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Status of government/NGOs funded fish farming projects in Nyeri, Muranga, Kirinyaga, Embu, Tharaka Nithi and Meru, Kenya

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Abstract
This study provides and assessment of the nature of ponds and fish types in fish farms in Nyeri, Muranga, Kirinyaga, Embu, Tharaka nithi and Meru Counties in the year 2015. It was done in February and March 2016. During the assessment, the general status of the groups and the projects were evaluated. In particular the team looked into the groups' characteristics, funds utilization, and management of the projects, project sustainability and adoption by community members. The projects benefits to the community, challenges, opportunities and linkages were also assessed. Even though the projects are up and running, there is room for improvement to ensure that the projects are sustainable and achieve the intended benefits of livelihood improvement and conservation of natural resources.
The consequences of poor training and skills in fish farming has resulted in stunted slow growing Nile tilapia and uncontrolled cannibalism in African catfish. Reduced growth rate in tilapia, reduced production in catfish and low quantities of honey produced are contributing factors to delusion of otherwise enthusiastic farmers who have embraced beekeeping and fish farming as livelihood improvement options. Lack of training and skills in modern fish farming by both farmers and the extension workers require urgent attention by all stakeholders. Capacity building of the extension workers is crucial for proper technology transfer to farmers. Opportunities for farmers' access to the required training and skills need to be deliberately created. Establishment of successful model fish farms and apiaries within farmers' reach would create such technology transfer opportunities. To achieve this, clear guide lines are required for coordination of the beekeeping and fish farming sector. The entire fish farming value chain and market structures need to be developed.

Keywords: fish ponds, status, fish types, central Kenya

1. Introduction
Kenya has an estimated 80,000 ponds throughout the country with production of over 22,000 metric tonnes (Farmerstrend, 2017) [3]. The Tilapine species constitute about 90% of aquaculture production in Kenya (Mwangi, 2008) [9]. The Government recognizes the constraints hindering aquaculture growth and development and realizes that the sub-sector can play an important role in poverty alleviation of rural populations.
The increase in ponds is due to continued sensitization (FAO, 2010) [5] on the need for alternative proteins sources other than the red meat. However, catching fish from the wild can't always fulfill the consumer's demand in Kenya and mostly in high altitude regions. Fish farming has become a major source of income for thousands of Kenyans (KMFRI, 2017) [7] contributing 2% of the national fish production.
The goal of the project is to contribute to reduction of rural poverty Nyeri, Muranga, Kirinyaga, Embu, Tharaka nithi and Meru Counties through: increased sustainable food production and incomes for poor rural households living in the project area and through sustainable management of natural resources.
To ensure sustainability and success of the fish farming project, Karatina University; with its pool of experts in fish farming did a quick assessment of the funded projects status between January and March 2016.

The objectives of the assessment were to determine the status of the projects in the following areas:
1. Funds utilization
2. Benefits (social, income, environment)
3. Project sustainability
4. Adoption
5. Opportunities, challenges and linkages

A survey of the status of fish farming projects was done in six counties, namely: Meru, Tharaka Nithi, Embu, Kirinyaga, Murang'a and Nyeri. The counties fall within the upper Tana catchment namely the Mt. Kenya and the Abardares ecosystems. Groups of fish farmers were interviewed between January and March 2016, to gather information on the status of the projects. Face to face discussions were held with the groups on the projects sites.

2. Interview Design
Before starting the face to face interview, an interview guide

had been prepared. The guide was only available to the interviewer and not the respondents (fish farming groups). Open ended questions were asked and probing questions were asked where further information was necessary. During the discussions notes were taken on all the responses and later formed the data for analysis.

3. Analysis of the Findings

All the responses were entered into the excel computer program and sorted according to the objectives of the survey. The data was described using descriptive statistics mainly frequency distributions inform of charts and tables. The computer programme, Sigma plot version 7.0. and JUMP Statistical programme were used for the analysis of the findings.

4. Distribution of fish farming groups in the six counties

Fourteen fish farming groups were included in this project. The groups were located in Nyeri, Muranga, Kirinyaga, Embu, Tharaka Nithi and Meru counties. Four counties had each two funded fish farming groups while Nyeri and Embu counties had each three funded groups (figure 1).

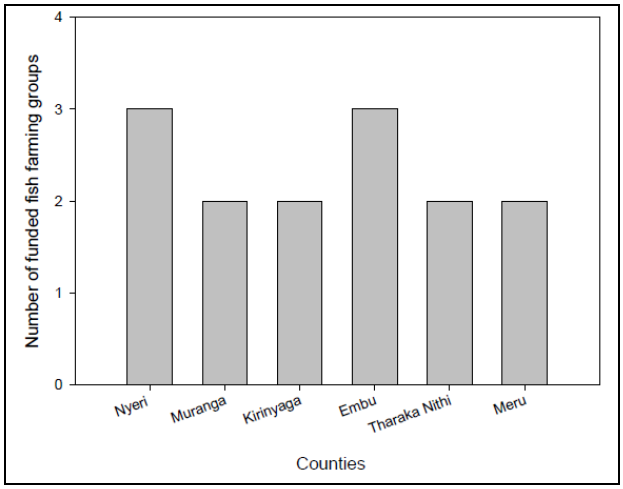

Fig 1: Number of fish farming groups in Nyeri, Muranga, Kirinyaga, Embu, Ntharaka Nithi and Meru counties

5. Membership and Gender Composition

The group membership ranged from 13-60 members. The total number of fish farmers in the fourteen groups surveyed was 332, although the current active membership was 264, showing a 20.5% decline in membership. The groups with the highest member decline were Kieni East Aquaculture, Rwanyange, Tilapia self-help group and Mathira respectively. Member decline was mainly attributed to disappointment when the fish farms had not yet started bringing in income, coupled by the requirement for members to start contributing money to buy fish feeds. Nevertheless, membership in nine groups has remained steady (figure 2).

Nevertheless, 58 fish farmers started fish farming initiatives on their own after observing and learning from fish farming projects. The status of these fish farms was not established.

All the 14 groups surveyed had both male and female gender. Six groups had more females while eight groups had more males than females (figure 2).

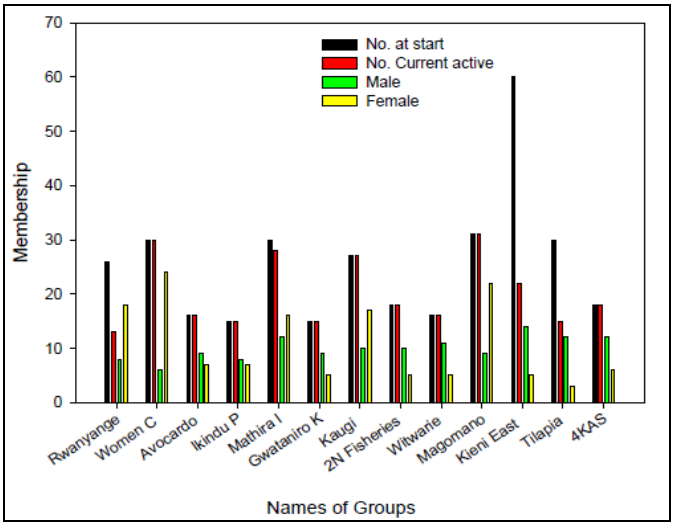

Fig 2: Membership to fish farming groups in Nyeri, Muranga, Kirinyaga, Embu, Tharaka Nithi and Meru counties. Also shown is the number of male to female members in each group.

Age of fish farming groups and adoption of fish farming practices

The age of the fish farming groups varied. Three groups were over 13 years, six were between 4 and 9 years, while four groups were one year old. Adoption rate of fish farming practices stood at 17.4 per cent with members of the community who observed and learned from fish projects being at 10.8%. Adoption by group members who started their own private fish farms was at 6.6%. There was no relationship between adoption rate of fish farming practices and the age of the group. In fact some of the oldest groups like Kaugi self-help group, Ikindu Primary and Avocardo group had minimal adoption, while younger groups like Tilapia self-help, Gwataniro and 2N Fisheries had higher adoption rates (r2= 1figure 3).

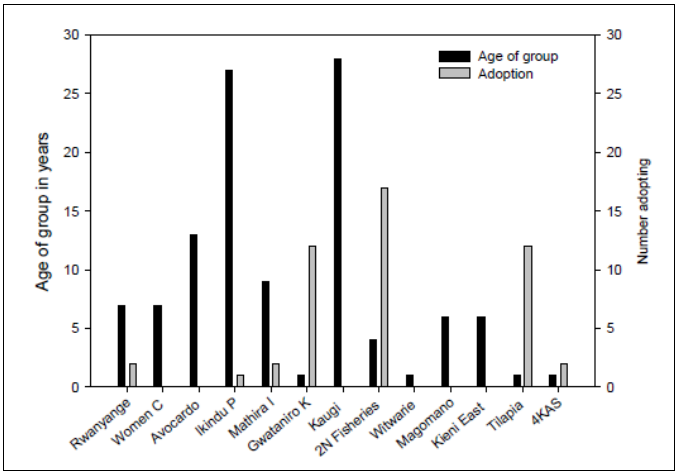

Fig 3: Relationship between the age of the fish farming group and adoption rate of fish farming practices in Nyeri, Muranga, Kirinyaga, Embu, Tharaka Nithi and Meru Counties.

6. Group Leadership

In all the fourteen groups, the leadership structures were well in place. Included were: the chairperson, vice chairperson,

secretary, vice secretary and the treasurer. All the groups had three committees: finance, procurement, monitoring and evaluation, in place. It was noted that in some groups, leaders (chairman/Chairlady, secretary and treasurer) doubled up as the chairpersons of the committees.

7. Pond Types and Sizes

All the fourteen fish farming groups employed different pond types for their fish rearing (table 1). Eighty one per cent of the fish ponds were liner ponds (fitted with liners), 6% were earthen and 13% were concrete ponds.

Table 1: Fish pond types, fish types, fingerling sizes, stocking density and sources of fish reared in Nyeri, Murang'a, Kirinyaga, Embu, Tharaka Nithi and Meru counties.

Group Name	Pond Type	Fish type stocked	Stocking density (number of Fish/m^2)	Size of fingerling at stocking (cm)	Sources of fingerlings
Rwanyange	Liner	Monosex Nile Tilapia	5	2	Jomesk
Women challenge to challenge	Liner	Mono sex Nile Tilapia	3.3	2	Kamiti Integrated
Avocardo group	Concrete	African catfish	6	2	Emmick Farm
Avocardo group	Concrete	African catfish	7	10	Emmick Farm
Ikindu primary	Liner	Monosex Nile Tilapia	4	2	Emmick Farm
Mathira Intergrated	Liner	Monosex Nile Tilapia	4	1	Emmick Farm
Gwataniro Karunda	Liner	Monosex Nile Tilapia	5.5	1	Jasa Fish Farm
Kaugi S.H.G	Liner	Monosex Nile Tilapia	3.6	2	Emmick Farm
2N Fisheries S.H.G	Liner	Monosex Nile Tilapia	7.4	1	Mwea AquaFish
Witwarie S.H.G	Liner	Monosex Nile Tilapia	6.7	2	Jasa Fish Farm
Youth Magomano	Liner	Mixed Nile tilapia	6.7	2	Kenya Canvas
Youth Magomano	Earthen	Mixed Nile tilapia	20	2	Kenya Canvas
Kieni East Aquaculture	Liner	African catfish	10	2	Sagana Fisheries
Tilapia Self Group	Liner	Monosex Nile Tilapia	6.1	2	Emmick Farm
4KAS	Liner	Monosex Nile Tilapia	13.3	3	Emmick Farm

Liner ponds were constructed in areas where the soils had low water retention while earthen ponds were built in areas where the soils had high water retention capacity especially in the wetlands. Concrete ponds were constructed in special cases especially in lower parts of Embu County where pets like ants destroyed liners by boring holes.

Concrete ponds were the most expensive to construct, followed by liner ponds and earthen ponds respectively. Nevertheless concrete ponds are more durable and require less maintenance. Though the liner ponds were the most preferred by the fish farmers, they posed several challenges if the farmers did not have the knowhow to install the liner correctly especially if the pond measurements were not accurate. Secondly in areas with water shortages and infrequent supply the liners got attacked by pests and also exposed to sun leading to tearing off; a major challenge we encountered in many groups.

Moreover in special cases like lower side of Embu county, the liner was attacked by some ants boring holes into it despite the continuous presence of water in the pond, a factor which led the group to endeavour into constructing concrete ponds despite the group having to source for funds and leaving the group in huge debts. All the ponds were approximately 300m2, although they took different shapes and dimensions depending on availability and shape of land on which the pond were being constructed. We observed shortcomings in pond construction in some groups such as poorly done embankments, soils falling into the pond water, improperly done water inlets and outs or a total lack of them, poorly fitted liners and poor sites for pond location.

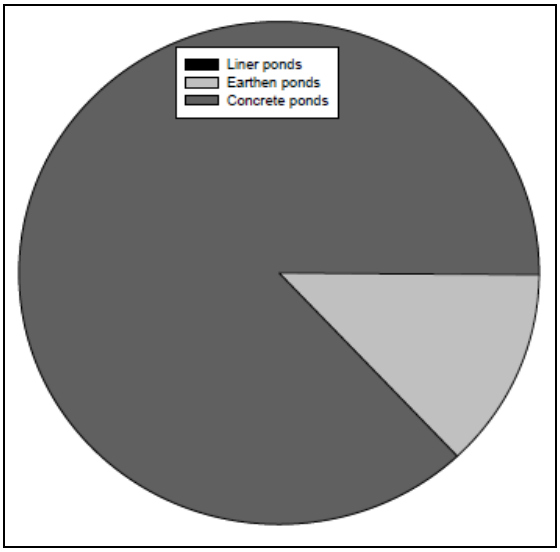

Fig 3: Pond types constructed fish farmers in Nyeri, Muranga, Kirinyaga, Embu, Tharaka Nithi and Meru Counties.

8. Fish Types

The fish types stocked by the groups were African catfish and Nile tilapia. The Nile tilapia was stocked either as monosex; meaning the group stocked only one gender (males), or mixed; meaning both male and females. For the African catfish there was no gender differentiation during stocking.

Sixty seven per cent of the groups stocked monosex Nile tilapia, 13% stocked mixed Nile tilapia while 20% stocked African catfish. Although 67% of the groups stocked monosex

Nile Tilapia, we encountered a major complaint from the farmers that their ponds had very many small fishes even after one year of rearing. When we assessed we found that there were fingerlings in the ponds, which is an indicator that the fingerlings were not a 100% monosex. This poses a great challenge to the farmers because as long as the females continued to breed, chances of growing big and reaching table size was small. In such instances, during harvesting farmers are likely to get a few big fishes (males) and very many small sized fishes (females) and tiny fingerlings.

There were no clear reasons as to why a group decided on which fish type to keep. In fact most of them did not know the management requirements of each type. Many groups indicated that they wanted to change the fish type they were currently rearing. Those who kept catfish wanted to change to Tilapia and those who kept Tilapia wanted to change to catfish. The reasons cited for those who wanted to change from catfish were decline in initial population stocked to almost a quarter of what they had initially stocked while the Tilapia farmers cited low growth rate and production of many young ones. Clearly the catfish farmers were not aware that the fish was a cannibal (ate other fishes) and required intensive management while the tilapia farmers were not aware of the management practices and environmental conditions required for optimal tilapia growth.

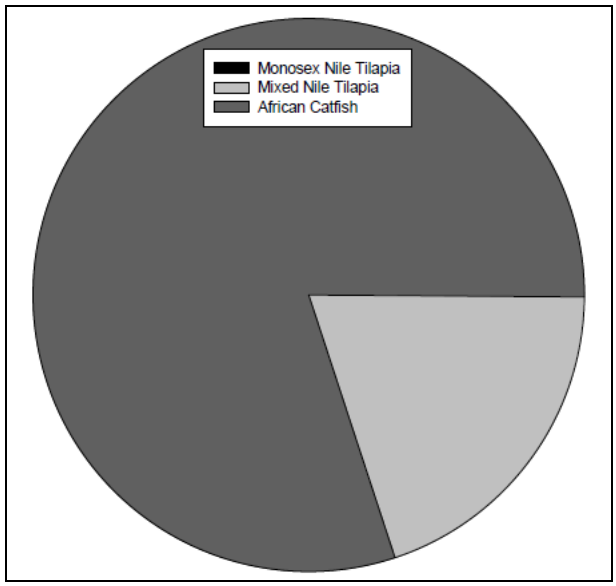

Fig 4: Fish types stocked by farmers in Nyeri, Muranga, Kirinyaga, Embu, Tharaka Nithi and Meru Counties.

9. Conclusions

Fish farming is a sustainable enterprise that requires less land and less labor as other agricultural enterprises. However, to make the enterprises successful livelihood options for farmers, there is need to train the farmers and empower them with the right skills and knowledge on fish farming. There is a need for establishment of well-run successful model fish farms within farmers reach where they can readily acquire knowledge and the required skills.

Additionally, completing the fish value chain and linking stakeholders in the aquaculture industry will help in sustainability, adoption and profitability. There should be quality control on the fingerlings and feed sold to farmers. Marketing structure and value chain should be well established.

Above all, it is essential to train farmers properly and adequately. Refresher courses for fisheries officer and extension workers on current fish farming knowledge and technologies are urgently required.

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