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Economic recovery project through the construction of ponds fish farms in NZULO, in the territory of Masisi, Province of North Kivu

Developed by VEFA FOUNDATION

I. INTRODUCTION

1.1 Presentation of the North Kivu province

The province of North Kivu is located astride the equator and covers an area of 60,409 km2 or 27% of the Congolese territory. It is limited to the north by the district of Ituri, in the Orientale province; to the east by Rwanda and Uganda; to the south by the sister province of South Kivu and to the west by Maniema.
North Kivu is a high altitude region whose relief is dominated by the immense fracture of the Rift Valley, bordered on either side by the mountain ranges which separate the hydrographic basin of the Congo River and that of the Nile. Its eastern part is full of the volcanic massifs of Virunga. In the North-East, the province is separated from Uganda by the Ruwenzori massif. In the extremity of its western zone, that is to say in the territories of Walikale and Lubero, it experiences an equatorial climate. The territory of Masisi experiences a semi-temperate mountain climate. The climate is relatively warm and less humid in areas located between 1000 and 1500m altitude. It is mild and more humid in the regions located between 2000 and 2500m and beyond, a true mountain climate with abundant precipitation and a temperature ranging from 0° to 10° C.

The province of North Kivu is one of the regions of the Democratic Republic of Congo with a high density with a population of 8 million individuals or 132 inhabitants/km2. The province of North Kivu is an agro-pastoral region, it has very immense economic potential. Agricultural activities and livestock breeding predominate in mild and humid areas. In its western part: Walikale and Lubero, the main activities are agriculture and forestry.

However, it should be noted that the province of North Kivu has experienced a deplorable economic crisis due to armed conflicts which shook the DRC for approximately a decade. This same situation results in a catastrophic decline in agricultural and livestock activities. This means that today, the diet of the population consists mainly of legumes (beans, peas, etc.), tubers (cassava, sweet potatoes, potatoes, taro, colocus, etc.), cereals (corn, rice, sorghum, etc.), green vegetables (cassava leaves, potato leaves, cabbage, amaranths, spinach, etc.). It should be noted that the diet cited above presents a deficiency in proteins and other nutrients of high nutritional value, in particular lipids containing essential fatty acids and group A vitamins.

The consumption of meat and fish is not within the reach of all budgets given the rarity and price of these foodstuffs on the market.

It is in this context that we are designing this project with the objective of producing a significant quantity of fish throughout the year and supplying local markets with animal resources very rich in proteins and nutrients with high food value.

1.2 **Presentation of the Project.**

The project aims to establish 4 fish ponds whose total production in a semi-intensive system would amount to 9.2 tonnes of fresh fish per year.
The farm will include nursery ponds, pre-grower ponds, grow-out ponds, broodstock ponds, a warehouse, and an office building.

The marketing of products will be carried out in local markets: in the city of Goma and its surroundings.

II. Justification for the choice of species to breed.

The choice is made on the species ***Oreochromis niloticus*** or **Nile Tilapia.** This choice was guided by the biology with a broad spectrum of tolerance of the species itself on the one hand, and the ecological and socio-economic conditions of the environment on the other hand.
Indeed, the North Kivu region benefits from an annual rainfall of around 1500mm and annual temperatures oscillating between 18 and 31°C respectively during the rainy season and the dry season. These climatic conditions agree quite well with the thermal requirements of this species whose optimal growth temperature is 28 to 32°C, the reproduction temperature is above 22°C and hatching usually takes place between 22 and 32°C.
In addition, *Oreochromis niloticus* exhibits a rapid growth rate in ponds in relation to water temperature; 28 to 32°C.

According to Mélard and Philippart, 1981b in Kestemont, 2007, in fish farming, Nile Tilapia has the following advantages:

1. Easy natural reproduction in captivity and rapid succession of generations (a few months).
2. Rapid growth even on a low protein diet.
3. Feed on plants (algae, higher plants) and micro-organisms, which gives them great potential ecological efficiency through a position at the first levels of trophic chains.
4. Existence of a wide range of strains adapted to a wide variety of environments, including brackish water and the sea.
5. High resistance to lack of oxygen, other chemical agents and diseases. 6. tolerate frequent handling well and adapt to the conditions of intensive or even super intensive breeding, particularly through artificial feeding.

7. Good food and organoleptic quality.

III. Justification for the choice of site.

The 4 fish ponds will be located in Nzulo, Masisi territory, in the province of North Kivu.
The choice of this site was motivated by the integration of a good number of environmental, soil, biological and socio-economic factors of the environment.

3.1. **Soil factors.**

The analysis of the Nzulo soil reveals a soil with a sandy-clay structure. This structure limits water loss in ponds due to the phenomenon of infiltration. Being located far from industrial zones and intensive agriculture, the soil of this area runs no risk of chemical or organic pollution.

3.2. Biological factors.

The city of Nzulo is located in an area where the presence of formidable fish predators (piscivorous birds, giant reptiles, etc.) is not reported. In addition, the water from the river which will serve as a source of supply for our ponds does not carry pathogens. The local population uses it for certain household purposes and we have never recorded cases of pathologies within species populating this watercourse nor among farmers using this water.

3.3. **Socio-economic factors.**

The city of Nzulo is located 24 km from the city of Goma. This situation will facilitate the transport of our products to the markets of the city of Goma (a city of more than 200,000 inhabitants) and to Nzulo and Bweremana; commercial circles.
However, let us point out the presence of electrical energy.

IV. Justification for the choice of breeding system.

The project aims to establish a semi-intensive pond farming system with the aim of producing at least 9.2 tonnes of fish per year. To do this, a complete breeding sector will be well structured from production to sale.
Indeed, the choice of this system was guided according to the ease of setting up the infrastructure, the availability of the quantity and quality of food to be distributed to the fish, market demand and means of transport consistent with current realities in the province of North Kivu.

Thus, using local labor, we will be able to build 4 ponds in total. Likewise, we will be able to ensure the transport of our production to all surrounding markets.

Part one: Construction of fish ponds

I. Zootechnics: Reproduction and breeding technique.

.1. Reproduction ponds (breeders).

They will serve as both spawning ponds and first rearing (until fish weighing approximately 0.1 g are obtained).
We will use 4 ponds of 2 ares each with a stocking density of 4 spawners per m2 of more or less similar size (200 to 250 g) with males slightly larger than the females, in a sex ratio of 3 females. for 1 male (LAZARD, 1986, PARREL et al, 1986). In order to obtain synchronized reproduction, spawning ponds must be stocked with female *Oreochromis niloticus* broodstock at an advanced maturation stage. The water temperature in the pond must be above 21°C to allow reproduction to proceed normally.

Under these conditions, we can expect a fry production of around 10 to 100 ind./m2/month during monthly emptying of the pond, or even 20 to 200 ind./m2/month per month. twice-weekly seining.

2. Nursery ponds.

These ponds will be used for the growth of fry of 0.1g for a period of one month until juveniles of more or less 5g are obtained. We will have 8 ponds of 4 ares each with a stocking density of 50 fry per. The fry will be fed with well-formulated foods and the survival rate at the end of m^2 this breeding phase will be
by around 50%.

3. Pre-growing ponds.

These ponds are intended for the production of fish weighing 20 g for a period of at least two months from juveniles weighing 5 g. We will have 4 ponds, the surface area of the pre-growing ponds will be 6 ares each and the stocking density will be 33 juveniles per m2
. These juveniles will be fed with pellets purchased from specialized companies and at the end of this breeding phase we hope to achieve a survival rate of 75%.

4. Growing ponds.

The grow-out ponds will be used to grow fish weighing 20g for a period of at least five months until fish of marketable size of more or less 250g are obtained. We will have 4 ponds of 6ares each with a stocking density of 25 fish per m2
. The fish will be fed with pellets rich in protein and energy and at the end of this breeding phase we hope to record a survival rate of 80%.

II. Fertilization, Feeding.

1. Fertilization.

Fertilization will be carried out in the ponds one to two weeks before stocking the fish. Fertilization will be practiced with the aim of increasing phytoplankton production given that the species raised; *Oreochromis niloticus* in the natural environment is mainly phytoplanktonophagous. We will use mixed fertilization (mineral fertilizers + organic fertilizers). The start-up fertilization will be 20 kg/are of poultry manure + 1 kg/are of NPK while the monthly fertilization will be 30 kg/are of poultry manure + 1 kg/are of NPK.

2. Food.

2.1. Feeding fry in nursery ponds.

The fry will feed on phytoplankton and zooplankton from the natural environment. An artificial food supplement will also be distributed in powder form. The food will be distributed four times a day for a daily ration of 10 to 8% of the live weight of fish.

We wish to provide the fry with a food with a crude protein/crude energy ratio of approximately 35/20 and a food conversion rate FCR= 1.5.

NB: In *Oreochromis niloticus* raised at 27°C, the optimal daily ration.

2.2. Feeding of juveniles in pre-growing ponds.

The juveniles will also feed on phytoplankton from the natural environment. An additional supply of artificial food will be distributed in pellet form. The food will be distributed three times a day for a daily ration of 5% of the live weight of fish. A feed with a crude protein/crude energy ratio of approximately 30/20 and a feed conversion rate FCR= 1.4 would be effective in ensuring better growth.

2.3. Feeding fish in grow-out and broodstock ponds

The fish will be fed on phytoplankton from the natural environment. An additional supply of artificial food will be distributed in pellet form. The food will be distributed twice a day for a daily ration of 2% of the live weight of fish. A feed with a crude protein/crude energy ratio of around 30/20 and a feed conversion rate FCR= 1.2 would be effective in ensuring better growth.

3. Estimation of the quantities of food to be distributed in the different livestock systems.

For food conversion rates estimated at 1.5; 1.4 and 1.2 respectively for rearing, pre-growing, growing out; the total ration to be distributed will be calculated according to the relationship **Rd = (Bf-Bi)*FCR.** This gives an idea of forecasting the quantity of food to be supplied and the cost to be allocated to the purchase.

III. Inventory management and product marketing.

Given that the markets targeted for the sale of our products are permanent throughout the year, we will undertake to supply these markets each month with 3 tonnes of fish. This is why our company will operate in a multi-cohort system. Our products will be sold part (2 tonnes) in the city of Goma for US$3/kg of fresh fish, and another part (1 tonne) in the city of Walikale for US$3/kg.

IV. Technique of different breeding phases.

On our farm, we plan to build 4 broodstock ponds, 8 nursery ponds, 4 pre-grower ponds, 4 grow-out ponds. Annual production will be subdivided into multiple cohorts. Thus, for the first year we will have 6 successive cohorts while from the second year 12 cohorts will be used.

1. Breeding technique

We want to stock 4 ponds of at least four acres each with juveniles weighing 10 to 20g. The estimated density is 5 fish/m2 . The fish will be fed with phytoplanktons from the natural environment coming from prior fertilization of the ponds, they will spend their entire growth phase there until they reach marketable size. At the end of the complete breeding period of at least six months, we hope to record a survival rate of around 50%.

2. Presentation of results

We hope to harvest 5 tonnes of fish for a six-month cycle, or 10 tonnes/year. The table below presents the various data relating to this production system.

3. Infrastructure, materials and cost.

The farm will include 1 brooding pond, 1 nursery pond, 1 pre-grower pond, 1 grow-out pond, a warehouse, and an office building. In the table below we present all the needs, the different materials and their cost at each level of production.

Fixed costs	Quantity	Unit price $	Total price ($)
Infrastructure			
Ground	40/40m 0		7000
Breeding ponds	10/10m 3000		3000
Nursery ponds	10/10m 3000		3000
Pre-growth ponds 10/10m 3000			3000
Growing ponds	10/10m 3000		3000
N/Total			19000
Materials			
Piping	5	30	150
Thermometers 0-50°C	1	15	15
Binocular microscope	1	300	300
Napkins	5	1	5
Fine mesh landing nets	20	2	40
Buckets	5	2	10
Dissection kits	5	14	70
Sennes	3	100	300
Large mesh landing nets 10		5	50
Plastic basins	10	5	50
Spades	7	10	70
Hoes	7	10	70
Shovels	7	10	70
Pickaxes	7	20	140
Wheelbarrows	4	70	280
Ordinary sales scale 2		30	60
Freezers	1	200	200
N/Total			1880
S/TOTALS Gen.			20880
Variable costs	**Quantity**	**Unit price $**	**Total price ($)**
Chemical products			
Organic fertilizer	1000kg 0.5		700
Chemical fertilizer	120kg	1	120
N/Total			820
FF operating costs		FF	800

Staff			
Aquaculturist Technician	1		500
Agro-fish farming technician	1		500
Workers	2		300
Watchman	2		500
S/Total			**1800**
Taxes and Taxes			500
Unexpected			1000
N/Total			**1500**
S/Total gen.			**4120**
GENERAL TOTALS			**25000**

XI. Project evaluation and outlook.

This project is feasible with a capital of **25,000USD.** Analysis of project performance shows that production will be beneficial.

Finally, on the food and health side, the project will slightly improve the health of the population by providing animal proteins as well as those from fish, which are very rich in essential amino acids and long-chain polyunsaturated fatty acids which have beneficial effects in preventing diseases. cardiovascular.

BISIMWA TRUTH

Head of Project