

## Assessment of Bird-Friendly Farming and Fishing Activities in Hadejia-Nguru Wetlands, Nigeria

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**Abstract:** This study assesses the possibility of bird-friendly farming and fishing activities as well as its effects on bird conservation in Hadejia-Nguru Wetlands. About 2 communities, Matara Uku and Lafiya were selected on the basis of location within the wetlands, types of natural environment as well as proximity to major river channel. Proportional representation of farmers and fishermen were done using a modified I in k sampling procedure, as recommended for social research in wildlife. Farmers were primarily male, older and earned a higher income than fishermen. Farming is all year round in the 2 communities while community ponds were allowed to fallow by fishermen in both communities, so as to ensure continuous exploitation of sizeable catch. Seasonal changes affected size of farmland cultivated by almost all respondents but not the number involved in farming activities. Farmers move closer to rivers/water channels in dry season (upstream), as well as encroaching into grazing reserves for coping with flood (downstream). Bird species that were regarded as pest was a greater concern to farmers than to fishermen. Most farmers unlike fishermen were willing to spend more money on pest management that might benefit the environment. Methods used in controlling bird pest in the area include arms (guns and traps) 68 and 37%; Pesticides (34 and 0%); Models (91 and 66%); Netting (23 and 68%) as well as early harvesting (84 and 0%) for farmers and fishermen, respectively. Most farmers and fishermen were ready to embrace any vibrant alternatives to killing wild birds in controlling their attack on farmlands and ponds. However while most farmers would like to attract insect eating birds to their farms, the opposite was the case with fishermen. Policy recommendation was made based on the survey results.

**Key words:** Birds, farmers, fishermen, pest control, Hadejia-Nguru Wetlands, Nigeria

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### INTRODUCTION

Human population at the Hadejia-Nguru Wetland's (HNW) communities competes with one another and with wildlife species for available rangeland and water resources. Also, with the loss of arable land to desertification in the North-Eastern part of the country. The pressure on the highly fertile rangelands of the area increased and the consequence movement of land cultivators and pastoralists towards the basin (IUCN, 2002). As a result of the thirst for water in such an area where it is scarce, large numbers of people are migrating into the region, especially during the years of severe drought (Adams *et al.*, 1993).

Hence, the wetland has a population density that is ten times that of the surrounding areas (RSPB, 2002). Hadejia-Nguru Wetland (HNW) supports at least 250 species of flowering plants, over 136 types of aquatic flora

and fauna and >103 species of fishes and 378 species of birds (Birdlife International, 2006). All these wild plants and animals depend on one another and the flood for survival and so many people depend on them for their livelihood. HNW falls in an area regarded as marginal land whose use is limited by physical and economical factors and which therefore makes it unproductive to extensive agriculture, however the wetland creates an economical and productive possibility in the midst of such an unproductive area (Adam, 1993).

With increasing population and expanding all year round irrigated farming, the HNW which serves as home, feeding and breeding ground for many birds species of both local and international importance has been put under intense agricultural role. Hence, Lemly *et al.* (2000) reported that the conflict between irrigated agriculture and wetland conservation has reached a critical point at global scale. Not only has local biological diversity suffered,

including the extinction of highly insular species but a ripple effect has impacted migratory birds world wide. Jacobson *et al.* (2006) argued that farms can provide good habitat for birds. It was also argued that farm management could help increase wild animal numbers and diversity, especially for birds. It was further stressed that not only might farms benefit birds but also birds might benefit farmers. This was earlier echoed by Adams *et al.* (1993), Okaeme *et al.* (1988) and Okaeme (1991). Some practices used by farmers do not help sustain birds. Ajayi (1971), Egbor (1977) and Olayide (1981) confirmed that some farmers enjoy killing wild birds and other wild animals for their meat.

Akinyemi and Oduntan (2004) made it known that the killing of wild animal is not an activity in which people engage in for the purpose of deriving leisure from it, rather it is an activity associated in one form or the other with the upliftment of living standard of people. However, some farm practices could help promote bird diversity. One technique is to reduce pesticide use. Another technique is to increase plant diversity on farm, as well as the inclusion of perch sites in field for foraging birds. All of these could help increase the number of insects eating birds which could help in controlling the action of parasitic insects on farmlands.

Wild birds could also help lower the population of aquatic insect pests and the larvae. Also, their dropping is a source of feed to fishes in the water. This study assesses the possibility of bird-friendly farming and fishing activities as well as its effects on bird conservation in Hadejia-Nguru Wetlands (NHW).

## MATERIALS AND METHODS

**Description of study area:** HNW lie on the southern edge of the Sahel savanna in north-eastern Nigeria. The area is a flood-plain complex, comprising mixture of seasonally flooded lands and dry uplands. Prior to the droughts of 1970s, the wetlands covered an area of about 4,125 km<sup>2</sup> but are now reduced to 3,500 km<sup>2</sup> (Birdlife International, 2006). The wetland is supplied by the Hadejia and Jama are rivers. The Jama are arises in Jos Plateau and the Hadejia in the hills around Kano; they both join to form the Yobe river which discharges into lake Chad.

An area of confluent drainage has been formed in the wetlands with multiple river channels and a complex pattern of permanently and seasonally flooded land and dry land. The wetlands are nationally and internationally important for migratory waterfowl. The wetlands support extensive wet-season rice farming, flood-recession agriculture and dry season irrigation. The flood plain also

supports large numbers of fishing people, most of who also farm and is grazed by very substantial numbers of Fulani livestock.

**Survey methods:** Research was undertaken in 2 separate communities of the wetlands-matara Uku and Lafiya. The villages were selected on the basis of a number of criteria including general location within the wetlands, types of natural environment as well as the proximity to river or major channels. Matara Uku is situated along the Marma channel with 216 registered farmers and 241 registered fishermen while Lafiya is situated downstream of the Burum Gana river with 379 registered farmers and 213 registered fishermen.

Proportional representation of farmers were done using a modified I in K sampling procedure as recommended for social research in wildlife (Ajayi, 1979; Akinyemi, 2000) where K represents 10, I = 3 i.e., 3 farmers out of 10 were randomly selected and sampled given a total of 30% of farmers and fishermen in each community. A grand total of 117 farmers and 136 fishermen were interviewed. Data were analyzed using descriptive statistics and regression.

## RESULTS AND DISCUSSION

**Socio-economic structure:** Farmers were primarily male Table 1. They were older and earned a higher income than the fishermen. The average age of the farmers was 52 years while that of the fishermen was 41 years. Past researchers have found that younger farmers or fishermen with higher education level are more likely to recognize harmful environmental effects (Jacobson *et al.*, 2006). They were more willing to adopt new technologies that have less impact on the environment. Also, farmers and fishermen with a higher income may show increased adoption of conservation techniques. This may be due to greater financial stability.

None of the respondents belong to any environmental club. In fact, a cross examination survey revealed that there were no such clubs in any of the villages sampled. However, all the respondents belong to either the farmer's association or fishermen's associations since samples were taken from registered farmers or fishermen. Only 28% of farmers and 9% of fishermen attended their monthly associations' meetings >8 times in a year while 27 and 79%, respectively attended twice or less than in a year. This may, however be detrimental to both the development of agriculture and environmental conservation effort since, the meetings serves as one of the most vibrant media where agricultural and conservation agents educate farmers.

**Table 1: Comparison of socio-demographic backgrounds and other characteristics of farmers and fishermen in study areas**

Variables	Farmer (%)	Fishermen (%)	Variables	Farmer (%)	Fishermen (%)
<b>Sex</b>			<b>Belong to any professional organisation</b>		
Male	93	76	Yes	0	0
Female	7	24	No	100	100
<b>Average age</b>			<b>Attendance at ** professional association meetings</b>		
≥55 years old	31	18	2 or less a year	27	79
40-54 years old	48	43	3-8 a year	48	11
<40 years old	21	39	>8 a year	25	9
<b>Education</b>			<b>Percent of income from farming/fishing**</b>		
Literate	17	6	≤25	3	53
Illiterate	83	94	25-75	37	28
<b>Expect children to farm/fish**</b>			>75	60	19
Yes	69	58	-	-	-
No	9	11	-	-	-
Do not know	22	31	-	-	-
<b>Belong to any environmental club</b>			-	-	-
Yes	0	0	-	-	-
No	100	100	-	-	-

\*\*Indicates significant difference ( $r = -0.9$ ;  $p < 0.01$ ) between farmers and fishermen (as shown in statistical tests of these data)

**Table 2: Percentage farm size cultivated by farmers in dry season at the study sites**

Hectares	Study site			Study sites (dry season)		
	Mat.Uku (%)	Lafiya (%)	Mean (%)	Mat.Uku (%)	Lafiya (%)	Mean (%)
*<0.1	41.9	56.6	49.3	53.9	38.9	46.4
**0.1≥5.99	24.4	30.2	27.3	20.5	31.5	26.0
***6≥9.99	17.4	13.2	15.3	14.1	24.1	19.1
****≥10	16.3	-	8.2	11.5	5.6	8.6

\*represents subsistence farming, \*\*represents small scale farming; \*\*\*represents medium scale farming; \*\*\*\*represents large scale farming

About 3 out of every 5 farmers obtained >75% of their income from farming only while about one out of 5 fishermen obtained the same income level from fishing. However, only 3% of the farmers had ≤3% income from farming while more than half (53%) of fishermen got only 25% or less income from fishing activities. There is a negative correlation relationship ( $r = -0.9$ ;  $p > 0.01$ ) between the percentage income obtained from farming when compared with what was obtained from fishing by farmers and fishermen in the study area. All the farmers cultivate food crops all year round (i.e., in both dry and wet seasons).

Table 2 shows the percentage farm sizes cultivated by farmers in both seasons at the two villages. Although, the communities upstream are characterized with shortage of water in dry season (drought) while those downstream experience flooding in wet season thereby reducing available landmass for cultivation. Yet, seasonal changes affected sizes of farmland cultivated by almost all respondents but not the number involved in farming activities.

Hence, drought in dry season (at Lafiya) and flooding in the rainy season (at Matara Uku) had little or no impact on farming activities in the wetland. In coping with the drought, farmers in Lafiya took to irrigation practice as well as moving closer to rivers and water channels, occupying shorelines that serve as feeding, breeding and playing ground for many water birds and

other animal species. The displacement of such bird species could lead to their starvation, exposure to predation or danger, infertility which altogether threatened their existence.

In Matara Uku on the other hand, farmers drained water bodies as well as encroached into grazing reserves which also serve as feeding ground for several bird species and livestock.

**Opinion about pest management:** Pest management was a greater concern to farmers than to fishermen (Table 3). More farmers (96%) reported that pest control is an important issue as compared with 54% of the fishermen. Many (91%) farmers compared with an average of 46% fishermen affirmed that insect pests cause considerable damage to their harvest.

It was reported that leaf-eating insects are a serious problem and that pest control costs a considerable amount of money with indication of 79% farmers and 21% fishermen. Though, both the farmers and fishermen look out for pest regularly but farmers (96%) looked out for pest more when compared with the fishermen (73%).

However, it was observed that the fishermen were more on the look out for pest on community ponds than in the open (general) water bodies. In addition, both farmers and fishermen thought their current pest management strategies did not affect the

Table 3: Opinions of farmers and fishermen about pest control and birds in the study sites

Opinions	Farmers (%)			Fishermen (%)		
	Agree	Neutral	Disagree	Agree	Neutral	Disagree
Pest control is an important issue for me**	96	3	1	54	12	34
Insect Pest cause considerable damage to my harvest**	91	4	5	46	14	40
I spend a considerable amount of money on pest control **	79	18	3	21	8	71
I am satisfied with my current pest management strategies**	75	16	9	48	39	13
I look out for pest regularly**	96	1	3	73	21	6
I think my current farm/fishing management activities do not affect the environment	92	6	2	95	5	0
If there were effective alternative to using pesticides I would use them	95	4	1	99	1	0
I would spend more money on pest management that might benefit the environment**	83	15	2	37	30	13
I recognize most of the different kinds of birds on my farm/pond	95	2	3	81	11	8
Some birds do not cause damage to crops/fish harvest	96	2	2	99	1	0
I do not mind having birds on my farm/pond that do not cause damage to crop	79	18	3	54	12	34
Some birds eat only insects	80	19	1	46	14	40
Birds could help lower insect population on farm/water bodies	83	15	2	21	8	71
I would like to attract birds to my farm/pond if they lowered insect population** r = -1	96	3	1	13	39	48
If there are alternatives to killing wild birds in controlling their attack on farm/pond, I will use it	81	14	5	88	9	3

\*\* Indicates significant difference between farmers and fishermen (as shown in statistical test of these data)

environment. More were willing to use alternative to pesticides. Most of the farmers unlike the fishermen would spend more money for pest management that might benefit the environment. Even though most of the fishermen were willing to use Environment-Friendly Pest Management strategies (EFPM), many of them would not agree to spend more money on EFPM. This is because the fishermen felt they do not make enough money to make ends meet and they also complain also government agent not given them support like they do for farmers.

**Opinions about birds:** Almost all (95%) farmers reported recognition of most of the bird species on their farms (Table 3). About 3 quarter of the farmers reported that Quelea bird (*Quelea quelea*) among others is the most troubling bird pest of greatest concern to them. Also, many of the fishermen reported recognizing most of the bird species on the water bodies in the area. Among those described to be of great significance are the white stork bird (*Ciconia ciconia*), *Dendrocygna viduata*, *Egretta ardesiaca* and *Pelecanus rufescens*. These participating farmers' perceptions echo past findings of Birdlife International (2006), IUCN (2002), Garba-Boyi *et al.* (1997) and Wetland International (2005).

Past studies have shown that the afore-mentioned bird species were available in the study area, thus validating the response of the rural dwellers as well as establishing their opinion on bird species regarded as pest in the study area.

Wetlands and irrigated farmlands that characterized HNW serves as home, shelter, feeding and breeding place for birds (especially water fowls) because of great variety of biodiversity (such as fishes, amphibians, insects, some reptiles, etc.) available as food for birds. Most (83%) farmers and few (21%) fishermen thought that birds could help lower insect populations on he farms and twater

Table 4: Communication issue and Pest Management by farmers and fishermen in the study areas

Variables	Farmers (%)	Fishermen (%)
<b>Primary sources of pest management information*</b>		
Govt officials	37	12
NGO officials	33	13
Chemical dealers	67	0
Colleagues	55	51
<b>Method of controlling wild birds attack on farm/ponds*</b>		
Ammunitions	68	37
Pesticides	34	0
Netting	23	68
Models	91	66
Early harvesting	84	0
Membership in professional association	73	47
Membership in environmental organization	32	17

\* Surveyed farmers and fishermen were allowed to list >1 source

bodies. However, while many (79%) farmers would like to attract birds to their farms, the opposite was the case with (13%) fishermen. Most of the farmers (81%) and fishermen (88%) were ready to embrace any vibrant alternatives to killing wild birds in controlling their attack on farmland and ponds.

Even though, majority of the farmers and fishermen (Table 4) use amenable methods such as models/statue/scarecrow (91 and 66%, respectively) and early harvesting (84 and 0%, respectively) to control birds damage to crops, an alarming 68% farmers and 37% fishermen still shot at wild birds on their farmland in addition to the use of other methods in controlling bird damage.

Other methods used included netting (23 and 68%) and pesticides (34 and 0%). The use of pesticides and early harvesting of crop were not represented to the fishermen in the study areas as shown in Table 4. Incentives and barriers for bird-friendly farming and fishing. In this study, most farmers were willing to attract birds to their farms. In past studies, farmers' attitudes

towards the environment have been negative (Jacobson *et al.*, 2006). In this study, almost all of the farmers are willing to have birds on their farms if they do not cause crop damage.

These positive attitudes suggest opportunity for improvement of bird habitats on farmlands in Nigeria. Certain factors could influence whether a farmer want to attract birds to his farm. The following factors were explored to understand the barriers and incentives to establishing bird-friendly farms. One factor is that farmers would be more likely to want to attract birds for pest control if they had reported considerable pest control costs and the bird is not a pest itself.

Another was whether farmers who had experienced crop damage by birds would still want to attract birds to their farms. In addition, when the responses of farmers who reported spending a lot was compared to the one who reported spending a little amount of money on pest control, it was shown that this factor influenced the participating farmers' willingness to allow or not allow birds on their farm be it a pest or not. This finding is contrary to that of Jacobson *et al.* (2006) who reported that neither the amount expended on pest control nor farmers' knowledge about insect-eating birds nor birds on the farms influenced the participating farmers' willingness to attract or allow birds on their farms.

**Social participation and communication:** Farmers and fishermen obtained information in different ways, (Table 4). Most of the farmers in the study areas obtain their information on pest control from either chemical companies or from their colleagues. However, the primary source of information for most of the fishermen is their colleague (i.e., co-fishermen). Few farmers and fishermen also obtained information from governmental and non-governmental officials. If we are to make any changes in current farming practices to benefit wild birds, information should better be made available to farm through these channels, especially via their professional association or rural heads from where it can then be passed from one farmer or fisherman to the others.

## CONCLUSION

This study revealed HNW harboured fishermen and farmers majority of who derived >3 quarter of their income (earning) from farming. Also, pest management was a great concern to farmers than to fishermen. Both farmers and fishermen could recognize bird species that preyed on their farms/ponds and were ready to embrace vibrant alternatives to killing wild birds on farmlands/ponds. Also, many farmers and fishermen agreed that birds could

help lower insect population on farms/ponds in addition to increasing soil and water fertility and making food available for fishes via their droppings. However, farmers unlike fishermen were willing to attract friendly birds to their farm for their benefits. In general, respondents income determines their willingness to allow birds on their farms.

Local dwellers are not adequately integrated in conservation activities at the wetland communities. Management of the Dagona Waterfowl Sanctuary as well as NGOs working in the area need to organize conservation clubs across the wetland region with attractive benefit for members. All resource users however, need to be educated on the importance of the continuous existence of the wetland and associated plant and animal species for the benefit of all.

Since, most of the farmers and fishermen alike obtains information from either chemical companies or colleagues. Hence, information on environmental friendly pest controlling should better be made available to farmers and fishermen via these channels if we are to make any changes in current farming practices to benefit wild birds in the area.

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