Cage culture of tilapia in Lake Kivu (Rwanda)

This project is the outcome of a group efforts to whom credit and technical responsibility go. The project document has been developed based on an assignment which was given to course participants and supervised by Dr. Abdel Rahman El Gamal as a part of the "Fish Culture Development" training course". This annual course is organized by the Egyptian International Centre for Agriculture - Egypt (EICA) and Japan International Cooperation Agency (JICA). The names, countries and pictures of the team members who developed this project document are shown in subsequent slides.

2015

Project Profile

- **Project Name:** Cage culture production of Tilapia
- **Location:** Lake Kivu, Rubavu District, Nyamyumba Sector
- **Source of Funding:** Credit
- **Project Cost:** 71,000,000.00 RF
- **Projected production;** 40 Tons tilapia per year
- **EXPECTED REVENUE:** 100,000,000 Rwanda Franc

Project team

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FOREIGN AGRICULTURAL RELATIONS
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Contents

Acknowledgment

- God
- JICA
- EICA
- DIRECTOR GENERAL - EICA
- World Fish Centre (Director and the core workers)
- Professor Abdel Rahman El Gamal – Our supervisor
- Our coordinators
- Group members


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INTRODUCTION
1.1 Background description

- The project is to produce **40 Tons** of Nile tilapia (Oreochromis niloticus) in Rubavu District, at Kigufi village
- Kigufi village is located on the Western part of Rwanda bordered with part of Lake Kivu.
- Lake Kivu is a fresh water body which is suitable for the establishment of cage culture. Its depth is about **400 Meters**.
- The temperature ranges 24^0C – 25^0C throughout the year and the lake has got high dissolved oxygen which is the ideal production of tilapia all year round.

INTRODUCTION (Continued)

- The market for fish product is in Rubavu town and Goma at the Eastern part of Democratic Republic of Congo
- The Rwanda population is almost 11 million
- The per capita consumption of fish in Rwanda is 2.5kg/year
- Demand for fish continues to grow because of the growing in human population as well as the stagnating production from capture fisheries which has remain a major source of fish in Rubavu District.

INTRODUCTION
1.2 Project justification

- It is estimated that, 15,000 Tons of fish is imported from Tanzania and Uganda. Out of which 60% is consumed locally. (Source: Rwanda Agriculture Board).
- So, the project intends to produce at least 40 Tons of Tilapia through cage culture to meet the short fall in fish demand.

2.0 PROJECT OBJECTIVES

2.1 General objective:

The main objective is to produce at least 40 Tons of Tilapia (*O. niloticus*) per year in Kigufi village at Rubavu District in Rwanda.

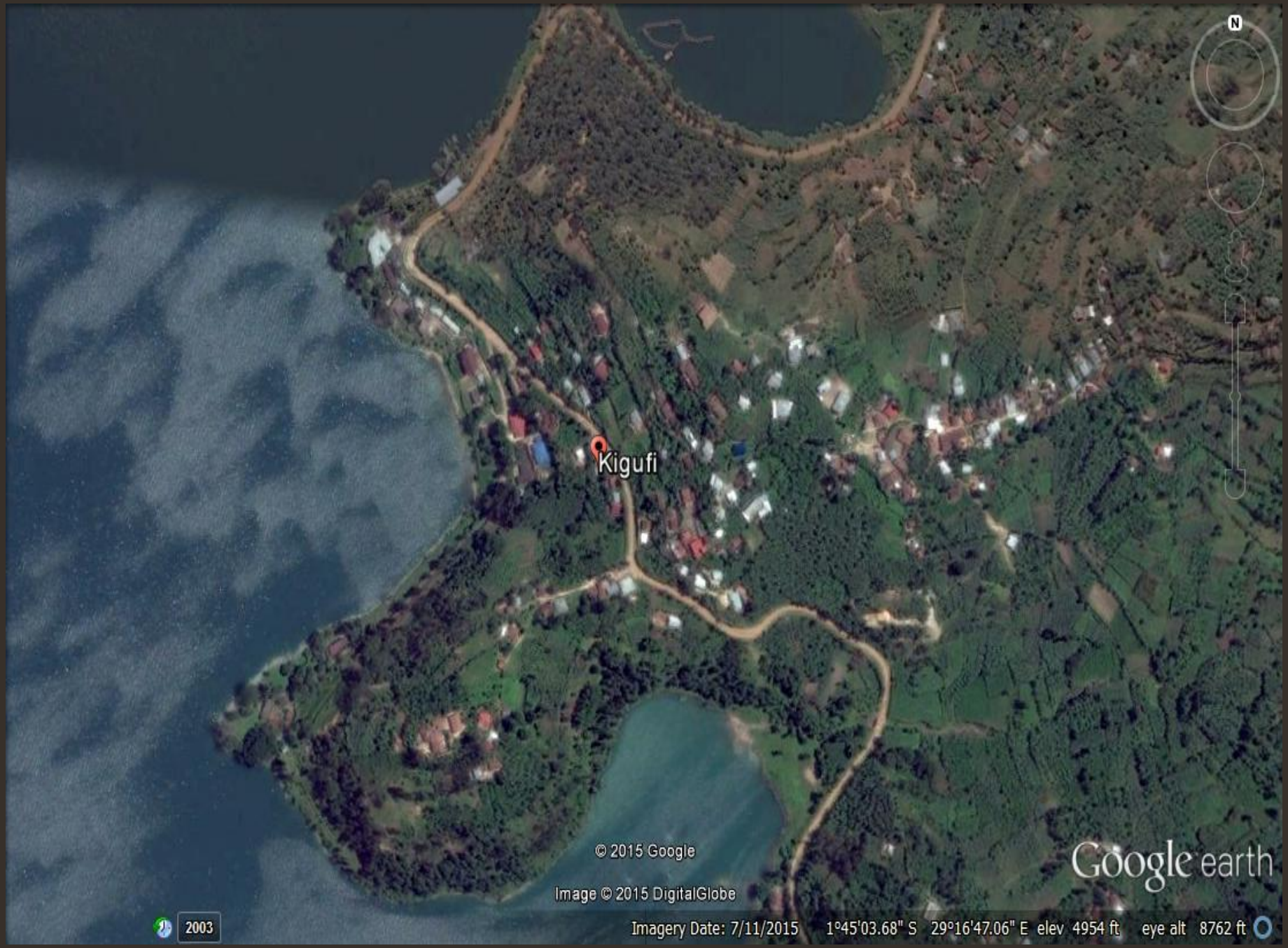
2.2 Specific objectives:

- To ensure production of 20 Tons Tilapia every 6 months (one cycle of production)
- To supply fresh Tilapia to Rubavu, Goma and other nearby districts,
- To reduce the importation of fish.

3.0 DESCRTIPTION OF THE PROJECT

3.1 Location

- Kigufi village is located on the western part of Rwanda bordered with a part of Lake Kivu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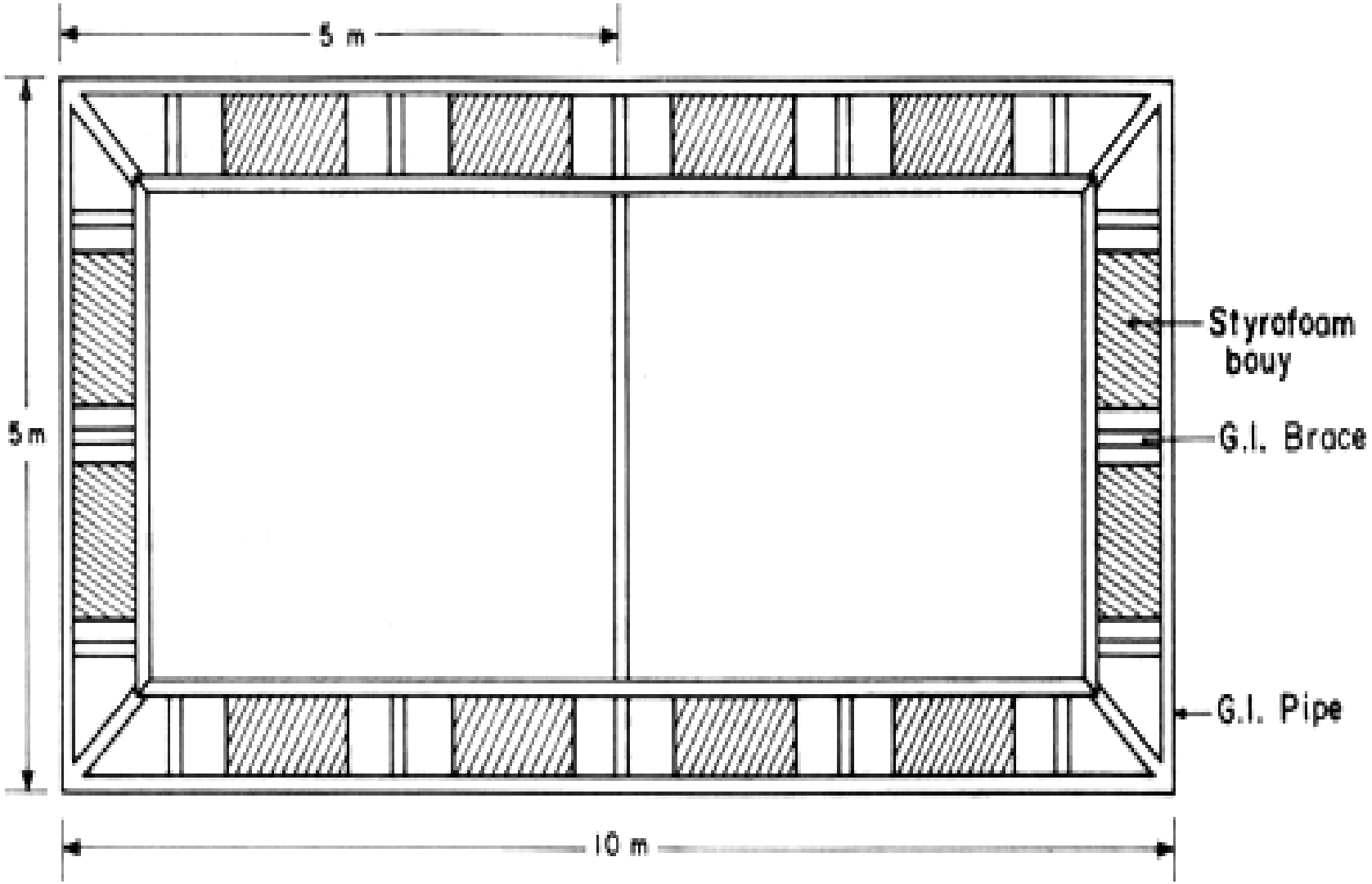
Kigufi
© 2015 Google
Image © 2015 DigitalGlobe
Google earth
2003
Imagery Date: 7/11/2015 1°45'03.68" S 29°16'47.06" E elev 4954 ft eye alt 8762 ft

3.2 A sketch and layout of cage design



4.0 PROJECT RATIONALE: THE CHOICE OF THE SPECIES

- The community at Rubavu District and Goma city have strong preference to tilapia as compared to other fish species due to taste, guarantee market (starting from small fish to large fish).
- Also, tilapia could be produced at low cost, its prolific breeding as well as its high tolerance to a wide range of adverse environmental conditions.
- Tilapia has been found the best candidate for cage culture in Lake Kivu.

5. CULTURE PRACTICES

5.1 Production system

The system of production will be Semi-intensive system which involves stocking of all male Tilapia fingerlings into the cages. Under this system, fish will be provided with floating feed of at least 30% protein.

5.2 Number and dimensions of Cages

The total planned number of cages is 10, each with a total volume of 100 cubic meters (5m x 5m x 4m deep).

CULTURE PRACTICES (Continued)

5.3 Source of fingerling

- Kigembe government hatchery will be the source of fingerlings required for the project.

5.4 Stocking density

- As planned harvest is 2 tons of tilapia/cage /production cycle, 10,000 fingerlings with an average weight of 25g will be stocked in each cage.
- In order to produce 40 tons of market-size tilapia/year, two production cycles are.
- Thus, it is estimated that 200,000 tilapia fingerlings will be required for the 2 production cycles for the whole project.

CULTURE PRACTICES (Continued)

5.5 Sampling

- Sampling will be done biweekly in the first month after stocking, then after on monthly bases till harvesting.
- About 100 tilapia specimens will be sufficient for each sampling of individual cage.

5.6 Feeding

- Fish –as they grow- will be fed at a rate starting with 5% after stocking and ending by 2% of body weight close to the harvest.
- Feeding rates will be adjusted weekly based on theoretical feed conversion estimate then based on biweekly/monthly actual sampling.
- During the first 2 months, fish will be provided with 30% protein feed and there-after 25% protein till harvest.

Table 1. Feeding regime

Culture period (months)	Types of feed	Feeding Rate (% ABW)	Protein inclusion (%)	Feeding frequency per day
1	Fingerling	5	30	4
2	Juvenile	3	30	4
3	Juvenile	3	25	3
4	Adult	3	25	3
5	Adult	2	25	2

6.0 FINANCIAL ANALYSIS

6.1 Source of funding

- The source of funds for the project will be a 5-year credit from a bank.
- The estimated annual interest rate is 19%

Table 2. The amount of annual payment to the bank during the five-year period

LOAN REPAYMENT IN RWANDA FRANC			
Year	**Loan at the beginning of the year**	**Interest due on the year 0**	**Annual equal installment**
0	71,000,000.0	71,000,000.0	
1	71,000,000.0		23,220,561.8
2			23,220,561.8
3			23,220,561.8
4			23,220,561.8
5			23,220,561.8
	TOTAL		**116,102,809.00**

6.4 Total Capital Investment

Table 5. Total capital investment for cage culture project (in Rwandan Franc)

S/N	Item	AMOUNT (RF)
1	Fixed costs	1,986,000.00
2	Operation costs	64,630,000.00
3	Annual depreciation valu	151,800.00
4	10 % Contingency	3,360,780.00
5	Pre-production expenses	871,420.00
	TOTAL	**71,000,000.00**

6.1 Fixed Costs

Table 3. Fixed costs of different items for the project (in Rwandan Franc)

S/N	ITEM	Unit	Quantity	Unit cost (Rwanda Franc)	COST (Rwanda Franc)
1	Plastic Drums		80	2,000	160,000.00
2	Bamboo tree		100	500	50,000.00
3	hacksaw blade		2	1500	3,000.00
4	Brush		4	1500	3,000.00
5	Net cages	100-m roll	4	75,000	300,000.00
6	Rope	Rolls	4	5,000	20,000.00
7	Needle		10	1,000	10,000.00
8	Sinkers		50	2,000	100,000.00
9	Storage house		1	1,500,000	1,500,000.00
	TOTAL				**1,986,000.00**

6.3 Operation costs

Table 4. Working costs for the project (in Rwandan Franc)

S/N	Item	Unit	Quantity	Number of days/ months	Unit cost (RF)	Cost (RF)
1	Fingerlings	pcs	200,000		30	600,000
2	Feed					
	a. Fingerling feed	kg	125kg/day	30 x2	800	6,000,000.00
	a. Juvenile feed	kg	240kg/day	60 x2	800	23,080,000.00
	a. Adult	kg	300kg/day	60 x2	800	28,800,000.00
3	Skilled labor		1	12 months	150,000	1,800,000.00
4	Casual labor		2	12 months	75,000	1,800,000.00
5	Fuel	Liters	5	30	1,000	150,000.00
6	Security	2	2	12 months	100,000	2,400,000.00
7	Pre-production expenses					871,420.00
	TOTAL					**64,630,000.00**

6.2 Annual depreciation and maintenance Table 3

S/N	Expenditure category	Amount (RF)	Annual depreciation %	Depreciation value (RF)
1	Plastic drums	160,000	20	32,000
2	Bamboo tree	50,000	30	15,000
3	Hacksaw blade	3,000	10	300
4	Brush	3,000	100	3,000
5	Net cages	300,000	30	90,000
6	Rope	20,000	30	6,000
7	Needle	10,000	5	500
8	Sinkers	100,000	5	5,000
	TOTAL			151,800

7.0 REVENUE

7.1 Total annual revenue

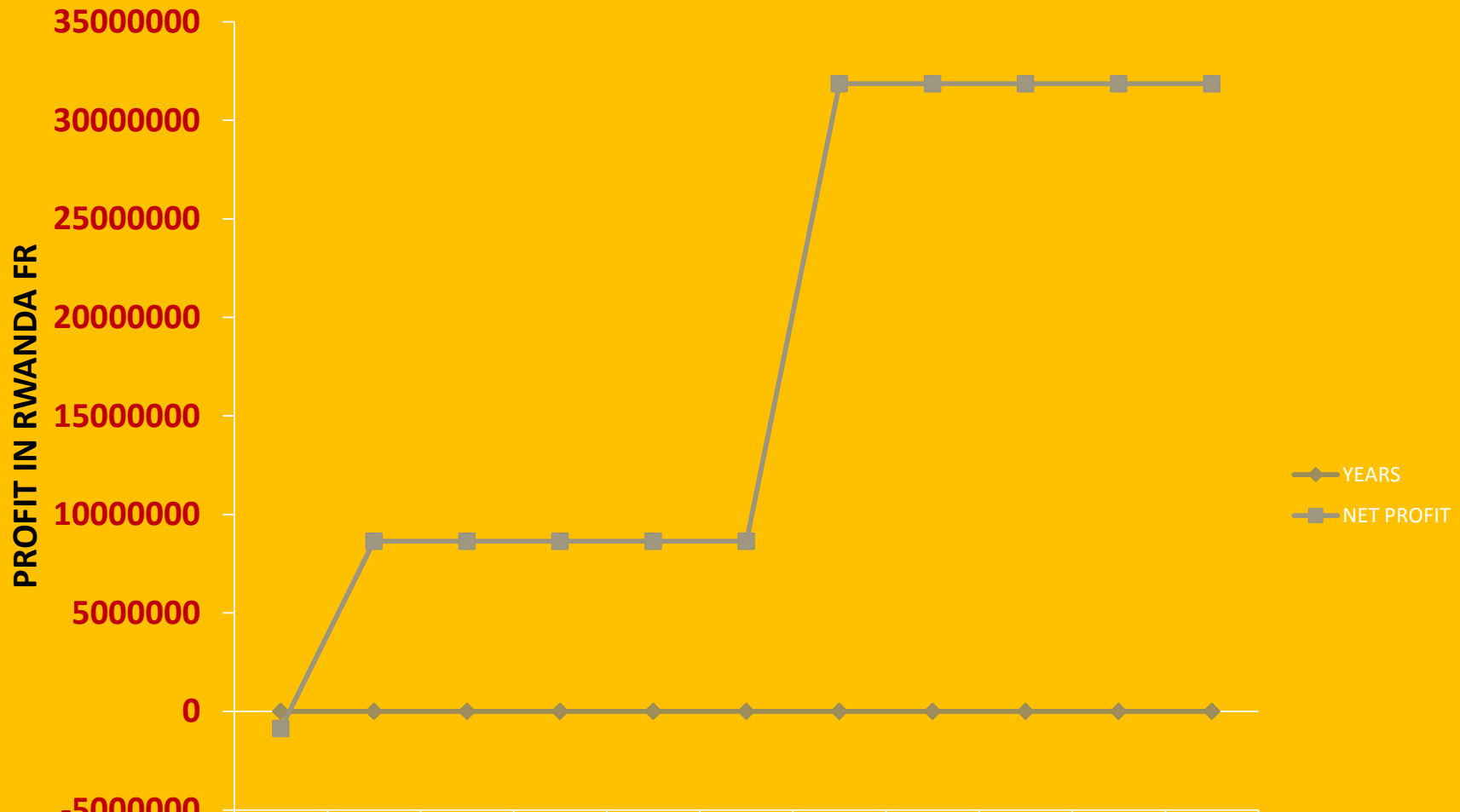
The revenue is based on the following calculations:

- The sale price of produced fish is **2,500 Rwanda Franc/kg**
- The revenue of one production cycle (6 months) = 50,000,000 Rwanda Franc
- Total annual revenue (2 production cycles) = **100,000,000 Rwanda Franc**

7.2 Net profit

ESTIMATES OF THE NET CASH FLOW FROM THE CAGE CULTURE OF TILAPIA OVER 10-YEAR PRODUCTION (IN RWANDA FRANC)						
YEAR	**TOTAL REVENUE**	**OPERATION COSTS**	**DEPRECIATION VALUE**	**10 %ANNUAL CONTIGENCY**	**ANNUAL LOAN REPAYMENT**	**NET PROFIT**
1	0	871,420 (Pre-production)	0	0	0	**-871,420**
2	100,000,000	64,630,000	151,800	3,360,780	23,220,561.80	**8,636,858**
3	100,000,000	64,630,000	151,800	3,360,780	23,220,561.80	**8,636,858**
4	100,000,000	64,630,000	151,800	3,360,780	23,220,561.80	**8,636,858**
5	100,000,000	64,630,000	151,800	3,360,780	23,220,561.80	**8,636,858**
6	100,000,000	64,630,000	151,800	3,360,780	23,220,561.80	**8,636,858**
6	100,000,000	64,630,000	151,800	3,360,780	0	**31,857,420**
7	100,000,000.	64,630,000	151,800	3,360,780	0	**31,857,420**
8	100,000,000	64,630,000	151,800	3,360,780	0	**31,857,420**
9	100,000,000	64,630,000	151,800	3,360,780	0	**31,857,420**
10	100,000,000	64,630,000	151,800	3,360,780	0	**31,857,420**

A graph showing the rate of profit expected in 10 years of production



	1	2	3	4	5	6	7	8	9	10	11
YEARS	0	1	2	3	4	5	6	7	8	9	10
NET PROFIT	-871,420	8,636,85	8,636,85	8,636,85	8,636,85	8,636,85	31,857,4	31,857,4	31,857,4	31,857,4	31,857,4

9.0 PROJECT REVIEW

- The project will be reviewed quarterly and annually in order to assess its performance against its objectives
- Monitoring is a continuous process which will be carried to ensure proper implementation of the project and act when necessary.

Table 7. The activity calendar during first year

No.	Activities	Months											
		Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
1	Site selection and surveying												
2	Collection of materials for cage construction												
3	Cage construction and installation												
4	Collection and stocking of fingerlings												
5	Collection of feed and feeding												
6	First harvest of fish and marketing												
7	Project Review, monitoring and evaluation												

Above activities in subsequent years are carried out as above with some adjustments as needed; surveying and site selection is carried out in the first year

CONCLUSION

From economically point of view, the project is feasible in such a way that, after the duration of bank payment at an interest mentioned earlier, it will operate as a self-dependence venture. It is expected that after five years of loan repayment, the overall net profit will be **31,857,420.00 Rwandan Franc** which is four times the initial profit generated for the earlier five years.

THANK YOU