

INTEGRATED AGRICULTURE- AQUACULTURE PROJECT PROPOSAL- SOLWEZI DISTRICT, ZAMBIA

This project is the outcome of a group efforts to whom credit and technical responsibility go. This project is based on an assignment which was given to course participants and supervised by Dr. Abdel Rahman El Gamal as a part of “Fish Culture Development” Training course” in 2014. This annual course is organized by the Egyptian International Centre for Agriculture - (EICA). Names, photos and countries of the team members are shown above and in a following slide

2014

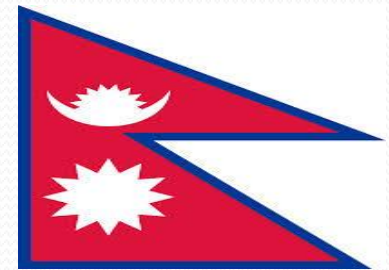
Members of the Group



Alick Grunnie Mbewe
Zambia



Bishnu Prasad Khanal
Nepal



Nabayunga Stella Walugembe
Uganda



Mohamed Zahangir Alam
Bangladesh



Sharaf El-Deen Zakaria Haroun
Sudan





EXECUTIVE SUMMARY

- Project is targeting 3 enterprises (Poultry rearing, Fish and Vegetable farming) on 3 hectares of land. Fish farming being the key enterprise.
- Its to be located in Solwezi district in Zambia.
- Zambia is a landlocked country in Southern Africa with a tropical climate and has a surface area of about 752,618 Km².
- In Solwezi District, however, the consumption of fish is even much lower due to the massive increase in population coupled with a lack of a major natural fishery in the province.

EXECUTIVE SUMMARY cont'd

- The per capita consumption of fish currently stands at 6.5 kg.
- The soils in the district are clayey loams, implying that they are good for fish farming.
- The most commonly cultured fish species in the province are *Oreochromis andersonii* (Three spotted Bream), *Oreochromis macrochir* (Greenhead Bream) and *Tilapia rendalli* (Redbreast Bream).
- The Project Proposal is about integration of *O. andersonii* with broiler chickens and vegetables.

EXECUTIVE SUMMARY cont'd

- Fish production target-14.35 tonnes
- 1800 broilers per batch with an average weight of 3kg per bird.
- 40,000 cabbage pieces per season, with an average of 0.8kg per head.

INTRODUCTION

- Integrated fish farming is a system of producing fish in combination with other agricultural/livestock farming operations centered around the fish pond
- Integrated aquaculture entails increasing the productivity of water, land and associated resources while contributing to increased food fish production
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INTRODUCTION cont'd

- This maximizes land utilization within a specific area, as it also utilizes land which would have otherwise been idle and also makes one system of farming benefit from the other
- This closed system reduces costs associated with aquaculture and makes use of land which would otherwise have been unutilised.
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- Fish convert plant and animal waste into high quality protein and simultaneously enrich pond mud for use as fertilizer on crop land

OBJECTIVES

General:

- To maximize aquaculture production by way of synergic interactions with other farming systems on the same piece of land.

Specific:

- To increase per capita fish consumption in Solwezi District and surrounding areas
- To reduce unemployment amongst the youth

OBJECTIVES Cont'd

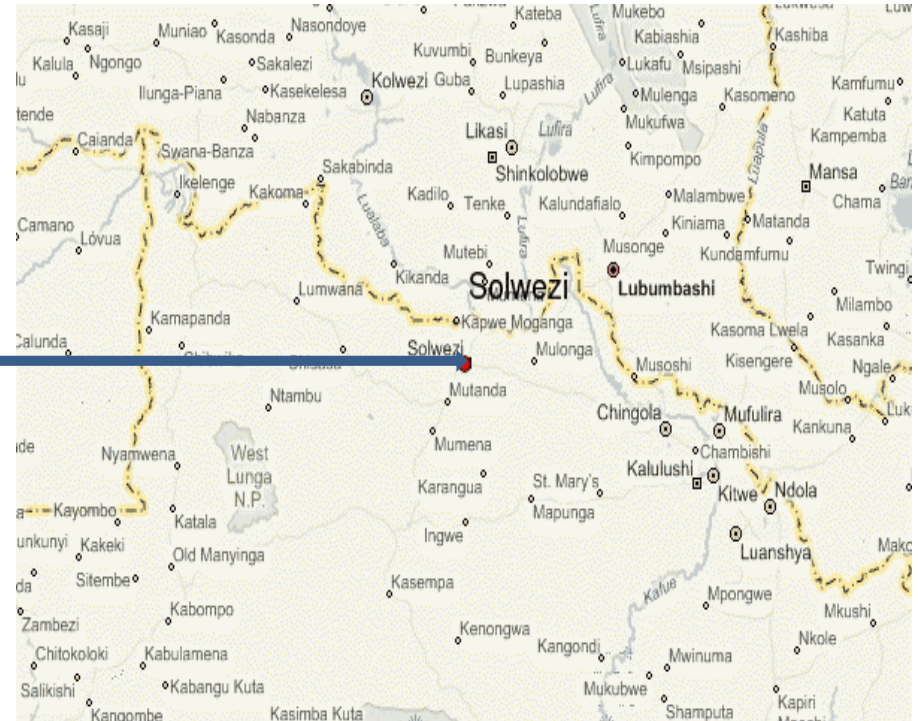
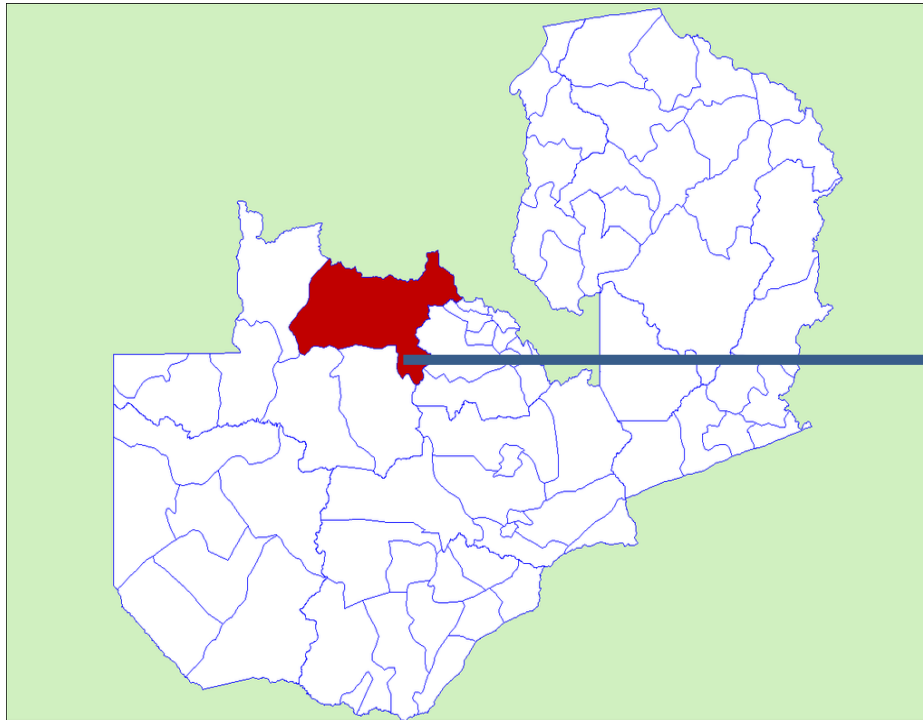
Specific: Cont.

- To increase income and tap into the foreign market
- To effectively use land which otherwise would be idle
- To pass on knowledge about integrated aquaculture
- To reduce the cost of conducting aquaculture
- To promote aquaculture in the area

PROJECT SITE AND DESCRIPTION

- Solwezi District is the Provincial Capital of North Western Province of Zambia.
- Its coordinates are 12.4167° S and 26.2305° E.
- The district is endowed with many water resources and wetlands making it an ideal place for fish farming making it highly potential for the growth of aquaculture
- The district also has good soils, clayey loam soils that are ideal for pond construction and crop farming purposes.
- The stream where water will be tapped from is free from pollution
- The project is easily accessible and has an all-weather road

PROJECT SITE AND DESCRIPTION



Map Showing the location of Solwezi District

JUSTIFICATION

- High demand for fish, chicken and vegetable
- High aquaculture potential
- Availability of perennial streams which enable pond filling and drainage by gravity
- Fertile soils which are ideal for agriculture
- Good climatic conditions
- Availability of mono sex fingerlings
- Availability of labor

WATER SOURCE

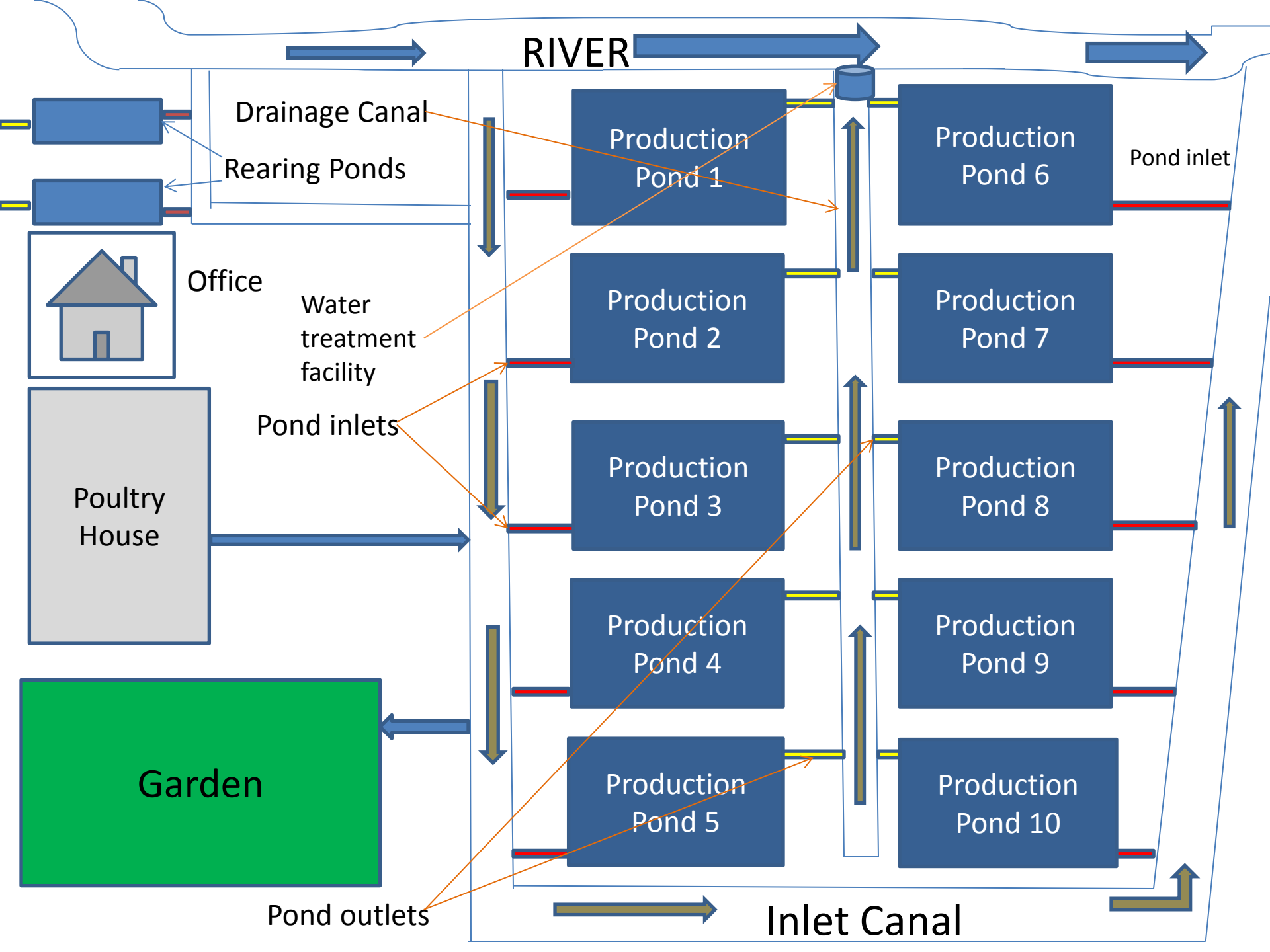
- The source of the water is a perennial stream with a gentle gradient that will allow filling and draining of ponds by gravity.
- This will reduce costs associated with digging a borehole and pumping water in and out of the ponds.

PROJECT DESCRIPTION

- This will be a semi-intensive system where mono-sex culture of *Oreochromis andersonii* (Three Spotted Bream) will be cultured in integration with broiler chickens and vegetables on a 3 hectare land.
- The fingerlings will initially be conditioned in hapas mounted in rearing ponds for two days to monitor their performance and check for mortalities and to ensure that only those with good qualities are stocked.
- These will then be transferred to production ponds which have been fertilised using chicken manure to reduce the cost of production and increase profit margin.

PROJECT DESCRIPTION (CONT.)

- The fingerlings will then be fed on a formulated feed with 40% crude protein at 5% body weight.
- This will be reduced as the fish grows older to 3% of their body weight for six (6) months, twice per day. The stocking density will be 4 fingerlings per square meter.
- The ponds will also be fertilized every two weeks or as when the bloom reduces in order to maintain high levels of plankton in the ponds.
- Water parameters like Dissolved Oxygen (DO), PH and Temperature will be checked everyday using a water checker and results recorded. Others like salinity will be measured seasonally.
- Additionally, some vegetable waste will also be fed to the fish.



RATIONALE

- The direct discharge of fresh chicken manure to the fish ponds produces enough natural fish feed organisms and increases production without the use of any additional manure/fertilizer.
- The transportation cost of the manure is not involved.
- The nutritive value of applied fresh manure is much higher and is dry and mixed with bedding materials e.g. rice husk.
- Some parts of the manure is consumed directly by the fish.
- No supplementary feed is needed for the fish or if needed, it is in reduced amounts.
- No extra space is required for chicken farming as chicken house will be constructed on the side of ponds.
- More production of animal protein will be ensured from the same area of minimum land

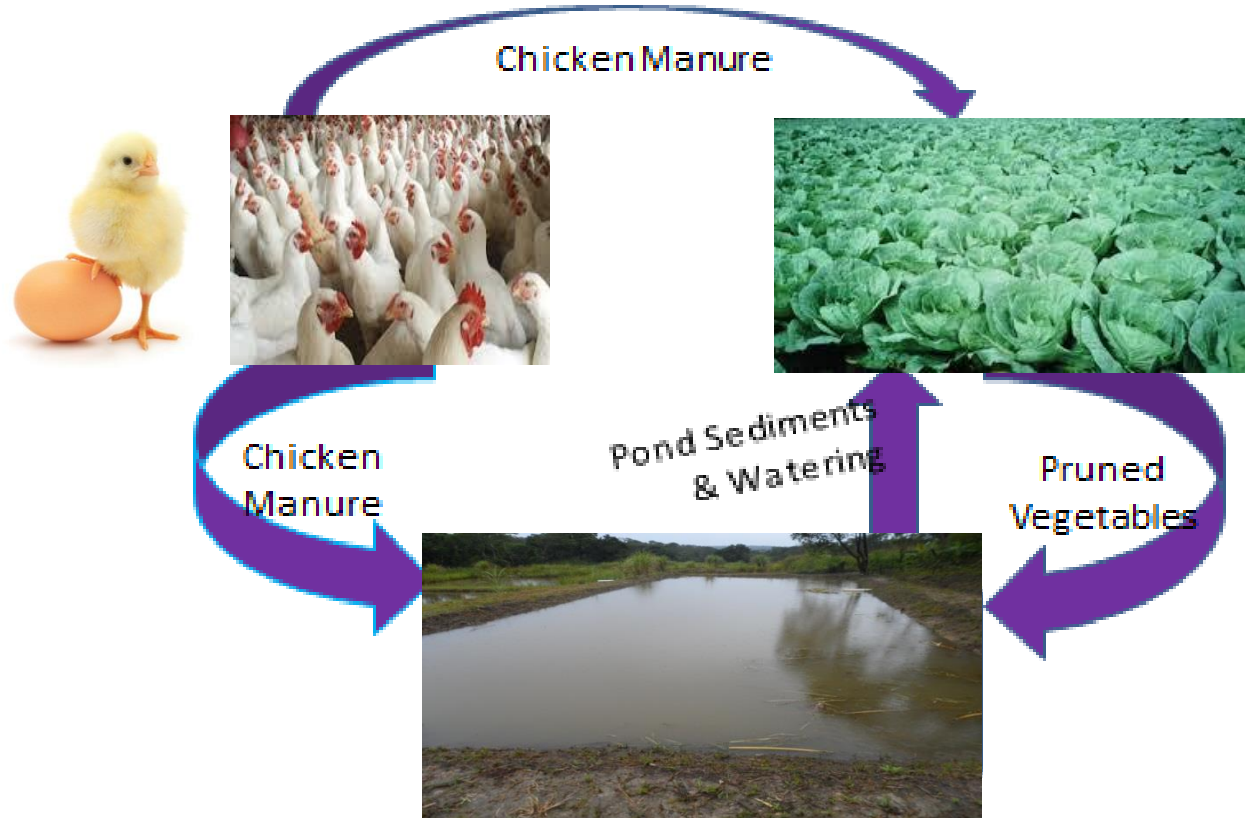
ADVANTAGES

- The overall farm production and income will increase.
- Pond sediments will be used to fertilise the vegetable gardens, thereby reducing cost of manuring of vegetables
- The pruned vegetables can be used to feed the fish.

CULTURE TYPE

- This will be a semi-intensive system where mono-sex culture of *Oreochromis andersoni* will be cultured in integration with broiler chickens and vegetables-cabbage.
- It is also all about a closed energy flow system where one agricultural sub-system feeds into the other to maximize benefits and reduce operational costs.

CLOSED IAA SYSTEM



WATER PARAMETERS

- Water parameters will be measured everyday using a water checker viz dissolved oxygen (DO), temperature and pH .
- Turbidity will also be measured using a secchi disk every week

OPERATION COSTS

Aquaculture Sub-system-Fixed Costs

S/N	ITEM DESCRIPTION	UNIT COST (USD)	QUANTITY	TOTAL COST (USD)
1	Land (Traditional and privately owned)	3,200	3 hectares	9,600
2	Pond Construction	(a) Production ponds-1,200	10	12,000
		(b) Conditioning ponds-350	2	700
3	Office and Storeroom Construction	7,000	1	7,000
	Office Furniture & Computer & Printer	2,000	Assorted	2,000
4	Vehicle (4X4 pick up)	42,000	1	42,000
5	Water Checker	500	1	500
6	Fish Buckets	10	5	50
7	Slashers	0.8	10	80
8	Weighing Scale	20	2	40
Sub-total				73,970

Aquaculture Sub-system-Operational Costs

S/N	ITEM DESCRIPTION	UNIT COST (USD)	QUANTITY	TOTAL COST (USD)
1	Fingerlings	0.08 (per fingerling)	64,000	5,120.00
2	Maize Bran	3.92 (25Kg)	100	392.00
3	Fish Feed-Grower (40% CP)	36.89 (50Kg)	144 Kg/day X 3 months (12,960 Kg)	9,561.89
4	Fish Feed-Finisher (30%)	34.55 (50Kg)	336 Kg/day X 2 months (40,320 Kg)	13,930.56
5	Hapas (8mX2mX1m)	74.00	2	148.00
6	Seine Net (100M)	95.00	2	190.00
7	Labour	200	4	800.00
8	Fuel	1.57	5000	7,850
Sub-total				37,992.45
Grand Total				111,962.45

Poultry Sub-system-Fixed Costs

ITEM	QUANTITY	PRICE (USD)
Poultry House	1 with semi detached 2 poultry units and store. (Brick house with iron sheets).	1,569
Feeding troughs	40 feeding troughs	376
Manual drinkers	15 drinkers	118
Lighting fixed/ Infra Red Lamp	5 lamps	125
Water tank- capacity of 10,000litres.	1 tank-plastic	1,500
Total cost		3,688

Poultry Sub-system-Operational Costs

ITEM	QUANTITY	COST (USD)
Day old chicks	2000 per patch	1,560
Feeds;		
• Starter mash	32 bags of 50kg.	904
• Growers mash.	60 bags of 50 kg	1,695
• Finisher mash	48 bags of 50 kg	1,357
Stress pack	400 litres	2
Vaccines;		
• Gumboro	200g	7.85
• New castle	2000ml	7.85
• Coccidiosis	1 pack (100 doses)	15.70
Dewormers	1 pack	3.92
Antibiotics	1 pack	15.70
Electricity costs	monthly	30.8
Water	monthly	19.2
Labour	8 weeks	77
Wood shavings / coffee husks	8 sacks	21.6
Total costs		5,698

Vegetable Sub-system-Operational Costs

Item	Quantity required	Unit price (USD)	Amount/ budget (USD)
Seeds	30 sachets	5.1	153
Fertilisers	4 litre jerry can of DI GROW	46.1	46.1
Insecticides and pesticides-	Assorted varieties- Mangozip, syperlacer etc	15.71	57.71
Tractor-ploughing	2 acres	57.5	115
Labour/casual workers.	3- one permanent and 2 temporary		115
Fuel /transport costs .	105 litres	1.46	153.3
Total			640.11

Vegetable Sub-system-Fixed Costs

Item	Quantity required	Unit price (USD)	Budget (USD)
Farm tools ;			
• Wheel barrows.	2	78.50	157
• Shovels.	2	7.85	15.7
• Rakes	2	15.70	31.4
• Hoes	3	15.70	41.70
• Watering cans	2	10.99	21.98
• Spray pump(20 litre capacity)	2	19.2	38.4
Safety boots	3	39.25	117.75
Gum boots	3	7.06	21.16
TOTAL			444.84

DEPRECIATION

Item	Asset Value (\$)	Life Span	Yearly Depreciation (\$)
Land	9,600	-	-
Pond construction	12,700	-	-
Office and Storeroom Construction	7,000	20	350
Office Furniture & Computer & Printer	2,000	5	400
Vehicle (4X4 pick up)	42,000	5	8,400
Water Checker	500	10	50
Fish Buckets	50	5	10
Slashers	80	2	40
Weighing Scale	40	5	8
Hapas	148	2	74
Seine	190	2	95

DEPRECIATION (Cont.)

Item	Asset Value (\$)	Life Span	Yearly Depreciation (\$)
Poultry House.	1,569	20	78.45
Feeding troughs	376	5	75.20
Manual drinkers	118	5	23.60
Lighting fixed/ Infra Red Lamp	125	1	125
Water tank- capacity of 10,000litres.	1,500	10	150
Wheel burrows.	157	3	52.33
Shovels.	15.70	2	7.85
Rakes	31.40	2	15.70
Hoes	41.70	2	20.85
Watering cans	21.98	5	4.40
Spray pump(20 litre capacity)	38.40	2	19.2
Safety boots	117.75	2	58.88
Gum boots	21.16	1	21.16

PROJECT OUTCOME

- Increased fish, poultry and vegetable production.
- Increased per capita fish consumption.
- Increased income.

PROJECT FINANCE-FISH PRODUCTION

This project will be self-financed for up to 10.7% and 89.3% by the donor

Item	Value	Self-finance		External finance	
		%	Value	%	Value
Fixed Costs					
Land	9,600	100	9,600	0	0
Pond Construction	12,700	0	0	100	12,700
Office and Storeroom Construction	7,000	0	0	100	7,000
Office Furniture & Computer & Printer	2,000	100	2,000	0	0
Vehicle (4X4 pick up)	42,000	0	0	100	42,000
Water Checker	500	0	0	100	500
Fish Buckets	50	100	50	0	0
Slashers	80	100	80	0	0
Weighing Scale	40	100	40	0	0
Sub-total	73,970				
Operational Costs					
Fingerlings	5,120.00	0	0	100	5,120
Maize Bran	392.00				
Fish Feed-Grower (40% CP)	9,561.89	0	0	100	9561.89
Fish Feed-Finisher (30%)	13,930.56	0	0	100	13,930.56
Hapas (8mX2mX1m)	148.00	100	148.00	0	0
Seine Net (100M)	190.00	100	190.00	0	0
Labour	800.00	0	0	100	800
Fuel	7,850				
Sub-total	37,992.45				

PROJECT FINANCE- POULTRY

Item	Value	Self finance		External finance	
		%	Value	%	Value
Fixed Costs					
Poultry Housing.	1,569	0	0	100	1,569.00
Feeding troughs	376	100	376.00	0	0
Manual drinkers	118	100	118.00	0	0
Lighting fixed/ Infra Red Lamp	125	100	125.00	0	0
Water tank- capacity of 10,000 liters	1,500	0	0	100	1,500.00
Sub-total	3,688				
Operational Costs					
Day old chicks	1,560	0	0	100	1,560.00
Feeds;		0	0	100	3,956.00
• Starter mash	904				
• Growers mash.	1,695				
• Finisher mash	1,357				
Stress pack	2	100	2	0	0
Vaccines;		100	31.40	0	0
• Gumboro	7.85				
• New castle	7.85				
• Coccidiosis	15.70				
Dewormers	3.92	100	3.92	0	0
Antibiotics	15.70	100	15.70	0	0
Electricity costs	30.8	0	0	100	30.8
Water	19.2	0	0	100	19.20
Labour	77	0	0	100	77
Wood shavings / coffee husks	21.6	0	0	100	21.6
Sub-total	5,698				

FINANCE TABLE-VEGETABLE SUB-SYSTEM

Item	Value	Self finance		External finance	
		%	Value	%	Value
Fixed Costs					
Seeds	153	100	153	0	0
Fertilisers	46.1	100	46.10	0	0
Insecticides and pesticides	57.71	100	57.71	0	0
Tractor-ploughing	115	0	0	100	115
Labour/casual workers.	115	0	0	100	115
Fuel /transport costs	153..3	0	0	100	153.30
Sub-total	640.11				
Operational Costs					
Farm tools		0	0	100	306.18
• Wheel barrows.	157				
• Shovels.	15.7				
• Rakes	31.4				
• Hoes	41.70				
• Watering cans	21.98				
• Sprayer (20 liter capacity)	38.4				
Safety boots	117.75	0	0	100	117.75
Gum boots	21.16	0	0	100	21.16
Sub-total	444.84				
Grand Total		10.7	13,036.83	89.3	109,396.57

MAIN ACTIVITIES

POND CONSTRUCTION AND STOCKING

- There will be two types of ponds, namely conditioning and production ponds.
- The size of the conditioning ponds will be 500m² each. Two hapas, with the measurement of 8mX 2mX1m, will be mounted in these ponds and will stocked with fingerlings for conditioning for 24-48 hrs.
- Thereafter, the fingerlings will be transferred to ten production ponds measuring 50mX30m (1,500m²) each.
- The stocking rate is 4 fish per square meter
- The fingerlings will be fed with fish feed containing 40% CP at 5% body weight for the first three months, then reducing quantities to 3% of body weight and 30% CP.

POULTRY REARING

- 2000 day old broiler chicks will be reared in each production batch, for a period of 6 weeks to 8 weeks
- Poultry farm size is going to be 150 m by 150m.
- 3 poultry houses are to be constructed size 20 m-length by 5 m-width with a storeroom of 4 m by 4 m. Stocking rate will be 20 birds per square meters during brooder, then 10 poultry birds per square meters in the next growing stages hence split in the 2 houses.
- The broilers will be reared in sequential manner, as first batch gets to 3 weeks, another batch of 2000 day old are stocked.

VEGETABLE PRODUCTION

- 2 acres of land will be utilized for horticultural growing, in particular cabbage- Gloria variety.
- Production period will be 16 weeks per batch grown.
- Spacing will be 10 inches apart in rows and 36 inches between each plant.

PROJECT OUTPUT (COST BENEFIT ANALYSIS)

Net Income = Total Sale Income - Total Expenses (in USD)

PERFORMANCE INDICES

1. Production costs of fish per kg = $\frac{\text{Total operating cost}}{\text{Kg of fish produced}}$

\longrightarrow $37,992.45/14,348.80 = \$ 2.65$ (From 2nd cycle)

\longrightarrow Cost of fish per Kg \equiv \$ 6.00

Since production costs of fish per kg is less than cost of fish per kg after sales, the enterprise is viable

Productivity per m²/cycle: $\frac{\text{Total fish (kg) in a cycle}}{\text{Area of farm (m}^2\text{)}}$ \longrightarrow 0.95 Kg

2. Net income = Total sale income - Total operating cost

\longrightarrow \$ 69,190.40 - \$ 37,992.00 = 31,198.40

3. Percentage return on operating cost = $\frac{\text{Net Income} \times 100}{\text{Total operating cost}}$

$\frac{31,198.40 \times 100}{37,992.45} = 82.1\%$ (2nd Cycle)

This shows that the project is viable

MARKETING

- Advertisement will be done on the local radio and television stations.
- Most of the fish will be sold at the farm due to high demand.
- The surplus will be taken to the market.
- Grade A (250g and above) price \$5/kg
- Grade B (150g and 250g) price \$ 4/kg
- Grade C (<150g) price \$3/kg

PROJECT OUTLOOK

- **Competition**- no competition at the moment
- **Sustainability**- by re-investment, qualified staff employed, high demand of fish, chicken & vegetables and low cost of production
- **Challenges**- High cost of feed
- **Threats**-disease outbreaks, & pest attack on vegetables

FINANCIAL APPRAISAL-Total Investment Cost

Item	Value (\$)	Rate (%)	Rate (%)
Fixed Assets			
Buildings and civil works	21,269	5	2.5
Subtotal 1	21,269	5	2.5
Office furniture	2,000	5	2.5
Water checker	500	10	5.0
Fish buckets	10	5	2.5
Slashers	80	2	1.0
Weighing scale	40	5	2.5
Hapas/seine nets	338	2	1.0
Feeding troughs/drinkers	494	5	2.5
Lighting bulbs	125	1	0.5
Subtotal 2	3,587	10	5.0
Water tank	1500	10	5.0
Wheel burrows	157	3	1.5
Shovels	16	2	1.0

FINANCIAL APPRAISAL-Total Investment Cost

Item	Value (\$)	Rate (%)	Rate (%)
Fixed Assets			
Rakes	31	2	1.0
Hoes	42	2	1.0
Watering cans & sprayer	60	2	1.0
Subtotal 3	1,806	10	5.0
Safety boots	118	2.0	1.0
Gum boots	21	1.0	0.5
Vehicle	42,000	5.0	2.5
Subtotal 4	42,139	10.0	5.0
Total Fixed Assets	68,801		
Pre-operational Costs			
Pre production expenses	150.0		
Interest during construction	0.0		
Total Pre-production Costs	150.0		
Working Capital	0.0		
Total Investment Costs	68,951		

Depreciation and Amortization (USD)

Item	Asset Value	Residual Value	Depreciation Value	Depreciation %	Annual Depreciation
Buildings and civil works	21,269.00	0.0	21,269.00	5.0	1063.50
Fixed Operational Costs	3,587.00	0.0	3,587.00	10.0	358.70
Vegetable tools	1,806.20	0.0	1806.20	10.0	180.60
Vehicle	42,138.90	0.0	42138.90	10.0	4,213.90
Pre-operational costs	7,860.00	0.0	7,860.00	20.0%	1,572.00
Total	76,661.10	0.0	76,661.10		7,388.70

Annual quantities and values of production

Quantities	Value
Operating efficiency	100%
Quantities Produced and sold (in kg)	14,348.80
Fish Sales (Grade B & C)	2,869.76
Fish Sales (Grade A)	11,479.00
Sale Revenues	
Fish Sales (Grade B & C)	11,479.00
Fish Sales (Grade A)	57,395.20
Chicken sales	10,444.00
Cabbage sales	6080.00
Total Revenues	85,398.20

Maintenance and Administrative Costs

Item				Asset Value	Maintenance Rate %	Annual Value
Maintenance						
Buildings and civil works				21,269.00	2.5	531.70
Fixed Operational Costs				3,587.00	5.0	179.40
Vegetable tools				1806.2	5.0	90.30
Vehicle				42138.9	5.0	2,106.90
Fixed Assets Insurance (1%)				68,801.10	1.0	688.00
Administrative Costs(4% of value of sales)						3,415.90
Total						7,012.30

Wages and Salaries

Item	Number	Monthly Wages	Annual Wages
Farm manager	1	200	2,400.00
Pond operator	1	100	1,200.00
Poultry worker	1	100	1,200.00
Garden worker	1	100	1,200.00
Security Guard	1	100	1,200.00
Total Wages			7,200.00
Social insurance (22.5%)		22.5%	1,620.00
Total			8,820.00

Annual Operating Costs

Item	Value
Material cost	29,004.50
Maintenance & Administrative Cost	7,012.30
Wages and salaries	8,820.00
Total	44,836.70

Materials and Fingerlings Cost

Item	Cost
Feeds and maize bran	23,884.50
Fingerlings	5120.00
Total	29,004.50

Working Capital

Item	Basis	Value
Inventories:		
Feed	1 year	23,492.45
Medicine	1 year	4,693.81
Sub total		28,186.26
Cash requisites.		
wages & salaries	1 year	8,820.00
Over heads (Contingency)	1 year	8,603.30
Maintenance & Administrative costs	1 year	7,012.27
Sub total		24,435.57
Accounts receivable	1 month sales	7116.52
Total		59,738.35

Key economic parameters of the Integrated Agriculture-Aquaculture Project

Indicator	Value	Comment
Internal Rate of Return (IRR)	33.5%	Project is viable
Pay Back Period	2.98 years	
Net Present Value	\$78,206	Project is viable since NPV is positive
Net Present Value-Benefits	\$385,215	
Net Present Value-Costs	\$307,009	
Benefit-Cost Ratio	1.25	Since B/C ratio is greater than 1, then the project is viable

THANK YOU

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GRACIAS

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