of adult cockerels were further decimated by an outbreak of Salmonellosis (Salmonella pullorum). The bacteria was suspected by the Veterinarian in charge to have been transmitted through NAPRI eggs supplier. A total of 101 adult cockerels died of Fowl pox outbreak. The number of dying birds increased by the days following the outbreak, but over the next two weeks the number of deaths reduced asymptotically to zero. Five mature cocks died when the flock was given final dose of vaccination.

Throughout the incidence, the dead, dying and sick birds were separated regularly from the healthy ones.

Although due by March, the adult cockerels were not debeaked because it was surmised that when they are eventually distributed to the fishing villages:

- i) they will soon wear out the beaks through free-ranging and sand pecking;
- ii) they require the beaks for self defense when attacked by the ferocious, semi-wild, resident population of local cocks already used to cock-fighting;
- iii) the beaks might also be useful for grasping of female feathers during mating.

### 3. THE DISTRIBUTION

Foge Island on Kainji Lake was chosen by the Project as an ideal location for the poultry improvement programme to start off.

The choice of the Island was based on several considerations:

- a) the Island is one big fishing community of several settlements
- b) the Island will allow for only minimal un-intentional migration of the improved cockerels
- c) the progress of the poultry improvement programme may be easier to monitor and the impact of the innovation better evaluated under a relatively stable Island environment.

It was decided to offer to the fishing families to exchange their local cocks completely against improved birds, to buy additional improved cocks if needed, or sell excess local cocks to the Project.

### 3.1 Reconnaissance Study Visit to Foge Island

Reconnaissance study visit was made to Foge Island between April 18th and 22nd, 1997. The visit determined the numbers of people in the fishing settlements on Foge that owned domestic chickens and the categories of their willingness to participate in the poultry improvement exercise.

#### Details:

No of fishing entrepreneur families:	318
No of fishing families who keep local chickens:	167
No of local cocks presently owned:	422
No of local hens presently owned:	612
No of local cocks offered to be exchanged:	292
No of additional improved cocks needed for stock expansion:	92
No of families with no local cocks:	67
No of families who want less improved cocks than the number of local cocks they presently own:	79

The total number of improved cockerels requested by the Foge Island fishing community was 530.

After assessing the need for improved cocks on Foge Island it was decided to extend the programme to two more villages in Agwara Local Government area, so that most of present stock of cockerels would be offered to fisherfolks of Foge and neighbouring villages.

### 3.2 Health Condition of Poultry on Foge Island

In a survey to determine possible alternative income sources in fishing villages around Kainji Lake that was carried out in 1996 Paralysis, droopiness, whitish faeces, respiratory diseases, pecking and Fowl fox were identified as common in the lake area (Table 2). Although the local chickens suffer all year round from one kind of disease or another, yet incidence of the diseases appeared to be at the peak with the onset of rains, that is, between late dry season and the early rainy season.

**Table 2: Type and Seasonal Prevalence of Poultry Diseases in Kainji Lake Area**

Disease	ER		LR		ED		LD	
	e	w	e	w	e	w	e	w
Paralysis	46	35	42	43	42	46	54	43
Craziness	2	-	5	1	28	2	5	3
Droopiness	17	20	11	32	8	15	15	19
Whitish faeces	15	2	21	0	25	2	7	-
Respiratory diseases	13	-	11	4	11	2	7	-
Bloody faeces	-	-	-	-	3	-	-	-
Pecking	4	29	2	4	3	21	-	19
Fowl fox	-	14	8	11	6	12	10	15

Key: (in number of respondents during interview)

ER = Early rainy season; e = Eastern shores of the lake;

LR = Late rainy season; w = Western shores of the lake;

ED = Early dry season; LD = Late dry season

(Ayeni, J.S.O. and Mdaihli, M., 1996)

During the reconnaissance study visit, the health status of the indigenous poultry on Foge Island was determined. Since the Island was shortly afterwards to receive improved cockerels, it was decided to treat the entire stock of chickens on the Island for diseases that might constitute threat to the incoming birds.



The common diseases encountered and treated (free of charge to the owners) on the Foge Island were worm infestation, gastroenteritis complex and bacterial infections (Table 3).

**Table 3: Birds Treated Against Worm Infestation, Bacterial Infestation and Gastroenteritis Complex, Foge Island**

Location	Number of Birds			
	Cocks	Hens	Chicks	Total
Tunga Alhaji	25	144	42	211
Magariya	12	76	21	118
Dutsi	10	70	15	95
Yauri	16	95	19	130

Although New castle (15) and the Fowl pox (22) diseases were present in a number of cases, yet no medication was administered because the improved stock were already inoculated against them and it was assumed that those that only recently survived an attack of Fowl pox were still immune.

Worm infestation was treated with anthelmintic drug, Piperazine<sup>R</sup>, applied orally at 1mg/bird. Gastroenteritis complex causing conditions such as diarrhoea and coccidiosis were controlled by antidiarrheal and anti-coccidial injectable sulpha drugs, respectively, at dosage rate of 0.3ml/bird. Cases of infestation by bacteria organisms e.g fowl pullorum or cholera were controlled by treatment with antibacterial, Diatrim (0.5gm/bird), applied orally.

### 3.3 Distribution of Cockerels

In all, 265 cockerels were distributed in the three fishing communities on Foge Island, 28 at Buka Dubu and 227 in Duga Mashaya in April and May, 1997.

The poultry keepers either paid 150 Naira per bird or gave their local cocks in exchange for improved cockerels. The cockerels remaining in the aviary of the Project after the distribution exercise in the villages were all sold to poultry keepers in New Bussa, Project headquarters at the rate of 200 Naira per bird.

### 3.4 Follow-up Visit to Assess the Performance of Improved Cockerels

Between July and August, 1997 study visits were made to assess the performance of the improved stock of cockerels.

About 81% of all the birds distributed to the poultry keepers on Foge Island survived. Of the 96 birds recorded to have died, some were preventively slaughtered at the first notice of sickness or stress; others were resold to fetch immediate profit, while the rest were eaten purposely on curiosity to compare their taste with those of the local chickens (Table 4).

An assessment of the condition of health of the newly introduced cockerels shows that 91.5% was rated as of good health, 5.8% fair, and only 2.7% were poor. Of the sick birds 89.7% were infested by lice, and 8.8% had respiratory problems, which is the major health problems of the newly introduced cockerels in the villages (Table 5).

Table 4: Health Recognizance Appraisal of the KLFPF Cockerel Production

Parameters	Foge Island	Buka Dubu	Duga Mashaya	Total
Total No of Chickens distributed	265	28	227	520
Total No of chicken seen during revisit	156	19	93	268
Total No. Chickens not seen	54	7	70	131
Total No. of chickens not alive (dead)	35	-	59	96
Total No. of chickens alive	230	26	168	424
Morbidity rate (%) Survivorship	86.8%	92.9%	74.0%	81.9%

Table 5: Numbers of Improved Cockerels Examined, their Sicknesses and Score of Overall Condition

Parameters	Foge Island	Buka Dubu	Duga Mashaya	Total
Birds examined	134	17	86	237
i. Good (1.5 - 2.5 kg)	15	2	5	22
ii. Fair (1.0 - 2.0 kg)	7	-	2	9
iii. Poor (0.5 - 1.0 kg)				
Cases of:	27	6	35	68
i. Lice infestation	20	6	35	61
ii. Respiration problems	6	-	-	6
iii. Nervous problems ( <i>Torticollis</i> )	1	-	-	1

It was recommended to the keepers to use the traditional curative methods which previous surveys by the Project showed to be quite efficacious. These are:

for Paralysis

- grinding of onions, mixed with kerosene and rubbed on the legs;
- rubbing of kerosene only;
- rubbing of ROB ointments on the body.

for Fowl pox

- onions plus kerosene rubbed on head and mouth

for Respiratory diseases

- Feeding of ground pepper and onions
- feeding onions in water
- giving of water containing ground pepper
- giving "Dogonyaro water" - infusion of Neem leaves soaked in water.

for Whitish faeces

- solution of soaked locust bean fruit and pain killers e.g
- solution of aspirin or panadol
- onion plus salt solution.

The removal of diseased birds from the main flock was an effective way of preventing reinfestation and spread of several diseases in the villages. In many cases, the sick birds were slaughtered (culled), or sold off as soon as disease symptoms were noticed.

Table 6 summarises the main local medicaments recommended for the treatment of chicken ailments noticed among the stocks within which the improved cockerels now reside.

**Table 6: Incidence of Disease Problems Around the Foge Island, Buka Dubu and Duga Mashaya of the Lake Kainji, Nigeria, Between July and August, 1997**

Case	Prevalence Rate Recorded	Symptoms	Management/Control Measures
Lice infestation	11.5%	Presence of eggs and/or moving lice on bits of skin feathers, shaft, head, neck, wings, vents, etc.	Bathing of affected chicken in wood ashes. Application of ectoparasitocidal agents with hematonic (blood-forming). Isolation from all possible means must be maintained: Application of ectoparasitocidal agents into the poultry housing facilities periodically.
Respiratory Problems	1.2%	Respiratory distress manifest by rates of rattling sound, sneezing etc. Couple with reduced growth rate.	Soak onion and pepper in drinking water. Use of drugs that could facilitate the decongestion of the entire respiratory tract.
Nervous Problem	0.2	Torticollis (Occasional twisting of the neck).	Nutritional deficiency (especially vitamin deficiency to be avoided). Use of Vit.B preparations in feeds and as medications.

#### 4. FINANCIAL ASSESSMENT OF POULTRY IMPROVEMENT PROGRAMME

Table 7 shows the amount of money generated from sales of the cockerels as well as the costs of input provided for raising the cockerels.

Of the 1,000 cockerel chicks started with by the Project, 70.8% were raised to maturity. Of the adult cockerels, twenty were disposed off as traditional gift to community leaders, thirty were exchanged for local cocks, and the rest were sold for cash payment.

Given that 520 birds were sold at subsidised prices to the fisherfolk, it is clear that the project is fairly cost recoverable; generating a revenue of 166,130 Naira compared with an expenditure on feed and medicament of 199,158 Naira.

Nevertheless, the administrative costs to prosecute the programme of poultry improvement in the remote fishing villages is considerably high (151,800 Naira).

**Table 7: Input Costs and Revenue Generated on Improved Cockerels Raised and Distributed by the KLFPP**

**A. Amount Generated**

Improved cocks	490 at N150	N	73,500
Improved cocks	168 at N200	N	33,600
Improved cocks (gifts)	20 at N200	N	4,000
Local cocks	30 at different prices	N	5,030
<u>Sub-total</u>			<u>N 116,130</u>

**B. Input**

Cost of cockerels		N	14,796
Cost of feeds & feeding stuff		N	130,462
Cost of drugs and medicaments/improved cocks		N	29,750
Cost of drugs local chickens		N	5,250
Cost of vaccines		N	24,650
Material for housing at aviary		N	38,675
<u>Sub-total:</u>			<u>N 243,083</u>

**C. Administrative Cost**

Field trips for treatment of local stock		N	23,125
Filed trips for chicken collection		N	29,750
Field trips for chicken distribution		N	55,000
<u>Sub-total</u>			<u>N 107,875</u>
<u>Total</u>			<u>N 467,088</u>

It was observed by the authors that the improved cocks already fetched as high as 400 Naira sale price per bird which was higher than the average price of 150 Naira each local fowl (Ayeni and Mdaihli, 1996). If at all the cocks were sold at market price, the total sum of 284,230 Naira could have been generated by the Project.

## 5. IMPACT ASSESSMENT STUDY OF COCKEREL EXCHANGE PROGRAMME

### 5.1 Assessment of the Cockerels

The distribution of improved cockerels to fisherfolks on Foge Island in April, 1997 was very successfully executed. Out of the 200 birds transported in open van, only one died in transit.

A preliminary study to evaluate the success of the exercise was embarked upon between 20th and 24th September, 1997. The study was principally to verify the reproductive success between the improved cocks and the local hens and to also evaluate the performance/survival of their offspring. By the time of the impact assessment study, some beneficiaries had already left their former fishing villages (being migratory), and so the performance of their cockerels and local flocks could not be determined. The domestic chickens of only a total of 69 respondents remaining in the six settlements of Foge Island were assessed (Table 8). Only 2 of the cockerels were reported stolen.

Judging by the number of hens kept by the respondents whose cockerels were assessed (Table 8), it was apparent that the yardstick used in the distribution of the cockerels was faulty. The average number of hens kept per household ranged from 3.58 in Tungan Alhaji Nda to 8.4 in Goshin Dushe (Table 8). With a usual mating ratio of 1 cock to 8 or 10 hens; only 1 or 2 cocks is actually required per keeper. But in fact, some keepers obtained up to 8-11 cockerels.



At most, no keeper should have got more than 3 improved cockerels on Foge Island. A few respondents actually confessed that they did not have any hens at the time they purchased the cockerels. It is therefore possible that the fairly large numbers that could have been recorded as "losses" elsewhere in this report arose as a result of lack of need for so many cocks by some, hence their eventual intentional disposal through sales and or slaughtering for eating. What should be done in future is to give out the cockerels on the basis of the number of hens actually seen, and to continue to replace the cockerels as more local cocks become matured enough to mate, or if any cockerel die.

Table 9 shows that the improved cockerels adapted very well to free ranging extensive system as indicated by the fairly high body weight. The average weight of the cockerels ranged from 1,700g to 2,900g with a mean of 1,825g at Tungan Jiba and 2,464g at Tungan Alhaji Nda.

The weights of the local hens also averaged 1,122g at Yauri Karama and 1,430g at Magariya, with a range of 650g to 1,870g. This observation indicates that the feeding of the cockerels was adequate especially in Tungan Alhaji Nda and Dogon Yashin, Magariya and Goshi Dutse where the birds had more access to fish or fish byproducts than in Tungan Jiba and Yauri Karama. Most of the keepers feed their birds at least twice per day and only two beneficiaries left the birds to only what they could pick on the range.

Table 8: Population of Improved Cocks and Hens Owned by Respondents on Foge Islands:

VILLAGE	NO. OF RESPONDENTS	NO OF COCKS GIVEN	RANGE NO OF COCKS	NO. OF HENS MEAN	RANGE
Tungan Jiba	5	15	2-4	2	5.6
Dogon Yashi	14	33	1-8	10	5.4
Goshi Dutse	8	18	1-4	5	8.4
Yauri Karama	14	30	1-7	8	6.1
Tungan Alh.Nda	14	53	1-9	29	3.6
Total	69	191		74	3.62

Table 9: Mean Body Weight(g) of the Free Ranging Improved Cocks and Local Hens

VILLAGE	IMPROVED COCKS		LOCAL HEN	
	mean	range	mean	range
Tungan Jiba	1825	1350-2300	1372	1260-1460
Dogon Yashi	2479	2200-2800	1233.3	990-1500
Goshi Dutse	2376	2200-2800	1286.7	970-1850
Yauri Karama	2198.9	1700-2550	1122.1	650-1500
Magariya	2378.8	2150-2450	1430	1220-1650
Tungan Alh.Nda	2464.4	1900-2900	1307.7	1150-1870

## 5.2 Reproductive Performance

The reproductive performance of the cocks indicated a very successful mating. The hatchability of 73.77 to 84.73% indicated that the cocks were very active and produced normal viable sperm cells. Even in a particular home where the cockerels died, the other free ranging improved cockerels from neighbours mated with the hens and offspring were produced.

The acceptability/success of the programme is already evident in the willingness with which keepers decide on their own to sell out or cull by slaughtering of local cocks so as to prevent local cocks from mating with the local hens. The poultry keepers on Foge Island expressed continued willingness to exchange more of their mature local cocks for improved cockerels whenever this becomes feasible in the future.

The average number of eggs incubated by each hen (Table 10) ranged from 8.3 to 10.9 and a total of 702 offsprings have been produced so far in the six settlements.

Goshin Dushe with only 5 cocks still alive was the most successful although like in the other settlements even the lost cocks have already sired some offsprings before they died or were disposed of. As a result of the fairly high mortality (20.14%) only 563 chicks were left out of the 702 hatched in the six villages. Mortality below this average was found in Yauri, Karama, Tungan Alhaji Nda, Dogon Yashin and Goshi Dutse.

The very high mortality in Magariya and Tungan Jiba was due to the non-medication of the local flocks before the improved cocks were distributed.

This clearly showed that the treatment of sick birds before distribution of cockerels is a sound practice that must continue with any lake-wide extension of the programme. Despite this, the number of offsprings produced within the first four months of distributing the cocks testify so far to the high success and prospect of the program.

The performances of the offsprings are also encouraging. From visual estimation only, the day old body sizes at 5, 7, 28, 56, 70, 84 and 112 days of age were much higher than those observed from experiences of the keepers and the authors for the unimproved local chickens. Day old body weight was 23.3g while one week body weight ranged from 5 to 68g. Mean body weight at 2, 4, 6, 8, 10, 12, and 16 weeks were 86.7g, 127.5g, 360g, 600g, 760g, 1015g and 1505g respectively.

In fact at 16 weeks some of the crossbreeds were already very superior in body sizes to their local parents; thus exhibiting a very high level of heterosis and a good combining ability between the improved cock and the local hens.

Table 10: Reproductive performance of the cocks and hens and survivorship of F1

VILLAGE	MEAN NO. OF EGG INCUBATED/HEN	% HATCHABILITY	TOTAL NO. OF F1 HATCHED	NO. OF F1 OFF- SPRINGS ALIVE	% MORTA- LITY OF F1
Tugan Jiba	9.6	84.72	122	78	36.07
Dogon Yashi	9.4	73.77	90	78	13.33
Goshi Dutse	8.7	80.11	153	128	16.34
Yauri Karama	10.9	84.73	111	102	8.11
Magariya	9.3	77.10	101	68	32.67
Tungan Alh.Nda	8.3	79.62	125	109	12.8
Total	893		702	563	20.14

## 6. GENERAL REMARKS

The poultry improvement programme carried out through the replacement of the local cocks with improved cockerels is clearly successful so far in the trial villages, particularly on the Foge Island, in terms of the adaptability of the cocks to free ranging life in fishing villages and heterotic advantage of the crossing, .

Vaccinating the local flocks before introducing the cocks was also advantageous as manifested by the lower mortalities of the cocks and the offsprings in villages where local flocks were vaccinated before introduction of the improved cocks.

The ability of the cocks to mate successfully with the local hens despite the dissimilarity in body size was evident from the high percent hatchability of the incubated eggs.

Other fishing villages stand to benefit from the genetic improvement of their local fowl if such a program is extended to them. In order to achieve this a proper survey of hens owned by each respondent should serve as a guide in the number of cocks to be given so as to discourage beneficiaries from either selling or slaughtering (for eating) cocks given to them.

Since the keepers are willing to get rid of the local cocks they own through sales, or exchange same for improved cocks, outright purchases from them by the Project, of the local cocks at the grow-out stages, should be encouraged. A few cocks as well as a fairly high percentage of the offsprings were actually lost to diseases even in villages where the local flocks were vaccinated before introducing the improved cockerels.

It should be possible to continue periodic medications in the villages benefitting from this program. The major killer diseases appear to be New castle Disease and luckily vaccines against this disease exist. The medications could be given, possibly at subsidized prices although most of the keepers said that they are willing to pay for any medication.

To minimise stress, loss of appetite, starvation and eventual death resulting from complications especially in the first 1-4 weeks of purchase, cocks meant for this program in future should be gradually introduced to feeding on grains and range life before distribution to keepers.

There is need to do a well coordinated monitoring of the flocks especially on the fairly closed population on Foge Island in order to scientifically document and quantify the genetic improvements resulting from this program.

Considering the success so far on Foge Islands and the many requests from other fishing villages, the program of poultry improvement described in this report should be extended to more fishing settlements around the Kainji Lake.

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