

SMALL- SCALE FRESHWATER FISH HATCHERY IN SIERRA LEONE

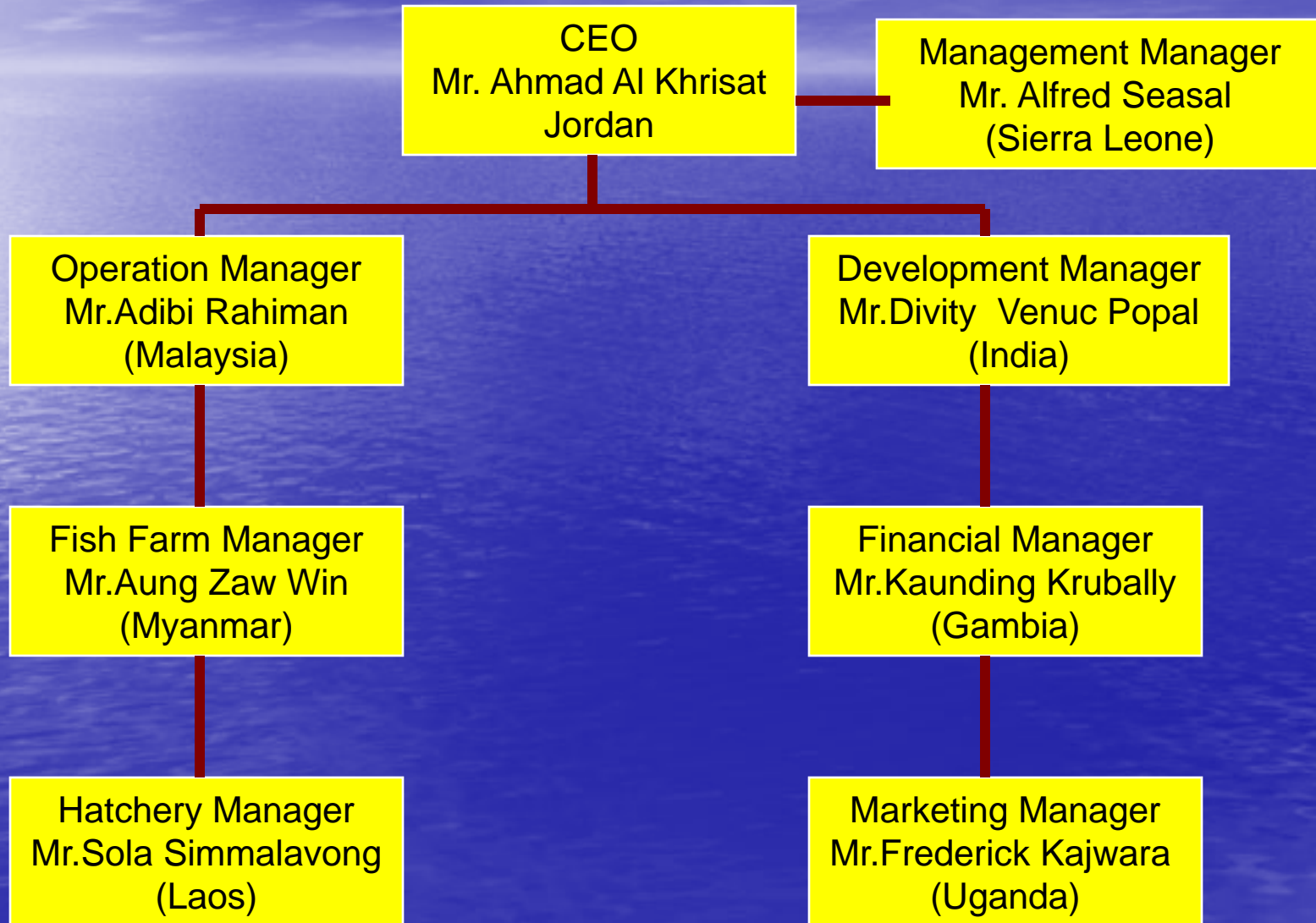
This project is the outcome of a group efforts to whom credit and technical responsibility goes. This project is based on an assignment which was given to course participants and supervised by Dr. Abdel Rahman El Gamal as a part of "Fish Culture Development Training course". This annual course is organized by the Egyptian International Centre for Agriculture - Egypt (EICA). The Name and some photos of the team members are shown in subsequent slides

2006

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ORGANIZATION CHART



JAWS COOPERATION



INTRODUCTION

- Aquaculture in Sierra Leone – concentrated in Bo
- Earthen pond - Species *O. niloticus*
- Recent survey – 1050 ponds in the country (80% private)
- Extensive & semi-intensive system
- Total aquaculture production 40 tonnes/year
- Nowadays the farmers just collected the fingerlings from the natural and nurse it in the ponds before sold to other farmer

INTRODUCTION (Cont.)

- There was an existing hatchery but not operate anymore due to the war 10 years ago
- The hatchery belong to the government
- The area is 2 ha with basic facilities such as some ponds, building, access road, electricity etc.
- The government will renovate this hatchery according to our operation

OBJECTIVES

- To improve existing hatchery
- To fulfill the market demand
- To develop small scale freshwater hatchery
- To provide employment for the people in that area

Our target production is one million of fingerlings every year

PROJECT IMPLEMENTATION

- Invited by the government of Sierra Leone to introduce a small scale tilapia hatchery
- The project will be done in a 5 years by our company and then will be given back to the government

HUMAN RESOURCES

- The work force of the project consists of :
- 1 farm supervisor (government staff)
- 3 general workers (the government will select)-
criteria: poor people
- Our company will do the management &
marketing

SITE SELECTION

- Sewa River, Bo, Free Town, Sierra Leone
- Source of water : river – fulfill the water quality parameters
- Support from the government



Species Selection-*Oreochromis niloticus*

- This species enjoys high people demand
- Tilapia culture requires minimal management efforts and hence could be farmed in low-tech systems
- The reproduction of the species is easy
- Tilapia enjoys good farming characteristics such as:
 - High growth rate
 - Readily domesticated “aquatic chicken”
 - Hardy and tolerant to disease as well as to wide range of environmental conditions

Hatchery Operation - Hapa

- An intensive method for producing tilapia fry as required for grow out purposes
- May use an inverted mosquito net - made of polyethylene netting designed to facilitate holding, breeding & nursery of products
- We decided to use hapa system in our project

Advantages of hapa system

- Ease in moving & relocation
- Easy to control competitors & predators
- Ease in daily observation of stocks & allows better management
- Handling of live fish is greatly facilitated
- Maximizes the utilization of available water resources, hence reduces the pressure on land resources.
- All spawning products are collected
- Fry produced are more uniform in size

Disadvantages of hapa system

- Management is more intense
- High labor cost for handling, stocking and maintenance
- Vulnerable to poaching
- Easily destroyed and blown away by typhoons or storms
- Securing an adequate water exchange through the hapas and cages all-time is a must

System Design & productivity

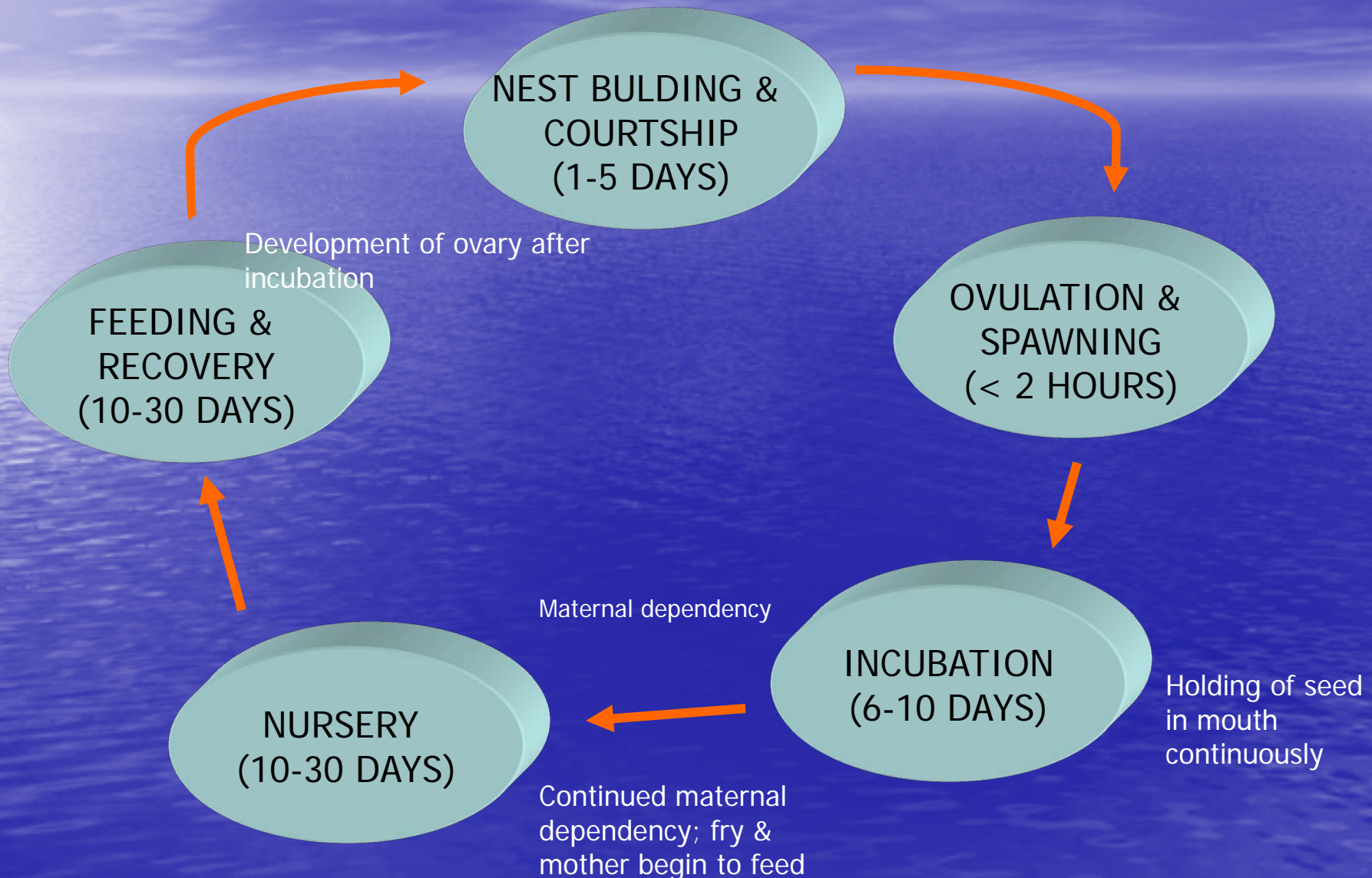
- Size of spawning hapa: 3m x 3m x 1.5m depth
- Density of broodstock 4 fish/m²
- Sex ratio 1 Male : 3 Female
- Number of broodstock: 36 (27 F & 9 M)
- Production out of each hapa: 5103 fingerlings
- Productivity estimate is based on the following assumptions

Assumptions

- Fecundity - 300 eggs/female/spawn
- No. of broodstock - 1440 (40 hapas)
- Males - 360 (~300 g)
- Females - 1080 (~250 g)
- Total no of fry - 291600/cycle (90% SR)
- Total no of fingerlings - 1.22 million (70% SR)
(6 cycles)

SR = survival rate

BREEDING CYCLE OF *O. niloticus*



PRODUCTION METHODS



Egg Collection

Timing of egg collection depends on:

Water temperature

Maturity condition of females

Eggs will be collected from female's mouth 7 days after stocking



Methodology - Egg Collection -

- Carefully lift the 3 bottom corners of the hapa
- Remove each female broodfish one at a time
- Carefully check female's mouth for incubating eggs
- Remove the eggs & yolk sacs by washing from female's mouth
- Eggs are placed in 4 bowls according to their colors



Sorting collected products according to colors = same embryonic development

Collected eggs/products are sorted into:

Yellow (just spawned)

Dark yellow/orange

Pigmented/eyed

Yolk sacs/swim-ups

Eggs may be treated with formalin (treatment); salt (5-7 ppt) may be used



Any swim-up fry found will be scooped out

Methodology- Fry Collection

Fry collection

This applies to the collection of free-swimming stage

Collection takes place after 11 to 14 days after the stocking of broodfish



Labor & equipment

2 to 3 field workers for collecting eggs/fry

2 field workers to do stocking for conditioning

1 field staff for cleaning/ disinfecting collected eggs before incubation

1 technician to record data

Basins, tubs, scoops, weighing scale

Methodology – Incubation/Pipping System



Gravity & continues
water flow is
secured





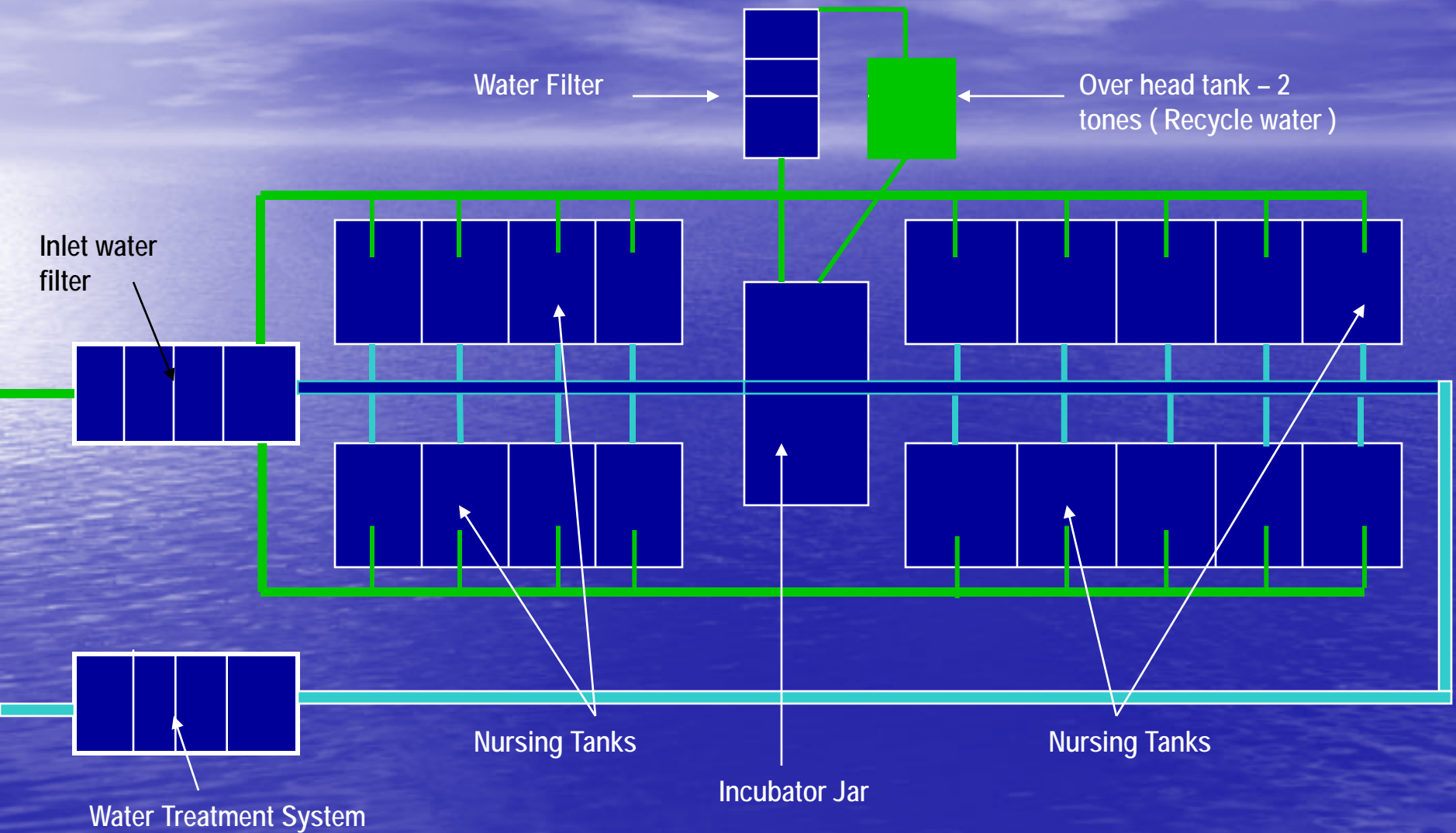
Incubation



Hatching



INCUBATOR SET LAYOUT



Ponds and tanks

Breeding ponds

- Two ponds of 0.1-ha each
- 40 hapas

Nursing tanks

- **Function:** to nurse hatched fry before transferred to nursing pond
- 18 concrete tanks of 6m x 3m x 1m depth
- Placed in the same location with incubator set

Ponds and tanks

Nursing ponds

- 1 pond of 0.1 ha with 20 hapas is required for nursing 100 000 fingerlings
- A hapa of size 3m x 3m x 1.5m is needed for 5000 fingerlings
- For the production of one million 5 ponds (0.5 ha total area) and 100 hapas will be needed

Conditioning pond

- 1500 brood stocks (total)
- Density 3 fish/m²
- Three 0.1-ha ponds are needed for males, females and back-up
- A hapa with size of (2m x 5m) will be needed for 30 fish
 - For males: 15 hapas
 - For female: 40 hapas

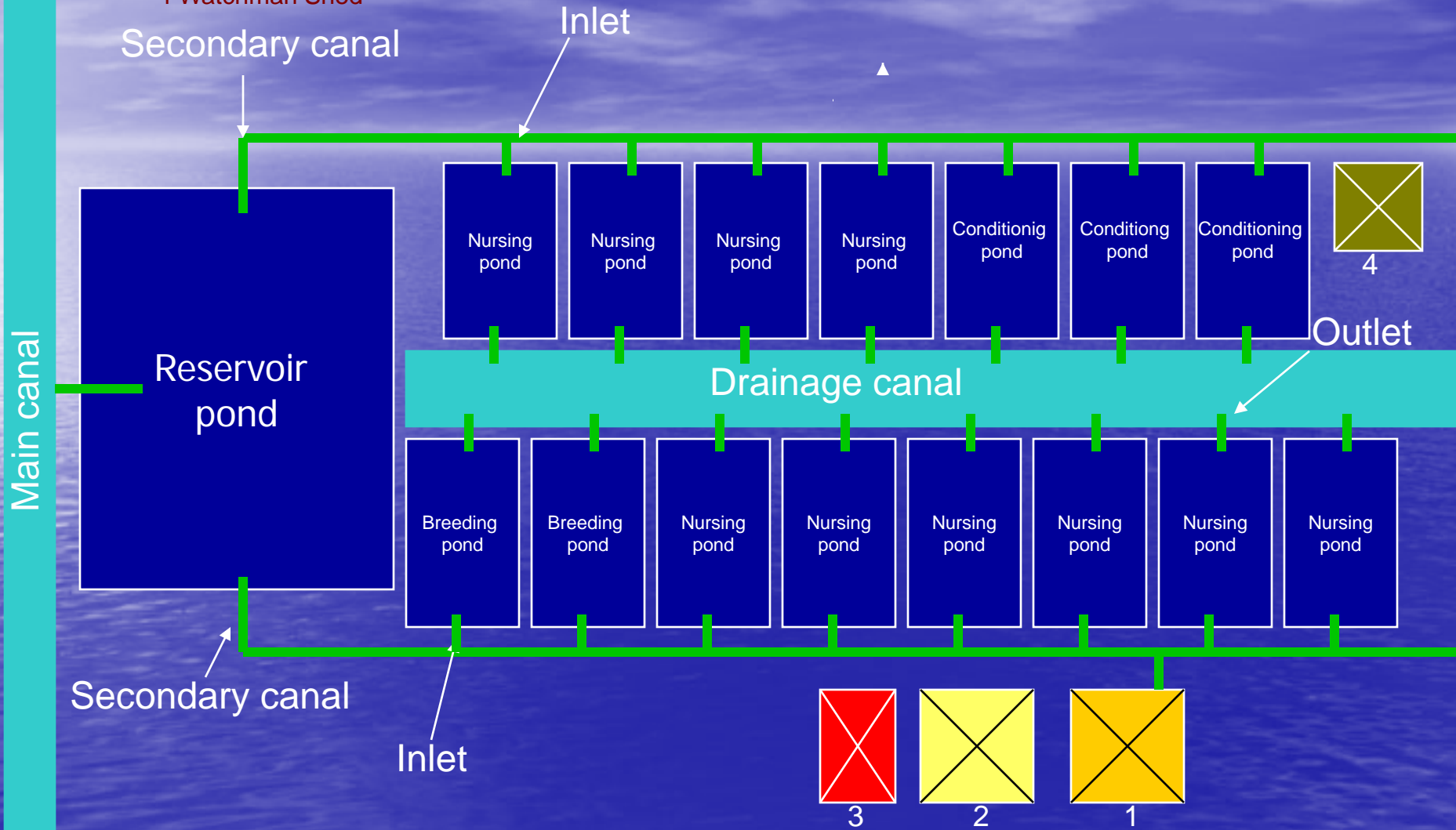
Broodfish replacement & rotation strategy

Broodfish that spawned will be reconditioned:

- This will lead to higher spawning success
- During reconditioning, broodstock will be separate by sex
- Good quality feed will be provided (on-farm formulated or commercial)

- 1 Incubator set
- 2 Office
- 3 Store
- 4 Watchman Shed

HATCHERY LAYOUT



ANNUAL ACTIVITIES CHART

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Capital Development Cost

| Item | Cost (USD) | Item | Cost (USD) |
|----------------------------|--------------|---------------|------------|
| Land (2 ha) | 3000 | Aeration | 3000 |
| Land clearing | 200 | Generator | 500 |
| Farm road | 500 | Hapas | 2000 |
| Pond construction | 15000 | Water pump | 1000 |
| Water system | 3000 | Lorry | 3000 |
| Electricity system | 2500 | Incubator set | 1000 |
| Office Building | 5000 | Concrete tank | 2000 |
| Storage & worker's quarter | 5000 | Contingencies | 2335 |
| TOTAL | 49035 | | |

Operation cost

| Item | Cost (USD) | Item | Cost (USD) |
|---------------|--------------|-------------------------|------------|
| Fertilizers | 1000 | Chemicals | 300 |
| Lime | 500 | Oxygen | 300 |
| Broodstock | 1000 | Salary | 15600 |
| Feed | 12000 | Administrative expenses | 500 |
| Electricity | 500 | Maintenance | 2452 |
| Petrol/diesel | 500 | Contingency | 986 |
| TOTAL | 35638 | | |

Project revenue & financial analysis

Project revenue

1 000 000 fingerlings

Sale price for 1 fingerling –
USD 0.05

Total Revenue – USD 50000

Financial analysis

Net income – USD 14362

IRR – 26%

Cost of production – USD
0.04/a fingerling

Payback period – 4 to 5
years

DISCUSSION & Conclusion

- This project is very important in regard to increasing aquaculture production in Sierra Leone especially fish is the main protein source
- A million of fingerlings can produce 400 tons of fish which equals 10 folds of the present aquaculture production in Sierra Leone
- This project has great potential as an economic activity and serve as a model of small scale aquaculture for enhancing household incomes and promoting rural employment



Thank You
Shukran
Gracias
Merci