

APPENDIX 9

Manua on 10M HDPE Circular Cage with Grid Mooring System



Shaping ideas into Plastic

INCA PHILIPPINES, INC.

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TOLL FREE 1-800-1888-4622; <http://www.inca.com.ph>

USER'S MANUAL

10M DIAMETER HDPE CIRCULAR CAGE WITH GRID MOORING SYSTEM IN KIJWENI

Introduction:

Modern marine HDPE circular floating cages, represent one such development. This have evolved significantly from basic system to high degree of complexity and carefully engineered structures. HDPE circular floating cages are widely used, because of the versatility of the materials used. This manual describes the grid mooring system that support the fish cage. The design options and technical specifications are provided for the key elements of the cage readily enabling the construction of structures that meet the needs of operator and are suitable for the environment in which they will be placed. Technical information is then provided on the cage, grid mooring, net cage design and on determining the appropriate size and shape.

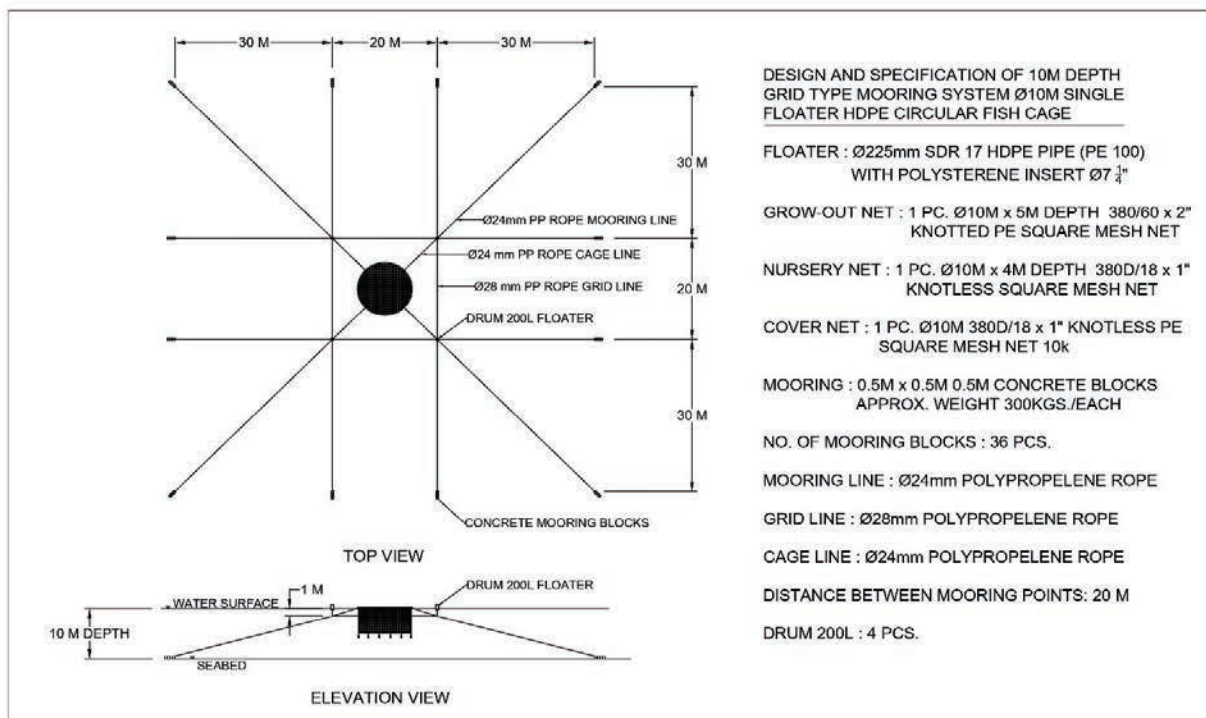
Purpose:

Aquaculture farming for Rabbit Fish (*Siganus Canalicullatus*) and Milkfish (*Chanos chanos*).

Site Selection:

The cage should be in sheltered areas protected from strong wind with adequate water flow. It is necessary to have sufficient depth in order to maximize water exchange, avoid oxygen depletion and avoid accumulation of uneaten food. The culture site should be near the shore and a good road for land transportation.

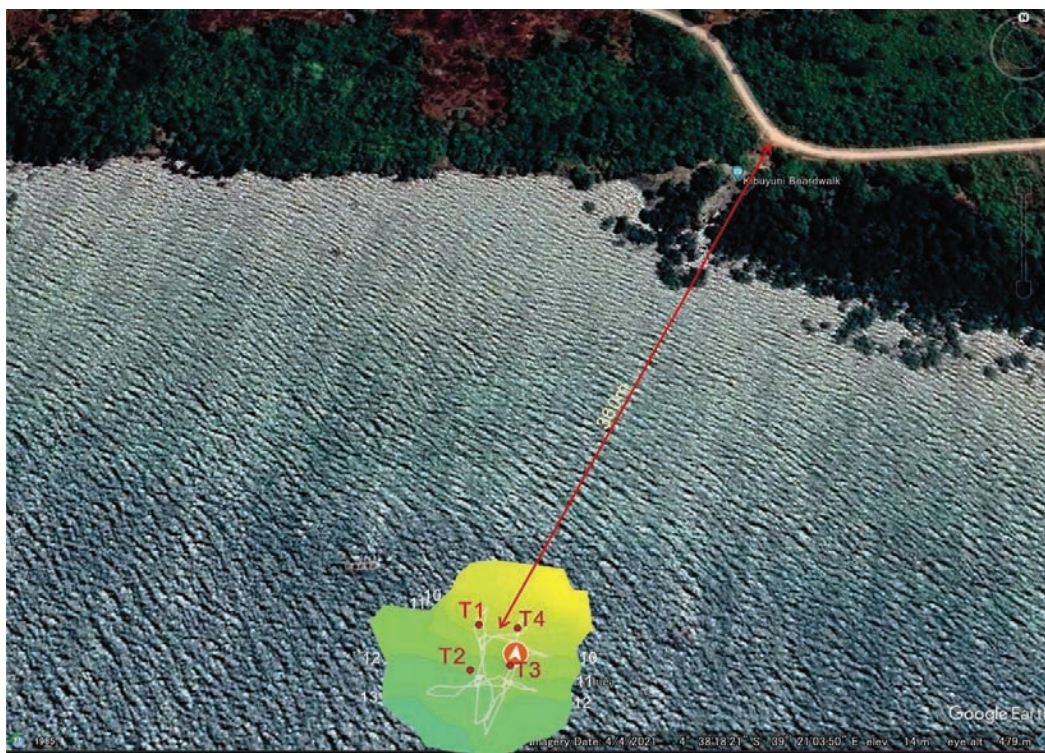
Design and Specification of Grid mooring system:



Bathymetry at the cage installation site:



- T1: S 04° 38.516' E 039° 21.200' DEPTH: 11 METERS
- T2: S 04° 38.528' E 039° 21.198' DEPTH: 12.2 METERS
- T3: S 04° 38.527' E 039° 21.209' DEPTH: 12 METERS
- T4: S 04° 38.517' E 039° 21.211' DEPTH: 10.6 METERS





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Bill of Quantities:

ITEM	PARTICULARS	UNIT	QUANTITY
1	HDPE PIPE SDR 17 Ø225 mm x 12M (THK:13.4mm)	pcs.	3
2	POLYSTYRENE SHEETS 4' x 4' x 4"	pcs.	10
3	KNOTTED PE NET 380/60 x 2" x 200MD x 50 YARDS	bundle	2
4	KNOTLESS PE NET 380D/18 x 1" x 200MD x 50 YARDS	bundle	4
5	POLYETHYLENE ROPE Ø10mm x 200M	rolls	3
6	POLYETHYLENE ROPE Ø8mm x 200M	rolls	3
7	POLYETHYLENE ROPE Ø6mm x 200M	rolls	3
8	POLYETHYLENE ROPE Ø5mm x 200M	rolls	2
9	NETTING NEEDLES (SMALL)	pcs.	25
10	NETTING NEEDLES (MEDIUM)	pcs.	25
11	NYLON TWINE 210/60 PLY	spools	8
12	NYLON TWINE 210/21 PLY	spools	6
13	POLYPROPYLENE ROPE Ø28mm x 180M	rolls	1
14	POLYPROPYLENE ROPE Ø24mm x 180M	rolls	4
15	POLYPROPYLENE ROPE Ø16mm x 90M	rolls	4
16	POLYETHYLENE ROPE Ø8mm x 200M (BLACK)	rolls	1
17	POLYETHYLENE ROPE Ø6mm x 200M (BLACK)	rolls	3
18	USED TIRE RING	pcs.	72
19	200L PLASTIC DRUM	pcs.	12
20	SILICON SEALANT	pcs.	2
21	GOOD LUMBER 4" x 4" x 12'	pcs.	8
22	HIGH TENSILE HEX BOLT Ø1/2" x 9" (HALF THREADED)	pcs.	16
23	HIGH TENSILE LOCKNUT Ø1/2"	pcs.	16
24	HIGH TENSILE WASHER Ø1/2"	pcs.	32
25	MONOFILAMENT NYLON # 160	kgs.	2
26	PORTLAND CEMENT 50KGS./BAG	bags	30
27	SAND	cu.m.	4
28	GRAVEL 3/4"	cu.m.	4
29	CORRUGATED ROUND BAR Ø3/8" x 20 FT.	pcs.	19
30	#16 G.I. WIRE	kgs.	3
31	MARINE PLYWOOD 1/2" THK x 4' x 8'	pcs.	6
32	GOOD LUMBER 2" x 3" x 8'	pcs.	16
33	GOOD LUMBER 2" x 2" x 12'	pcs.	8
34	WOOD NAIL 1"	kgs.	3
35	WOOD NAIL 3"	kgs.	3
36	WOOD NAIL 4"	kgs.	2
37	PVC PIPE Ø8" X 20'	pcs.	1
38	304 STAINLESS ROD Ø1/4" x 20'	pc.	1
39	304 STAINLESS QUICK RELEASE HOOK Ø5/16"	pcs.	12

ASSEMBLY GUIDE

1. Butt welding of inner floater HDPE pipe 32 meters length.





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Tools & Equipment:

ITEM	PARTICULARS	UNIT	QUANTITY
1	HYDRAULIC BUTT FUSION WELDING MACHINE V250; WELDING RANGE 90-250mm; POWER SUPPLY 220V; 50/60 HERTZ; RATED POWER 0.75KW; WORKING PRESSURE RANGE (BAR) 0-80 WITH HEATING PLATE, TRIMMER, SUPPORT & TIMER	unit	1
2	GENERATOR SET 8000 WATTS / SOURCE OF ELECTRICITY	unit	1
3	EXTENSION WIRE #12 30M LENGTH WITH HEAVY DUTY PLUG & OUTLET		
4	ELECTRIC CHAIN SAW 16"	unit	1
5	ADJUSTABLE WRENCH #30	pc.	1
6	COMBINATION WRENCH #30-32	pcs.	2
7	METER TAPE 50M	pc.	1
8	HEAVY DUTY SCISSOR	pcs.	3
9	BLUE TORCH GUN	pc.	1
10	BUTANE GAS TORCH	pcs.	2
11	UTILITY KNIFE	pc.	1
12	ELECTRIC DRILL	unit	1
13	DRILL BIT 3/8"	pcs.	1
14	DRILL BIT 1/2" (WITH EXTENSION)	pcs.	2
15	ADJUSTABLE WRENCH #30	pc.	1
16	COMBINATION WRENCH #19	pcs.	4
17	METER TAPE 5M	pc.	1
18	SCREW DRIVER 8"	pcs.	2
19	UTILITY KNIFE	pc.	1
20	BOAT WITH 15HP ENGINE	unit	1
21	SCUBA TANK	units	4
22	DIVING REGULATOR, DEEP GAUGE, 1ST STAGE, 2ND STAGE & INFLATOR HOSE	set	2
23	BUOYANCY COMPENSATOR (BCD)	pcs.	2
24	DIVING WET SUITE	set	2
25	DIVING BOOTIES	set	2
26	SWIM FINS	set	2
27	DIVING MASK	pcs.	2
28	DIVING KNIFE	pcs.	2
29	DIVING WEIGHT SYSTEM	pcs.	8
30	UNDER WATER CAMERA	unit	1
31	GARMIN HANDHELD GPS	unit	1
32	BLUE TORCH GUN	pc.	2
33	BUTANE GAS TORCH	pcs.	2
34	BOLO KNIFE	pc.	1
35	HAND GLOVES	sets	12
36	SHOVEL	pcs.	4
37	HANDSAW	pcs.	2
38	HAMMER	pcs.	2
39	CONCRETE PALE	pcs.	4
40	WIRE CUTTER	pcs.	1
41	CROW BAR	pcs.	2
42	TIE WIRE HOOK FASTENER	pcs.	1

Design & Specification of Mooring Formwork:



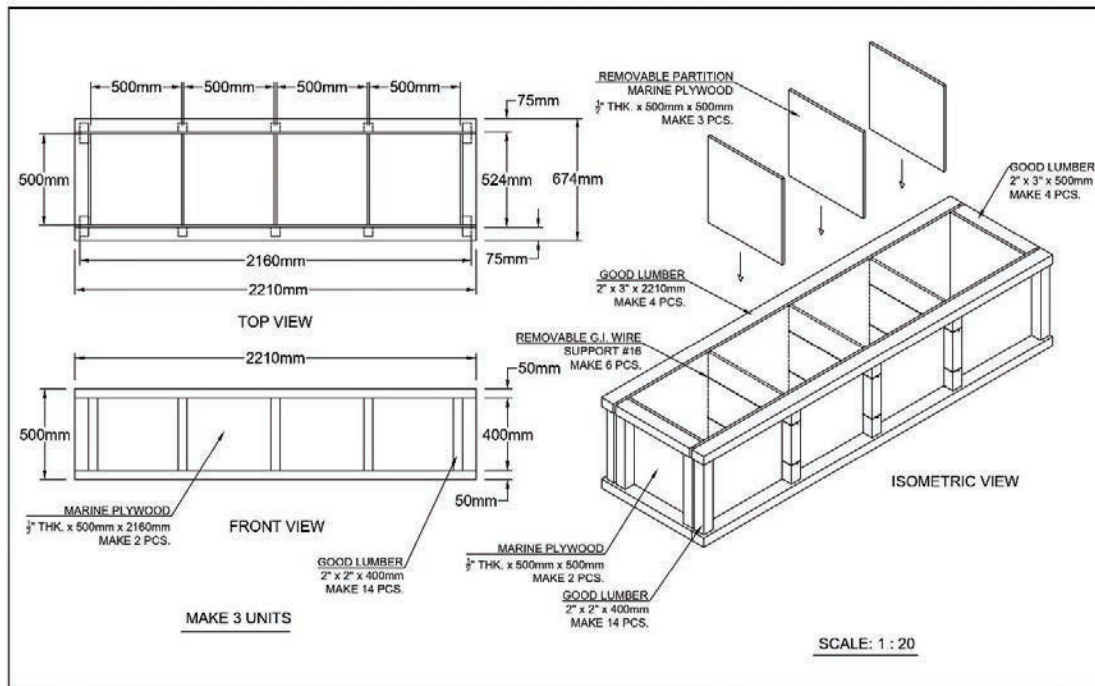


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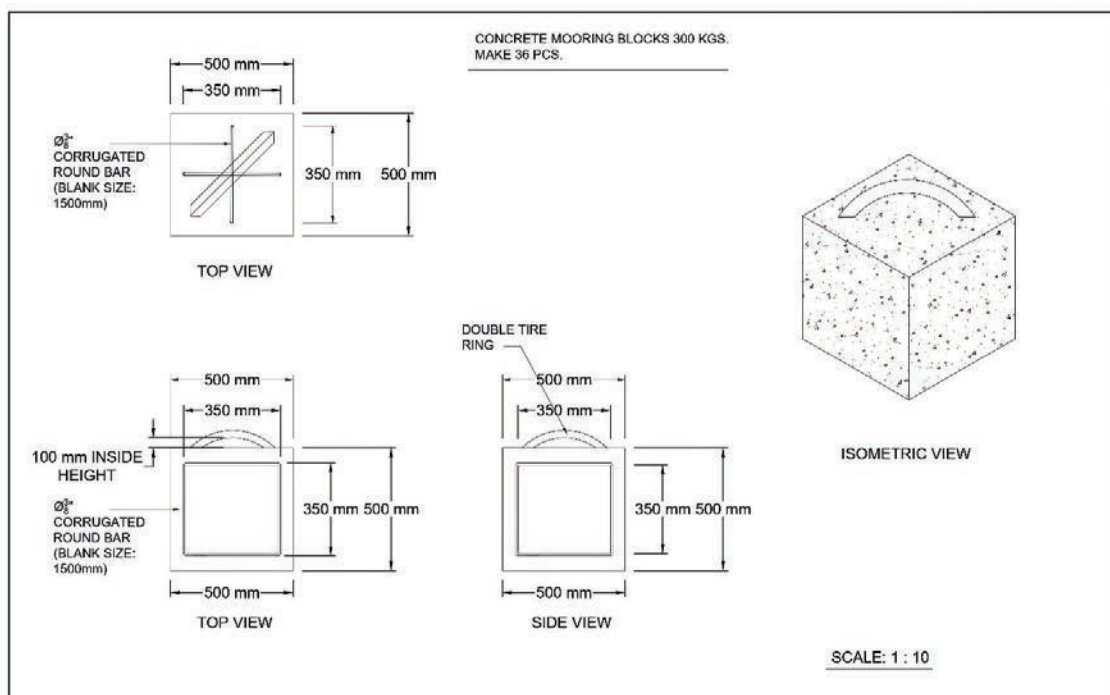
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Design & Specification of Mooring Formwork:



Design & Specification of Concrete Mooring Blocks:





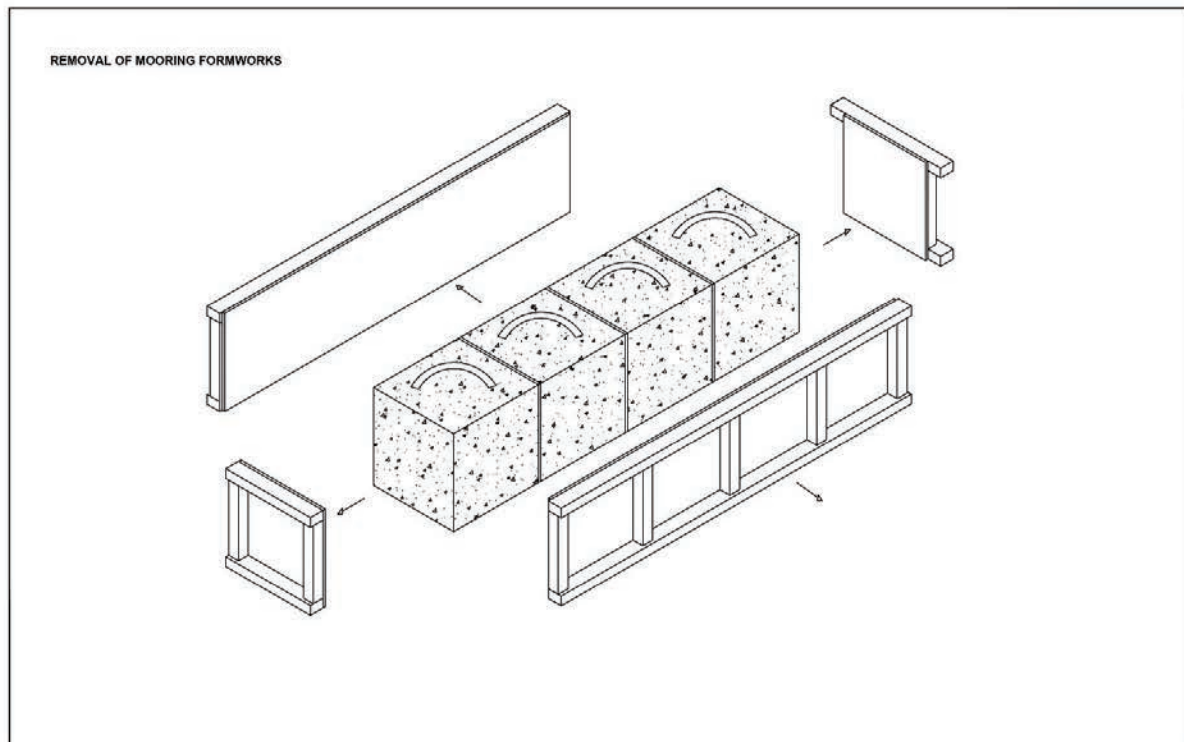
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Fabrication of Concrete mooring blocks:

1. Prepare a concrete mixture of 1:4:4 for 12 pcs. Mooring blocks and 12 pcs. Net weight.
2. Pour the concrete mixture in 3 units mooring formworks.
3. Wait for the concrete to set and gain enough strength to support itself.
4. Remove the side of the formwork and the partition. See figure below.
5. Repeat the same procedure to complete the 36 pcs. mooring blocks.

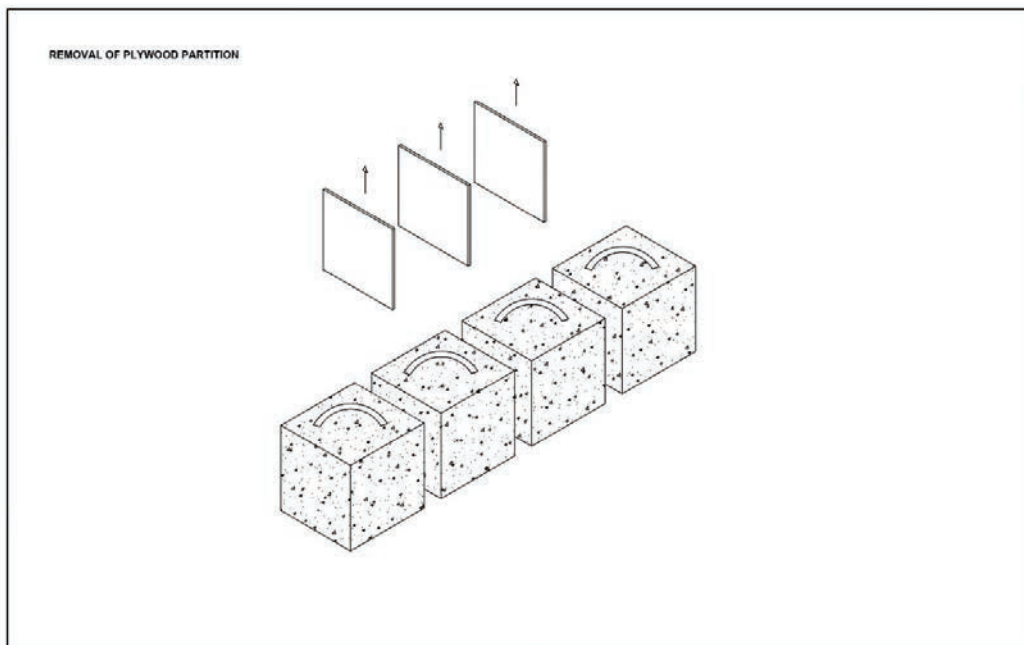




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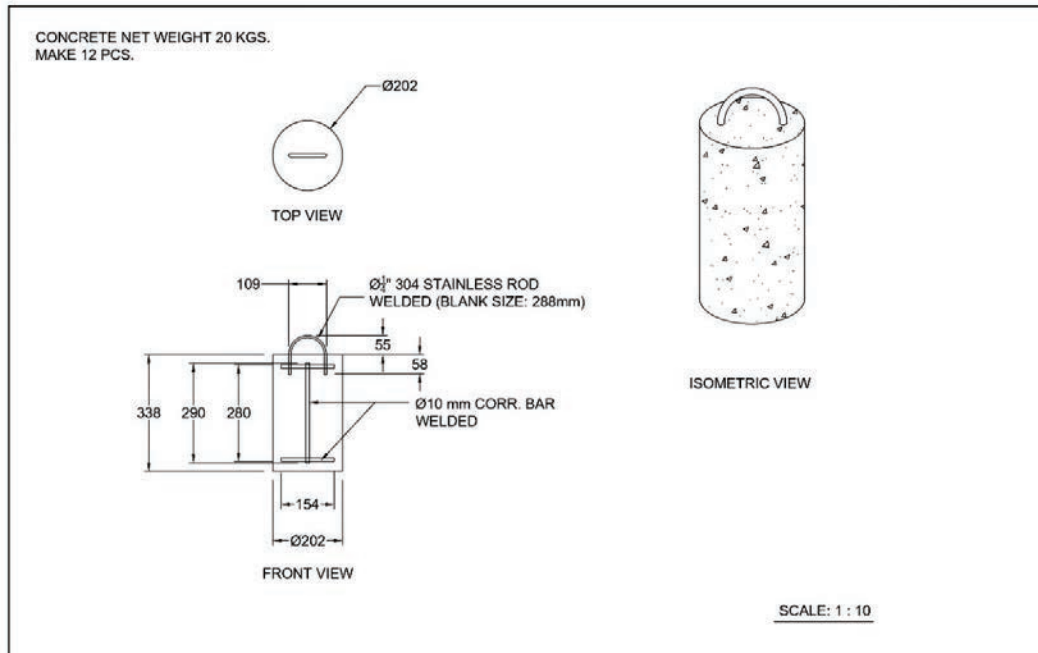
Fabricated 36 pcs. concrete mooring blocks in Kijiweni



Using tire rim as anchor ring is more economical, durable and corrosion-resistant compared to metal ring that rust underwater and pvc pipe which is a brittle material.



Design & Specification of Concrete Net Weight:



Fabrication of Concrete net weight:

1. Prepare a concrete mixture of 1:4:4 for 12 pcs. Net weight.
2. Pour the concrete mixture in 12 pcs. PVC net weight mold.
3. Wait for the concrete to set and gain enough strength to support itself.
4. Remove the PVC net weight mold. See figure below.

Fabricated 12 pcs. concrete net weight in Kijiweni.



PVC Net weight mold





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Design & Specification of Nursery net:

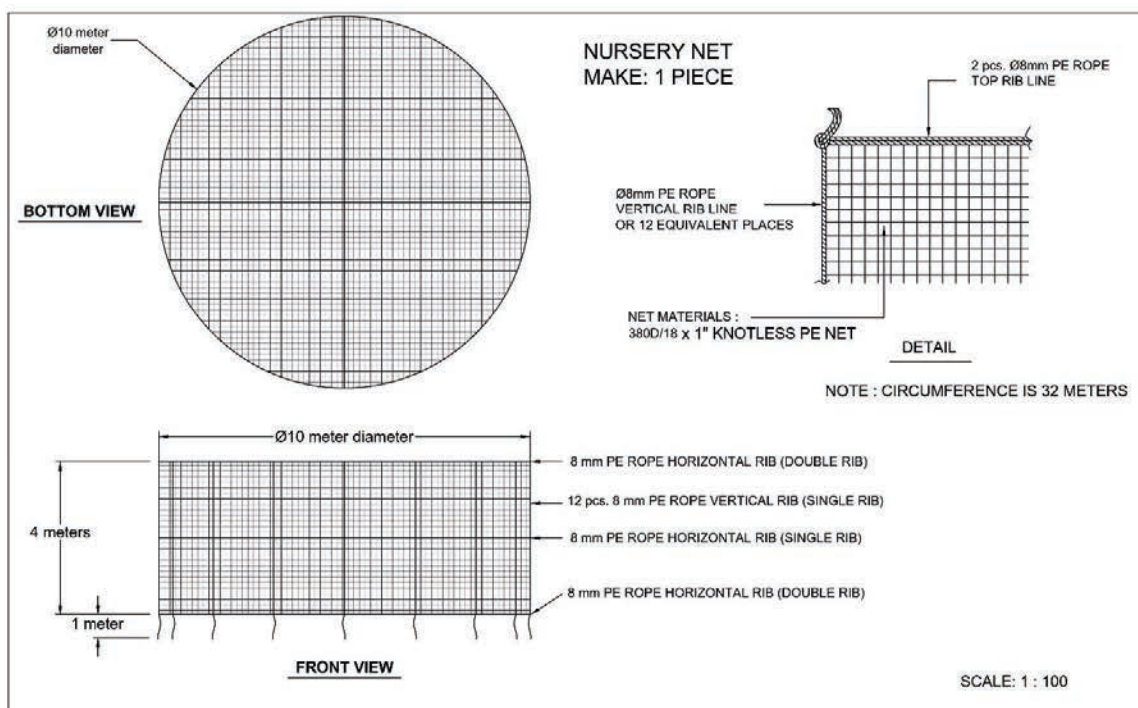
Original Netting material – Knotted PE net 400/9 x 17k x 300 MD

Substitute Netting material – Knotless PE net 380D/18 x 1" x 200 MD

The original material specification for nursery net is Knotted PE net 400/9 x 17k was not available in Kenya netting supplier. We decided to look for a substitute material which is the standard in Kenya Knotless PE net 380D/18 x 1" x 200 MD.

Advantages of Knotted PE net

1. Made from UV stabilized materials.
2. Higher breaking strength and better elasticity compared to knotless netting.
3. They are tough and durable.
4. It is very easy to repair in the unlikely event of damage.





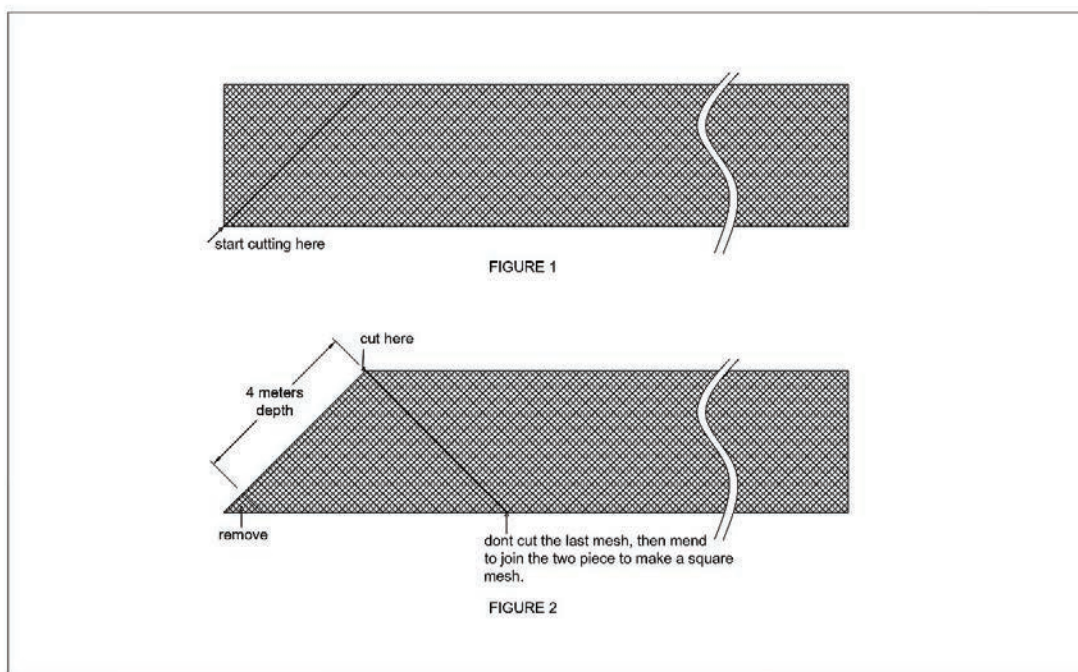
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Procedure on how to fabricate a nursery net Ø10 meter diameter by 4 meters depth:

1. Cutting of net from diamond mesh to square mesh. See figure 1.
2. Cutting and measuring depth of 4 meters from diamond mesh. See figure 2.



3. Mending, joining and cutting of diamond mesh net to make the total length of body/wall for circular square mesh cage net of 32 meters. See figure 3A & 3B.
4. Cutting of ropes. Use 8mm polyethylene rope.
 - A. Vertical ribs – 12 pcs. @ 6.5 meters length.
 - B. Horizontal ribs for top, center and bottom – 5 pcs. @ 34 meters length.
 - C. Bottom cross ribs – 2 pcs. @ 11 meters length. See figure 4.

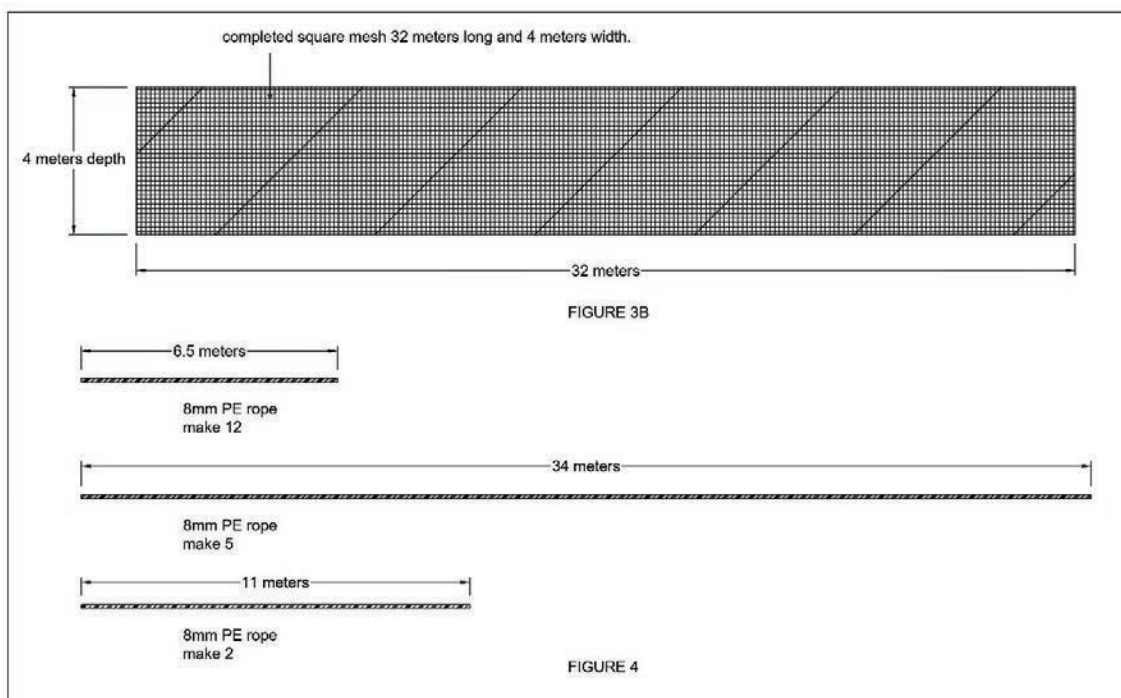
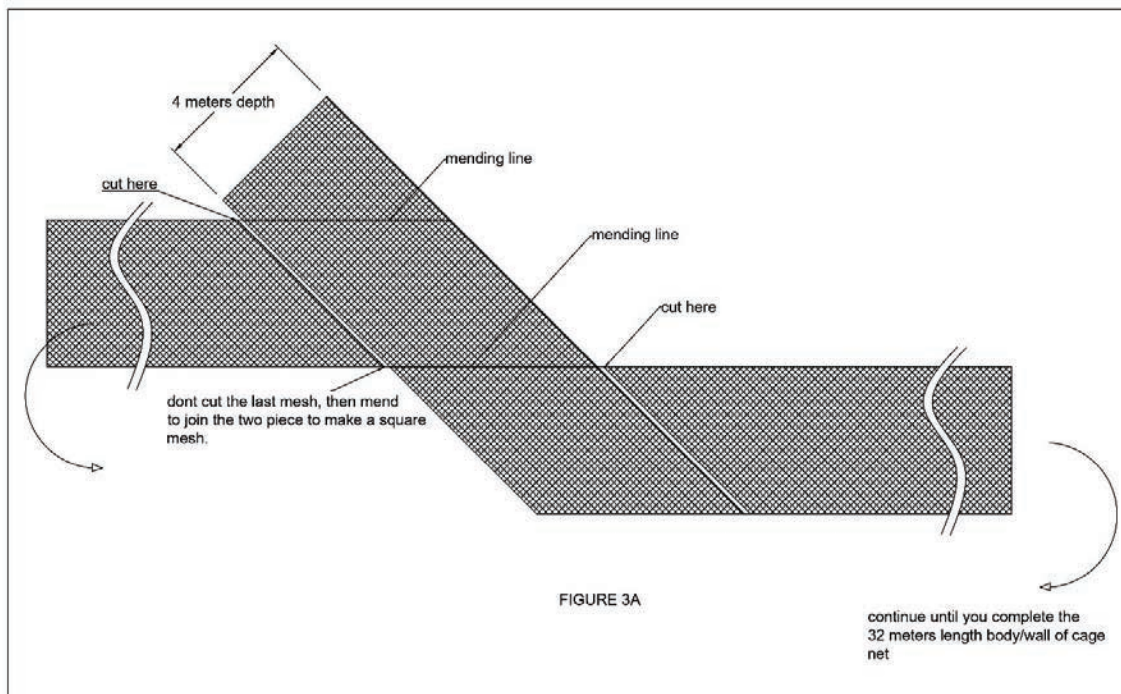




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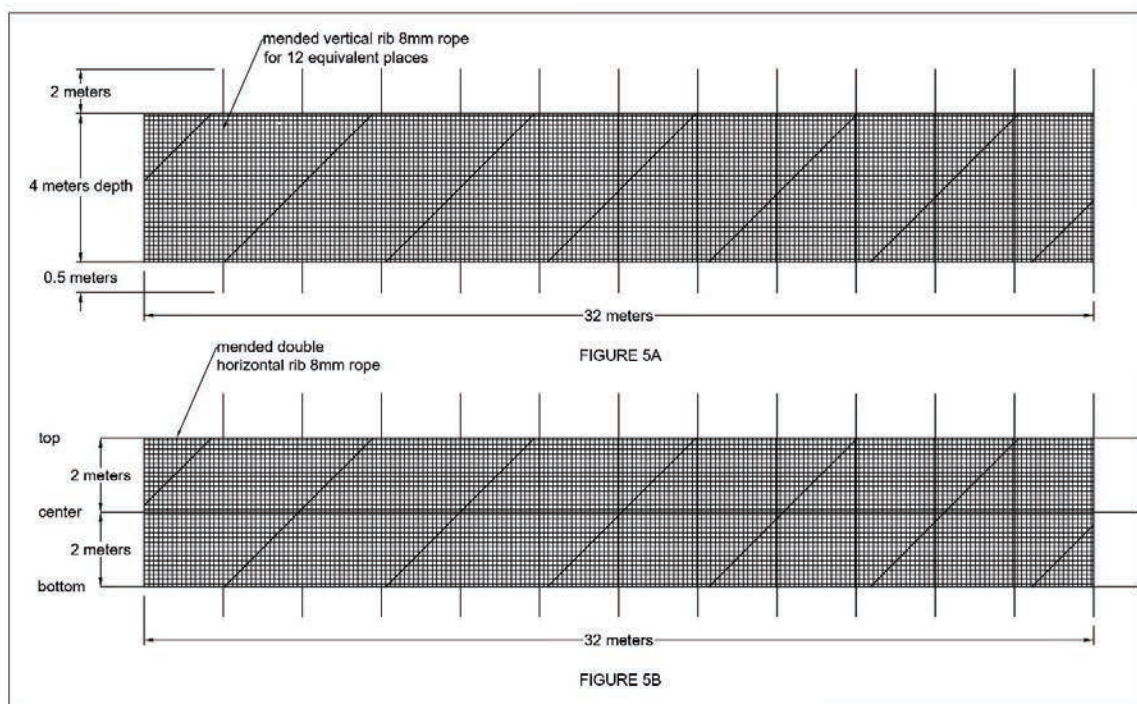
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5. Inserting of 12 pcs. vertical rib 8mm rope and mending to avoid loosening of net to the rope rib lines. See figure 5A.

Inserting of 3 pcs. horizontal rib 8mm rope and mending. See figure 5B.



6. Fabrication of base 10 meter diameter.

Look for flat and wide area 12 meters x 12 meters concrete flooring or compacted land. Make a round circle, measuring 5.08 meter radius then unfold or spread out the 12.5 square meter net. Make sure the cross rib 8mm rope is located at the center of the circle. Fixed the four corners of the net using concrete nails to avoid shrinkage/deformation of net. Then insert the 34 meter length 8mm rope by tracing the circumference line until completely rounded. See figure 6.

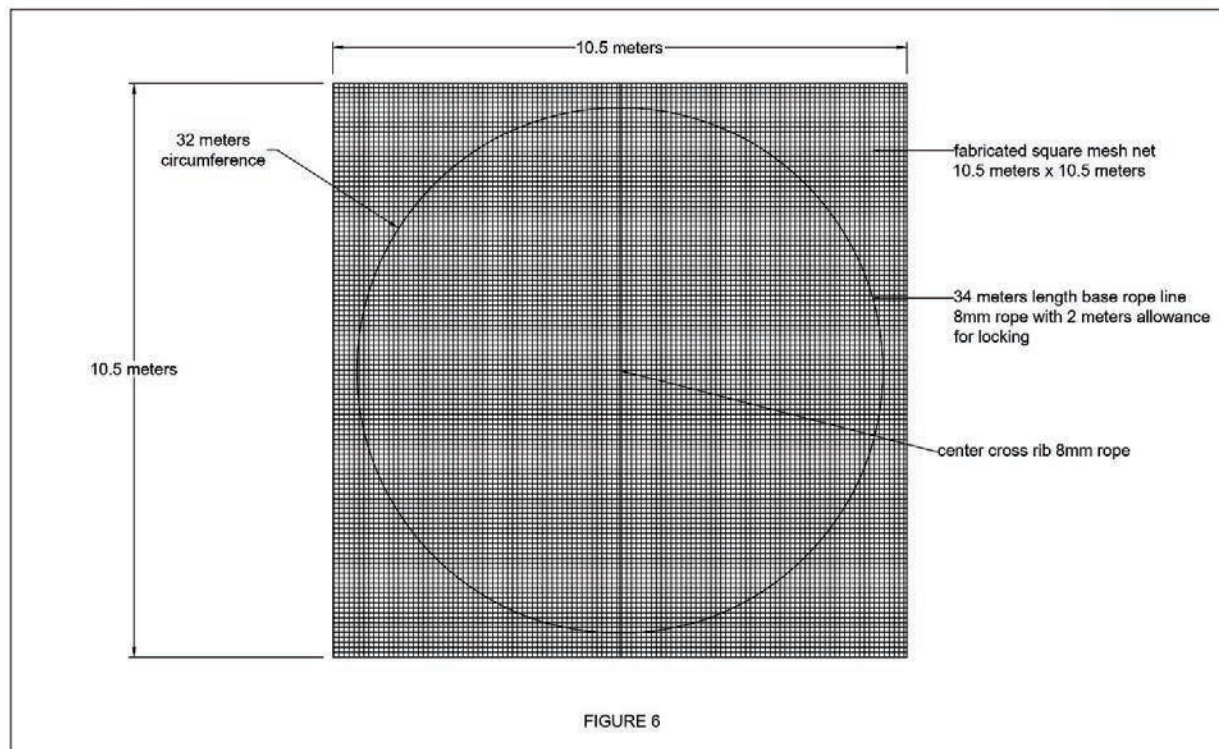




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7. Joining of wall and bottom of circular cage net 10 meter diameter by 4 meters depth.
See figure 7A.

Cut and remove the excess net after mending the wall and the bottom. Lock the vertical rope rib to circumference rope top and bottom. See figure 7B.





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This photo was the actual training and fabrication of nursery net. They are mending/joining the wall and the base/bottom net.

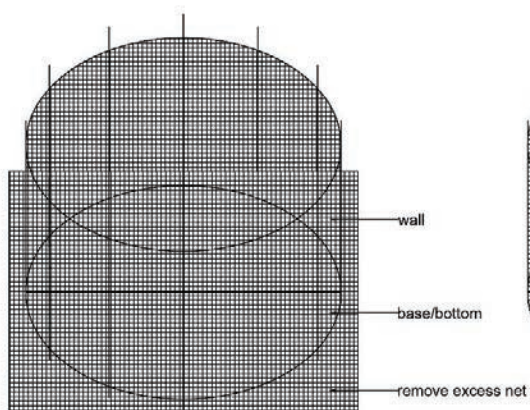


FIGURE 7A

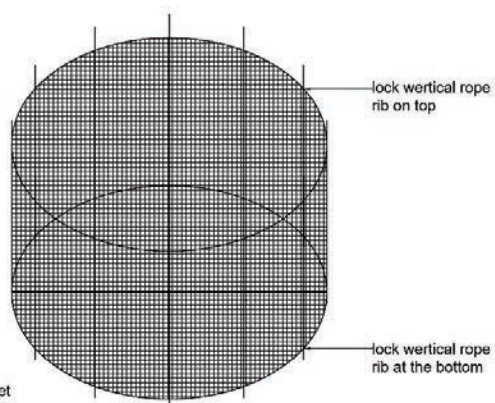


FIGURE 7B





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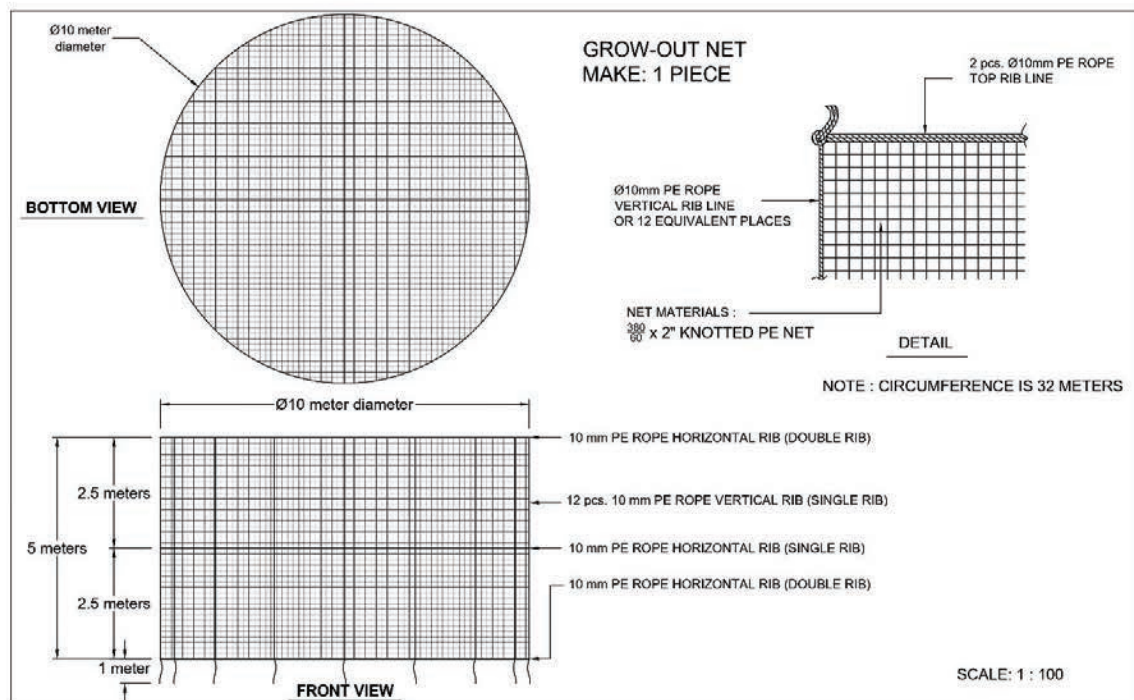
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Design & Specification of Grow-out net:

Original Netting material – Knotted PE net 400/15 x 10k x 300 MD

Substitute Netting material – Knotted PE net 380/60 x 2" x 200 MD



Procedure on how to fabricate a grow-out net Ø10 meter diameter by 5 meters depth:

1. Cutting of net from diamond mesh to square mesh. See figure 1.
2. Cutting and measuring depth of 5 meters from diamond mesh. See figure 2.



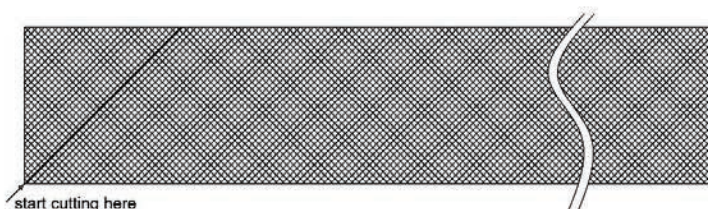


FIGURE 1

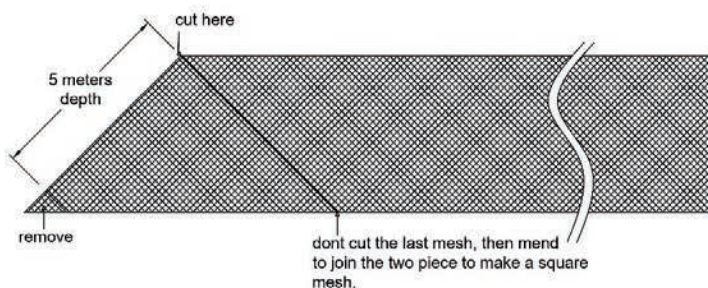


FIGURE 2

3. Mending, joining and cutting of diamond mesh net to make the total length of body/wall for circular square mesh cage net of 32 meters. See figure 3A & 3B.
4. Cutting of ropes. Use 10mm polyethylene rope.
 - D. Vertical ribs – 12 pcs. @ 7.5 meters length.
 - E. Horizontal ribs for top, center and bottom – 5 pcs. @ 34 meters length.
 - F. Bottom cross ribs – 2 pcs. @ 11 meters length. See figure 4.

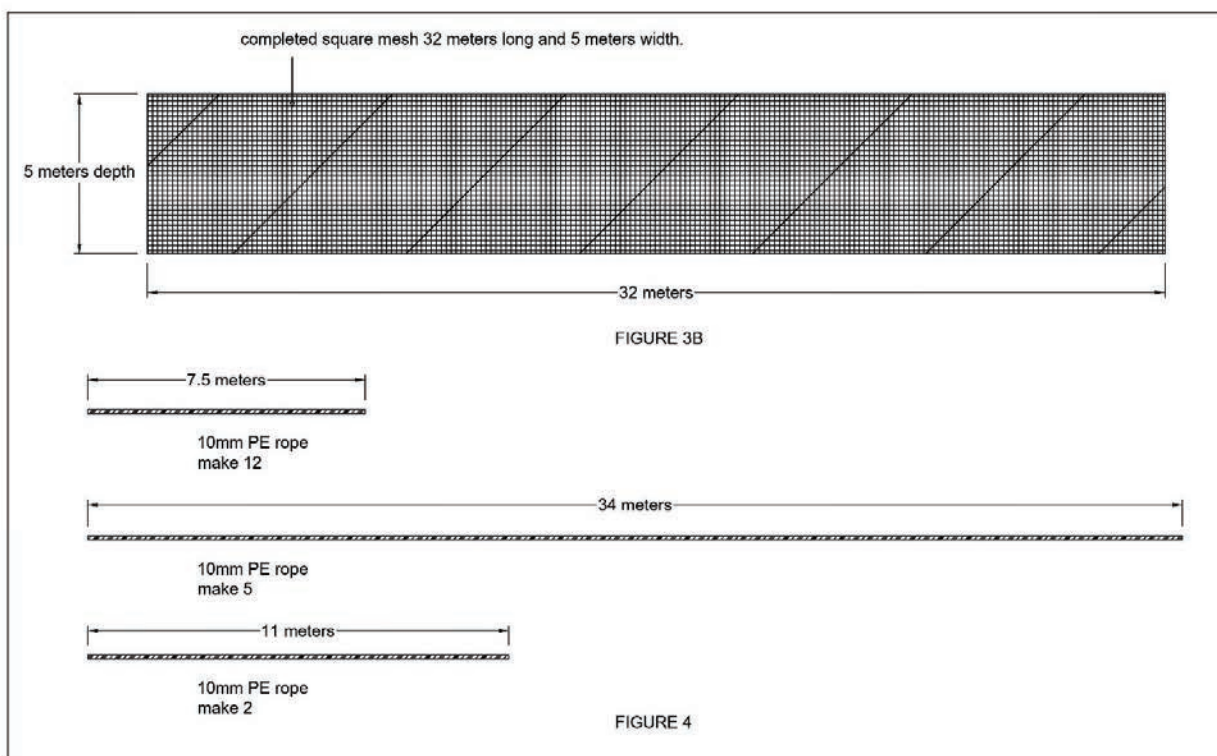
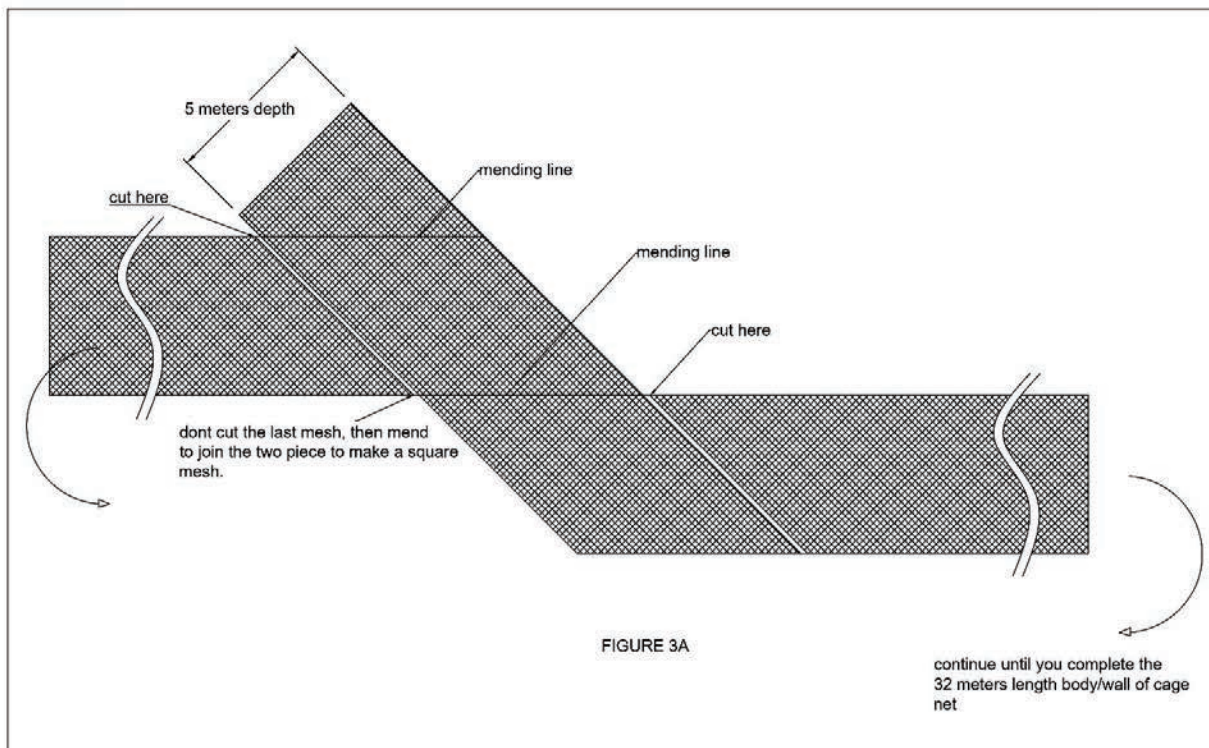




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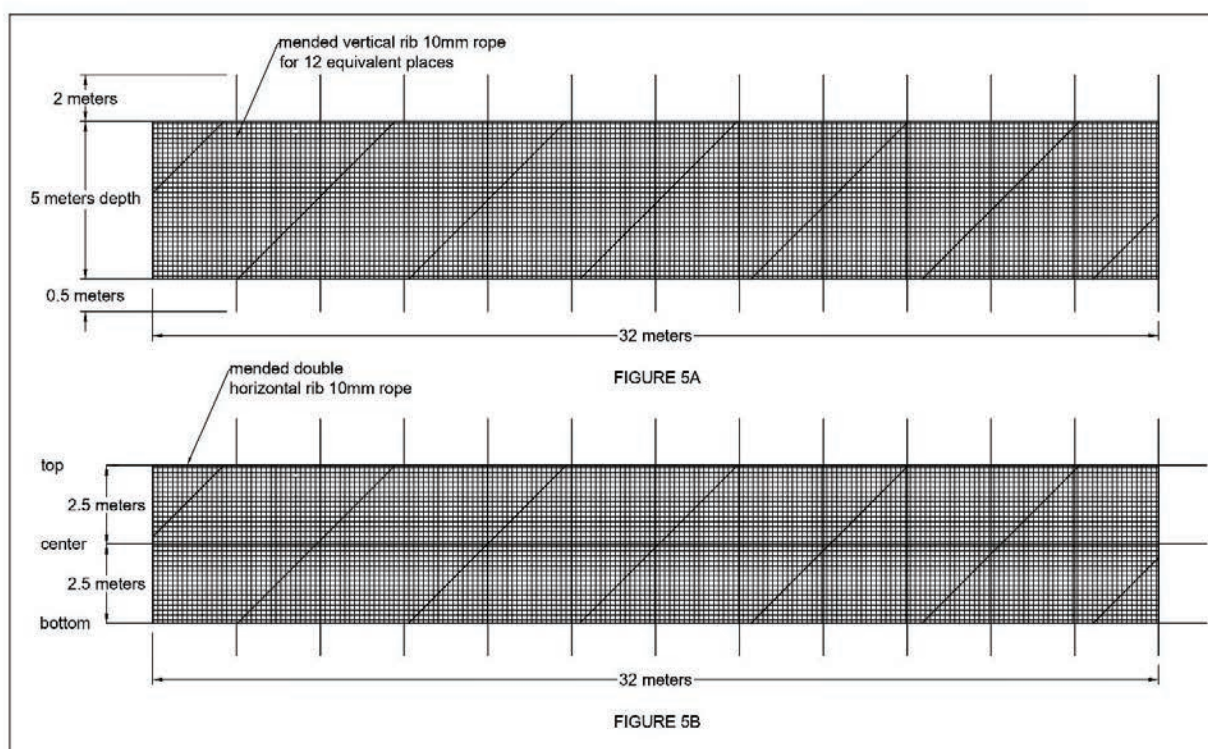
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5. Inserting of 12 pcs. vertical rib 10mm rope and mending to avoid slacking of net to the rope rib lines. See figure 5A.

Inserting of 3 pcs. horizontal rib 10mm rope and mending. See figure 5B.



6. Fabrication of base 10 meter diameter.

Look for flat and wide area 12 meters x 12 meters concrete flooring or flat compacted land. Make a round circle, measuring 5.08 meter radius then unfold or spread out the 12.5 square meter net. Make sure the cross rib 10mm rope is located at the center of the circle. Fixed the four corners of the net using concrete nails to avoid shrinkage/deformation of net. Then insert the 34 meter length 10mm rope by tracing the circumference line until completely rounded. See figure 6.

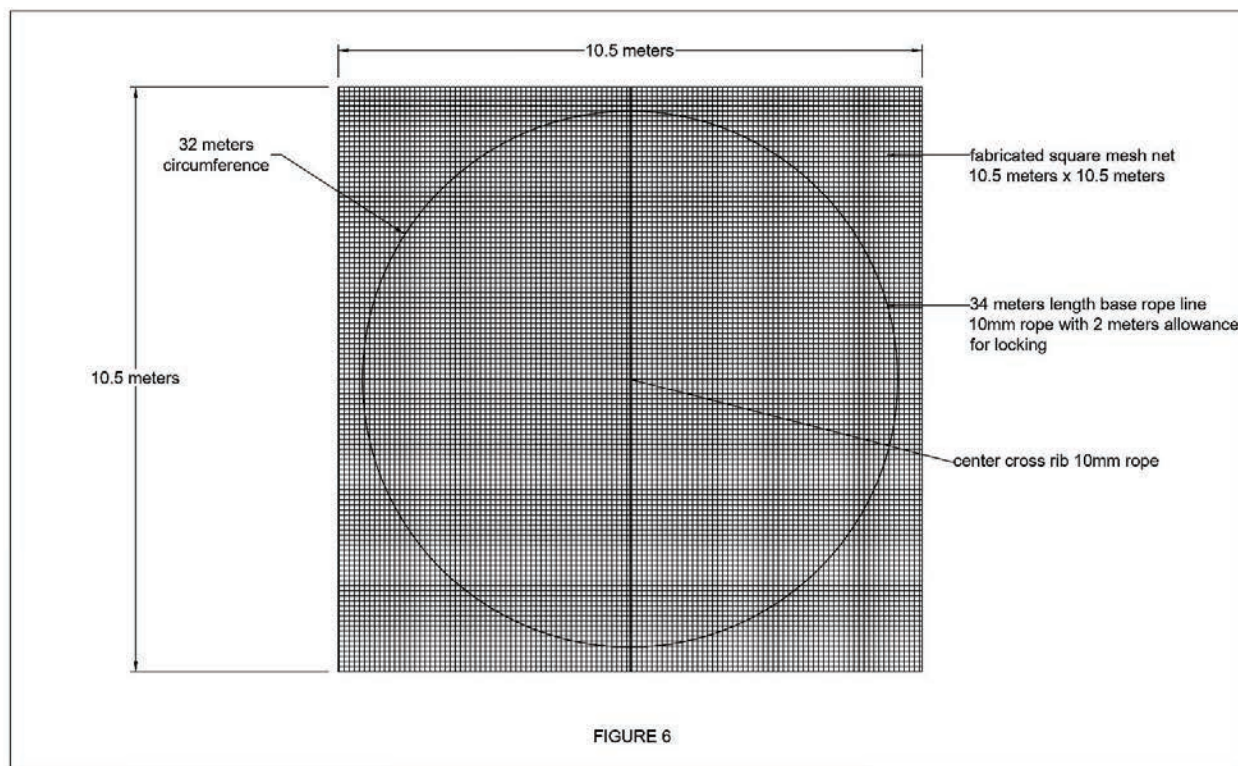




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7. Joining of wall and bottom of circular cage net 10 meter diameter by 5 meters depth. See figure 7A.

Cut and remove the excess net after mending the wall and the bottom. Lock the vertical rope rib to circumference rope top and bottom. See figure 7B.





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This photo was the actual fabrication of grow-out net base/bottom.

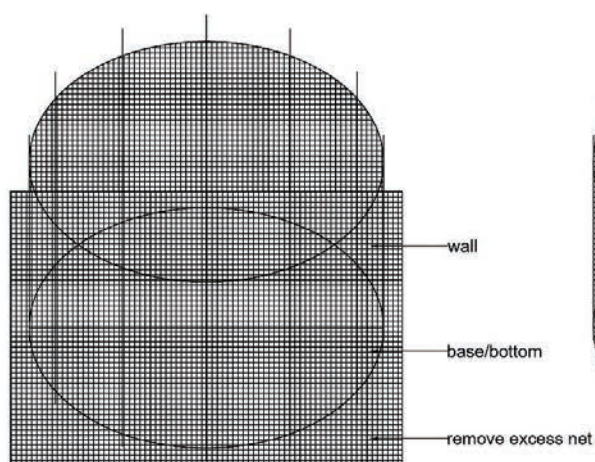


FIGURE 7A

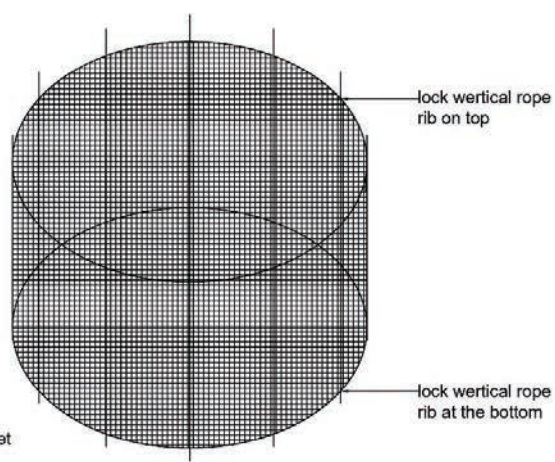


FIGURE 7B





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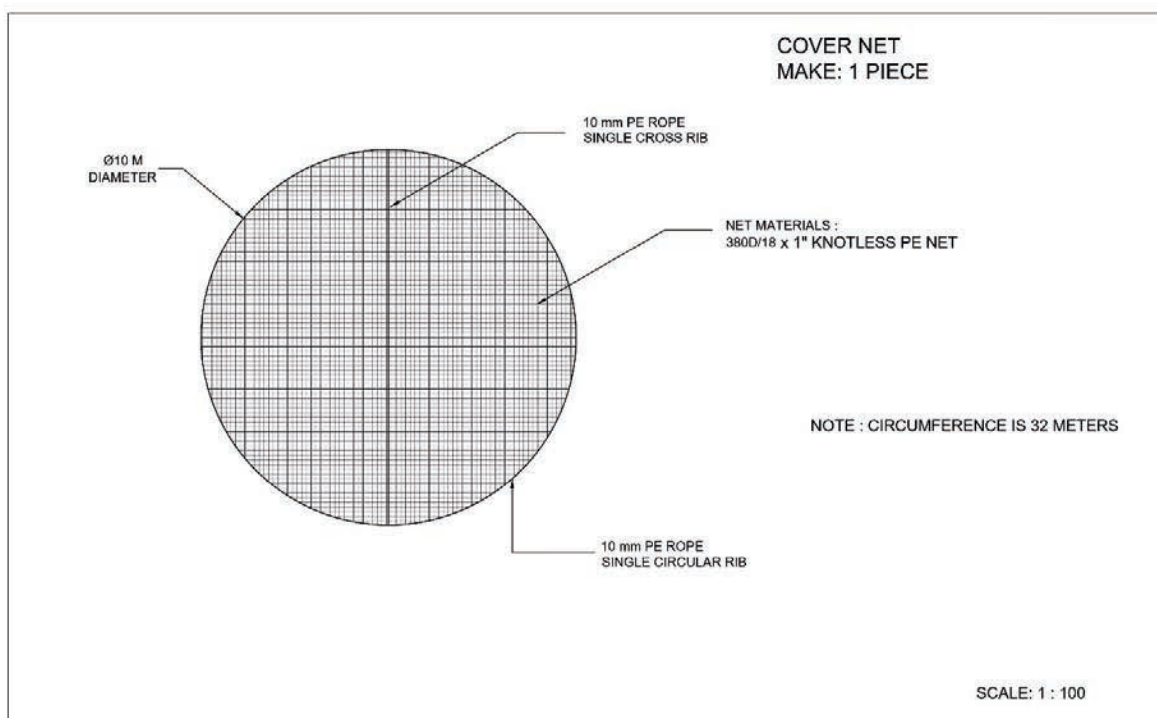
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Design & Specification of Cover net

Original Netting material – Knotted PE net 400/9 x 17k x 300 MD

Substitute Netting material – Knotless PE net 380D/18 x 1" x 200 MD



Procedure on how to fabricate a cover net Ø10 meter diameter:

1. The process is the same to fabricate the nursery base/bottom. See figure 1.

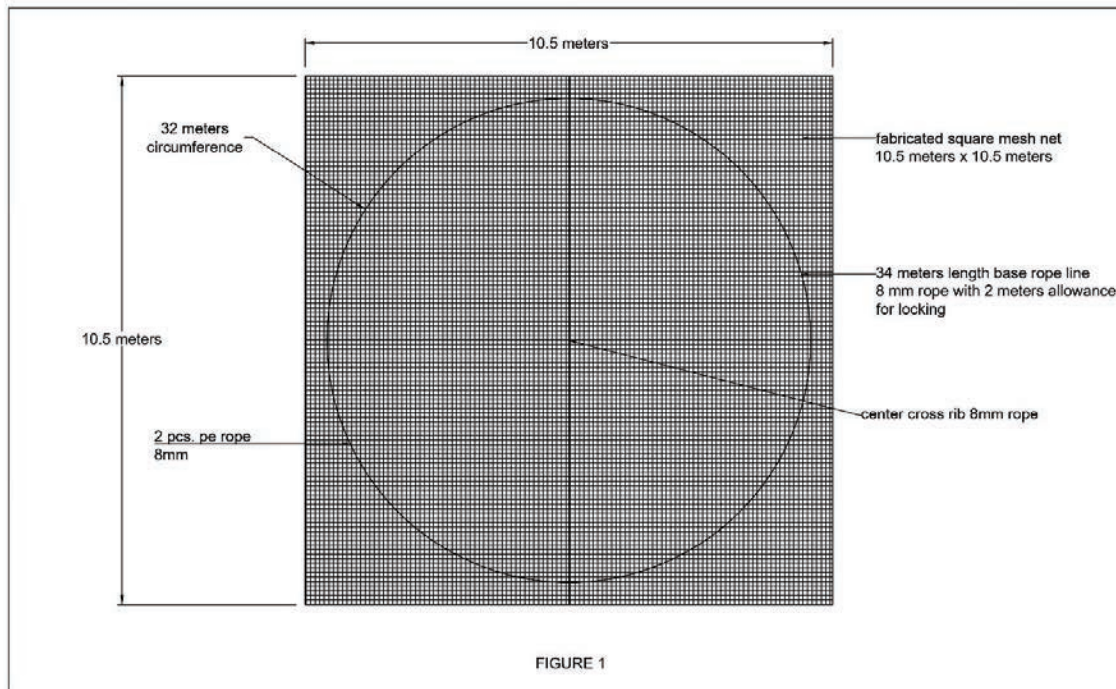




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This photo was the actual fabrication of cover net.





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Fabrication of 10 Meter HDPE Circular cage:

HDPE Pipe International Standard Specification PE-100 Material:

NOMINAL OUTSIDE	SDR 17
DIAMETER	(PN 10)
mm	T (mm)
225	13.4

Butt Fusion Machine Specification:

PARTICULARS	WELDING RANGE	POWER SUPPLY	HERTZ	RATED POWER	WORKING PRESSURE
HYDRAULIC BUTT FUSION WELDING MACHINE V250	90-250 mm	220 V	50/60	0.75 KW	0-80 BAR

Generator Set Specification:

PARTICULARS	AC RATED OUTPUT RUNNING	RATED AC VOLTAGE	RATED AC FREQUENCY	RATED 120/240 VAC	TANK CAPACITY
	WATTS			AMPERAGE	LITERS
GASOLINE GENERATOR	8000	220 VAC	60 HZ	66.6/33.3	24

Procedure on how to fabricate 10 meter HDPE circular cage:

1. Select the proper equipment to be use that accommodates the diameter of the pipe and fittings. See photo no. 1.



Photo no. 1





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2. Cut the polystyrene sheet 4' x 4' x 4" to form a circle 7 ¼" in diameter. You can make 36 in one (1) sheet. See photo no 2.



Photo no. 2

3. Insert the polystyrene circle pieces inside the HDPE pipe. Make sure to fill the 32 meters length of pipe. See Photo no. 3.



Photo no. 3





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4. Alignment and clamping of pipe two ends. It should be a seamless transition from one piece to the next with no gaps, and no ridge or drop off from one piece to the next. See Photo no. 4.

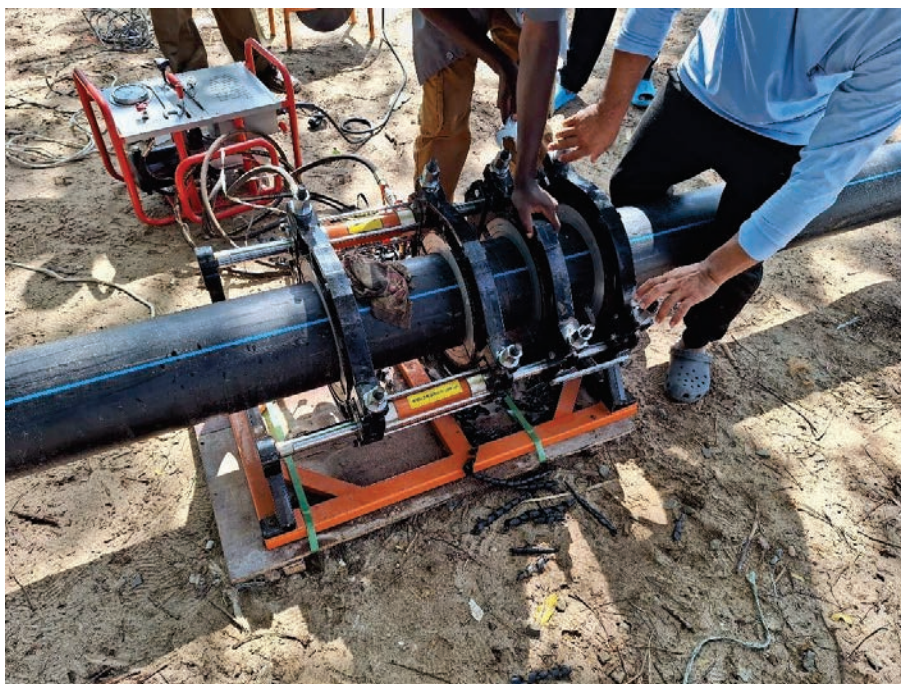


Photo no. 4

5. Butt fusion requires a clean, smooth, virgin surface of HDPE in order for the fusion to have the optimal result.
6. The inside and outside of the pipe needs to be cleaned thoroughly of debris with a clean, lint-free cloth or paper towel.
7. Heating plate must be carefully mounted between the cleanly faced ends. The pipe must remain in place against the heating plate for a process called the heat soak, based on the outside diameter and thickness of the pipe and fittings. See Photo no. 5





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Photo no. 5

8. Upon the quick, but efficient inspection of the pipes ends. The pipe can be rejoined smoothly but firmly, and once again locked into place.
9. When the proper cooling has been completed, the fusion is complete. Until that time, the pipes needs to remain in the clamps and not disturbed, so as not to damage or alter the fusion
10. Troubleshooting and bead inspection.
11. Continue and repeat the process with the straight pipe butt fusion to complete the 36 meters length or 6 pcs. HDPE pipe x 6 meters length. See Photo no 6.





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Photo no. 6

12. Measure the straight pipe with the total length of 32 meters, then cut the excess pipe using a chain saw. See Photo no. 7.



Photo no. 7





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13. Use a 16mm PP rope to pull and bend the straight pipe of 32 meters to form a circular ring. See Photo no. 8



Photo no. 8

14. Joining the encircled pipe ends must be clamped and aligned properly. It should be a seamless transition from one piece to the next with no gaps, and no ridge or drop off from one piece to the next. See Photo no. 9.





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Photo no. 9



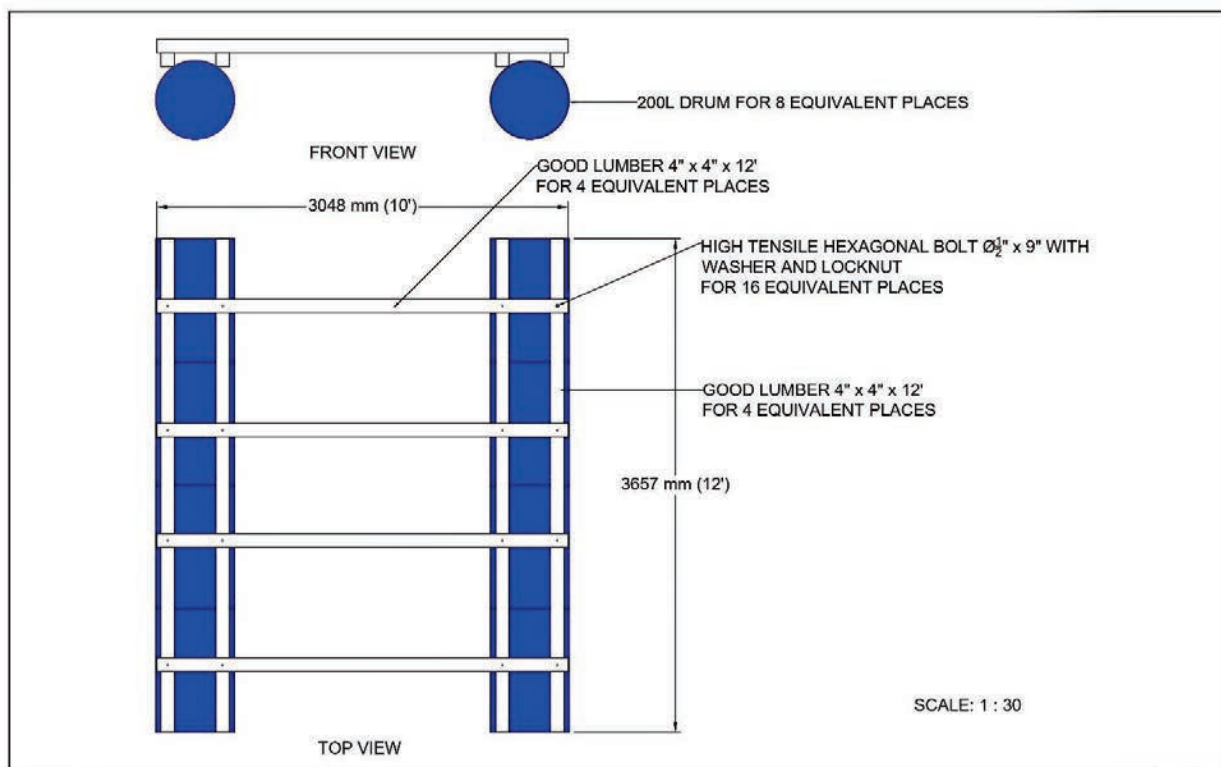


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Design and Specification of Mooring/Floating raft:



Procedure on fabrication of mooring raft:

1. Sealed the drum lid using silicone sealant. Make sure to tighten the lid properly to prevent seawater from entering the drum floater. See Photo no. 1





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Photo no. 1

2. Measure the distance of inner and outer wood as per design and specification of raft.
See Photo no. 2.



Photo no. 2





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3. Drill 16 pcs. bolt hole $\frac{1}{2}$ " diameter to fasten the high tensile bolt $\frac{1}{2}$ " diameter x 9 inch.
See Photo no. 3.



Photo no. 3

4. Fastened 16 pcs. high tensile bolt. Make sure the parts to be joined together are securely held and tightened with locknuts and bolt. See Photo no. 4.



Photo no. 4





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5. Tie the 8 pcs. drum floater on the wood frame by monofilament nylon # 160. Each drum has 4 pcs. 8mm diameter hole located on opposite sides. See Photo no. 5.



Photo no. 5

6. Fabricated mooring raft. See Photo no. 6



Photo no. 6





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Assembly and Installation of temporary marker:

1. Make 16 pcs. 25 kilograms sandbag for anchoring the temporary marker for T1, T2, T3 and T4. Make 8 pcs. polystyrene float 10" length x 10" width x 4" height for temporary marker. Use 10mm PE rope to anchor the marker. See photo no. 1.



Photo no. 1

2. Make a temporary grid line using 10mm PE rope. This rope will connect the temporary marker for T1, T2, T3 and T4 @ 20 meters distance respectively. See Photo no. 2.



Photo no. 2





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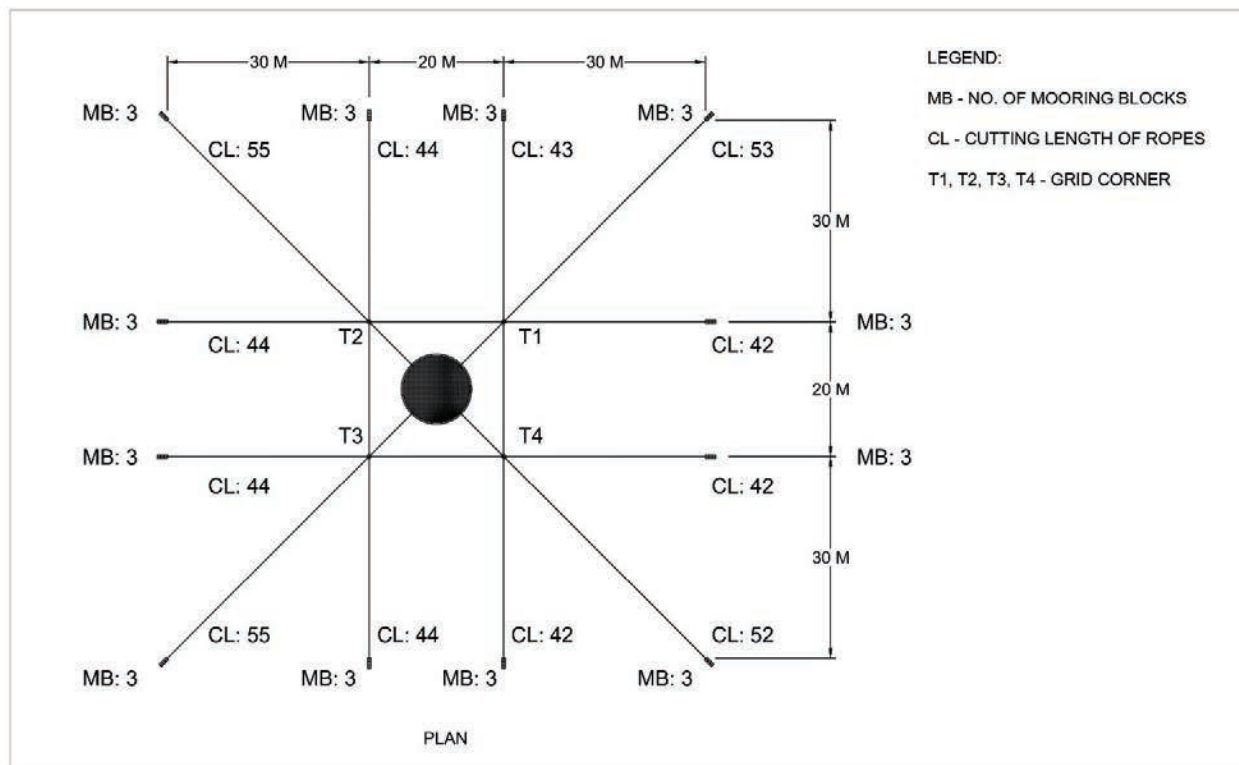
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2. Cutting of polypropylene ropes 24 mm for mooring line & mooring eye.

- a. T1 – 53 meters, 43 meters and 42 meters
- T2 – 55 meters, 44 meters and 44 meters
- T3 – 55 meters, 44 meters and 44 meters
- T4 – 52 meters, 42 meters and 42 meters

See figure below:



- b. 12 pcs. 4 meters for mooring rope eye.
- c. Burn both ends of the rope to avoid fraying.
- d. Put a marker on the center of mooring ropes, for tension buoy attachment.
3. Cutting of pe ropes for tying of concrete mooring blocks to mooring raft
 - a. 36 pcs. 10 mm pe rope by 2 meters length
4. Cutting of pe ropes for measuring the distance between mooring blocks and grid ring.
 - a. 1 pc. 10 mm pe rope by 30 meters length for parallel and perpendicular points of the grid.





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- b. 1 pc. 10mm pe rope by 42.5 meters length for corner points of the grid.
5. Cutting of ropes for towing of mooring raft.
 - a. 1 pc. 10 mm pe rope by 35 meters
6. Minimum of five (5) persons needed to lift and attach the concrete mooring blocks to mooring raft. One (1) person should be on top of the raft to pull the 10 mm pe rope by 2 meters length tied to the ring of mooring block. Four (4) persons must on the water to lift the mooring block until the concrete ring is tied to the raft. Repeat the same procedure to complete the 8 pcs. concrete mooring block before towing. See Photo no. 6

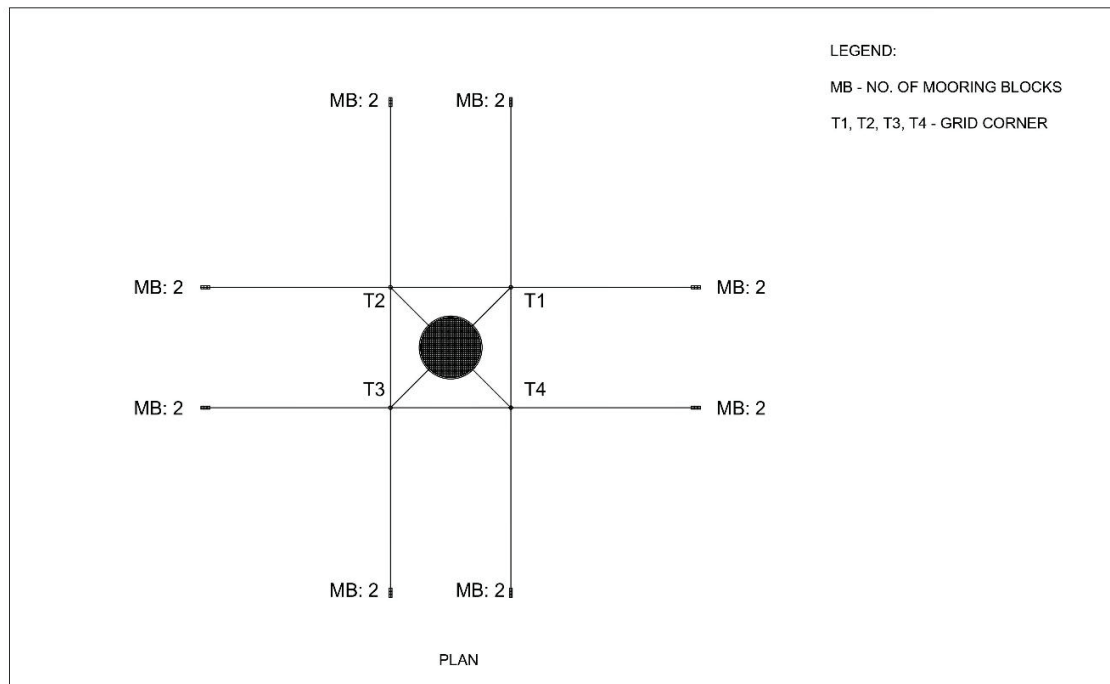


Photo no. 6

7. Use a Boat with 15 HP engine to tow the mooring raft. Tie the mooring rope to 2 pcs. mooring block using two types of knot (clove hitch & fisherman's knot). Tie the 10 mm pe rope 30 meters length to T1 polystyrene float to measure the parallel and perpendicular distance before dropping. Repeat the same procedure



for T2, T3 and T4 to complete the 16 pcs. concrete mooring blocks. See figure below.



On corner points of the grid. Tie the 10 mm pe rope 42.5 meters length to T1 polystyrene float to measure the corner distance before dropping. Repeat the same procedure for T2, T3 and T4 See figure below.

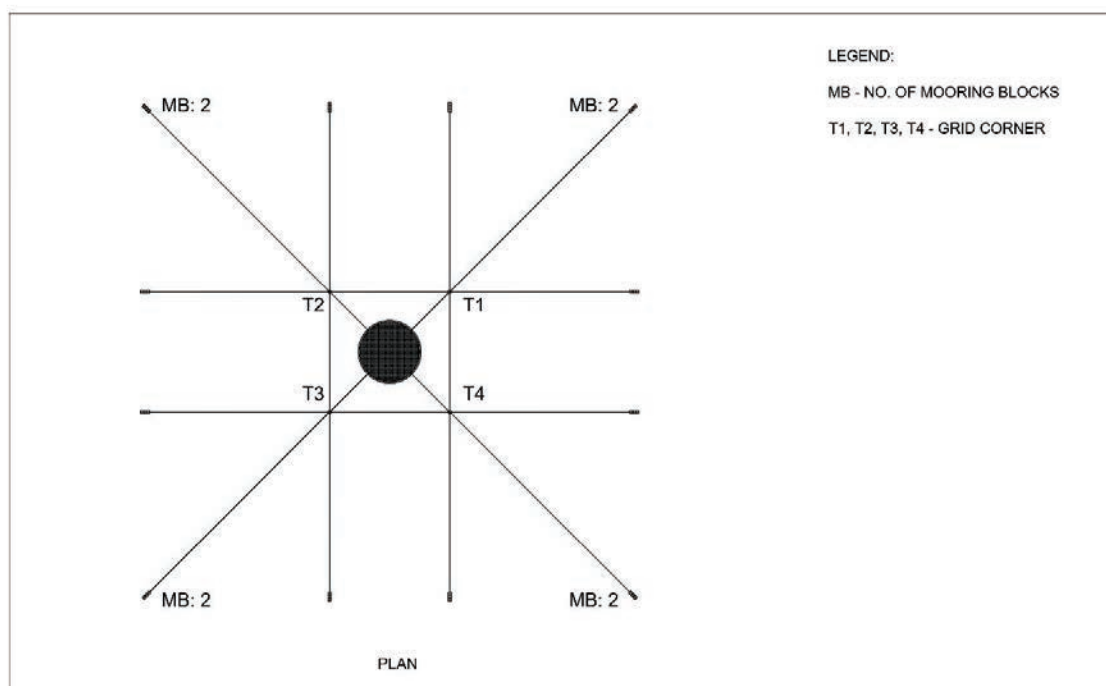




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8. For the remaining 12 pcs. concrete mooring blocks, tie the mooring rope eye to concrete mooring block tire rim. Insert the eye on the mooring rope line, then pull the rope going to the drop point. When the mooring rope line is already in vertical position, drop the concrete mooring block. Add 1 pc. concrete mooring block for the 12 points to complete 3 pcs. mooring block per point. See Photo no. 8 and figure below.





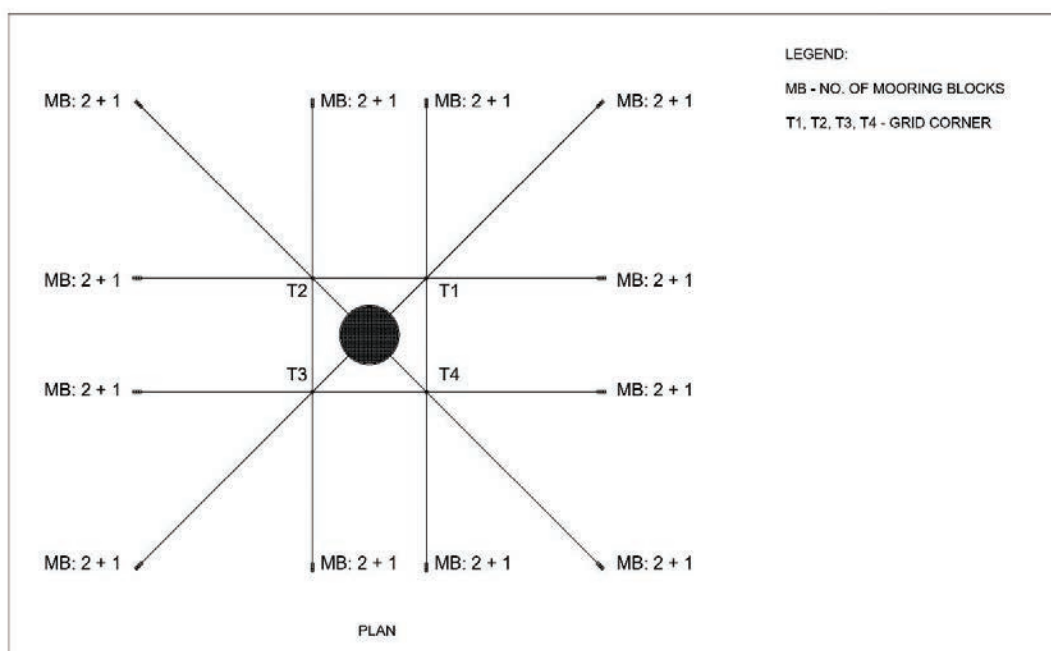
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Fabrication of Grid mooring system:

1. Cut 4 pcs. 28mm diameter polypropylene rope by 25 meters length for grid line rope.
Burn both ends of the rope using butane torch to avoid fraying. See Photo no. 1



Photo no. 1

2. Tie together 3 pcs. used tire rim using 6mm Pe rope for grid ring. Make 4 pcs. for T1, T2, T3 and T4 for one (1) grid cell mooring system. See Photo no. 2.





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Photo no. 2

3. Make a cross-section on the grid ring using 16mm PP rope for drum floater tying. See Photo no. 3.



Photo no. 3





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4. Connect the 28mm grid line rope on the grid ring for T1, T2, T3 and T4. Make sure to tie the rope by clove hitch knot and fisherman's knot, then insert the end rope. See Photo no. 4A and 4B.



Photo no. 4A



Photo no. 4B





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5. Drum floater preparation for T1, T2, T3 and T4
 - a. Remove the cap of the drum, then clean the threaded part using a dry clean cloth.
 - b. Apply the silicone sealant to avoid water to enter the drum floater.
 - c. Make 4 pcs. bag net for drum floater using 16mm PP rope.
For 1 pc. bag net, cut 4 pcs. 16mm PP rope by 7 meters length. On the midpoint of the 1 rope, join other 3 ropes by inserting across each other to make a diamond mesh 8 inches knot interval.
 - d. Insert the fabricated rope bag net to the drum floater. See Photo no. 5A



Photo no. 5A





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e. Tie the bag net drum floater to grid ring 1 meter apart. See Photo no. 5B.



Photo no. 5B





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Installation of Grid mooring system:

1. Load the assembled grid mooring to the raft, then tow using a boat going to T1 polystyrene marker. See photo no. 1



Photo no. 1

2. Tie the 3 pcs. mooring rope line to grid ring for T1. Repeat the same procedure for T2, T3 and T4. See Photo no. 2





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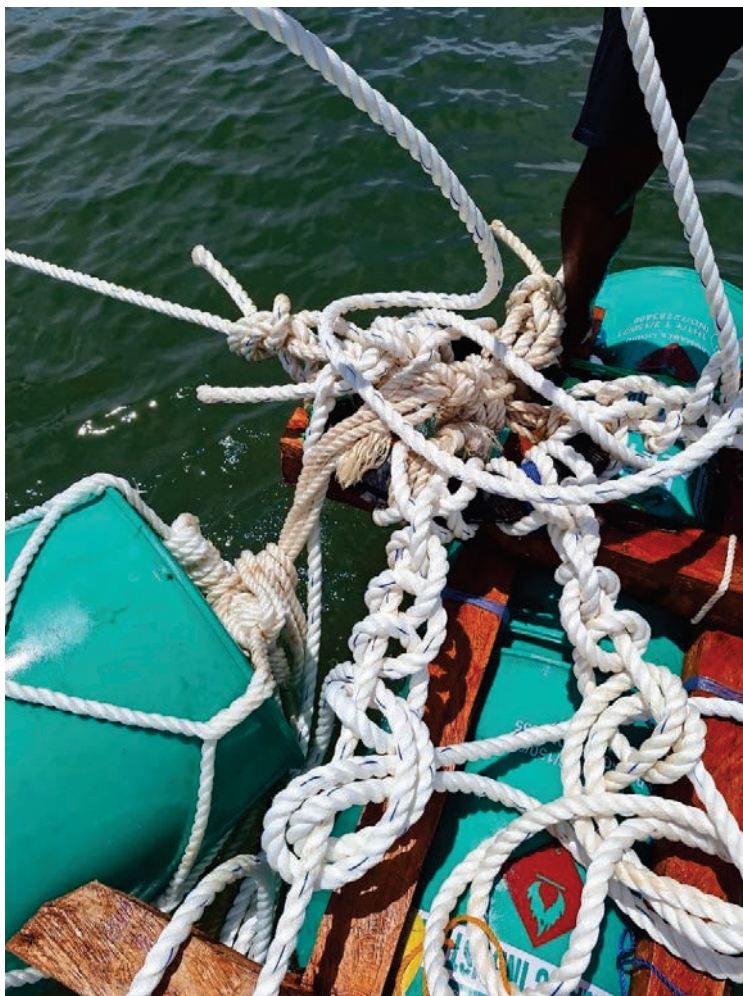


Photo no. 2

3. Align the grid mooring system and remove the temporary grid marker. See Photo no. 3





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Photo no. 3

4. During the peak low tide, align again and tighten all mooring rope line to final lock knot (clove hitch and fisherman's knot).





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Installation of 10 meter HDPE cage:

1. Cut 4 pcs. 24 mm polypropylene rope by 16 meters length for cage line rope.
2. Tow the cage using a boat with engine, from the shoreline going to the center of the grid. See Photo no. 2



Photo no. 2

3. Tie the 4 pcs. cage line rope to grid ring (T1, T2, T3 and T4). See Photo no. 3





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Photo no. 3



Actual photo of installed HDPE cage with grid mooring system in Kijiweni





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Installation of Nursery and Cover net:

1. Load the nursery net, cover net and net weights to the raft, then tow using a boat going to the HDPE cage installed. See photo no. 1



Photo no. 1

2. Cut 12 pcs. 10 mm pe rope by 9 meters length for suspension rope.
- 3.
4. Attached the 12 pcs. concrete net weight with suspension rope and quick release hook.
5. Install the nursery net by tying the 12 pcs. vertical rib line on HDPE cage. Make an eye at the bottom of vertical rib for quick release hook attachment.
6. Attach the 12 pcs. quick release hook on the eye of the vertical rib at the bottom. See figure 1 and figure 2.

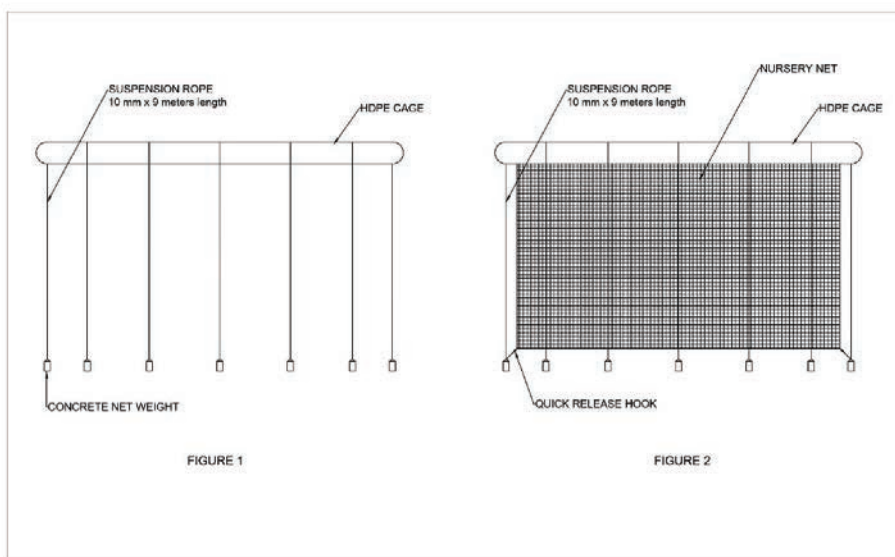




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7. Install the cover net including the center drum floater. See Photo no. 7



Photo no. 7





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8. Together, tie the nursery and cover net circular rib to HDPE cage. Use 5 mm or 6 mm pe rope.
9. Insert the tensioner rope to HDPE cage to fix the net. See photo no. 9.



Photo no. 9





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Procedure on how to change net:

1. Release the 12 pcs. hook from the vertical rib rope eye at the bottom of nursery net.
2. Insert the grow-out net from the bottom of nursery net until fully covered.
3. Tie 12 pcs. upper vertical rib to HDPE cage.
4. Attach the 12 pcs. quick release hook on the eye of the vertical rib at the bottom of grow-out net, to avoid the fish stock to entangled on the net.
5. Unfasten the rope for nursery and cover net. Then simultaneously fasten the rope for grow-out and cover net to prevent the fish stock from coming out of the net.
6. Slowly, full out the nursery net from the cage.
7. Continue to fasten the grow-out and cover net until the HDPE cage is fully covered.

Cage operation and maintenance:

The first rule to be followed for cage operators is to pay attention to the installation and maintenance of all the cage components. Marine environment has a high number of physical (static and dynamic) forces acting on the cage structure which is constantly in motion. This motion affects everything on the water surface or submerged. For optimal management of floating HDPE cage, there should be a record-keeping to keep track of the activities for maintenance and replacement of all parts overtime. Periodic inspection is needed, some parts should be inspected daily, and others have to be subjected weekly or monthly.

List of fish cage parts for inspection:

1. Daily – Nursery net/ Grow-out net & Cover net
2. Weekly – Concrete net weight and suspension ropes
3. Monthly – Grid line rope, Grid ring and Drum floater, Mooring line rope and Concrete mooring blocks

Net mending on site:

Damage net with fish stock can be repaired by a diver with scuba tank.

Removal of rope slack:

1. Unfasten the mooring line rope to grid ring. Then pull the rope to retighten again.
2. Fasten the tension buoy on the eye provided at the midpoint of the mooring rope line. A Diver with scuba tank can do this activity. See photo no. 2.





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Photo no. 2.





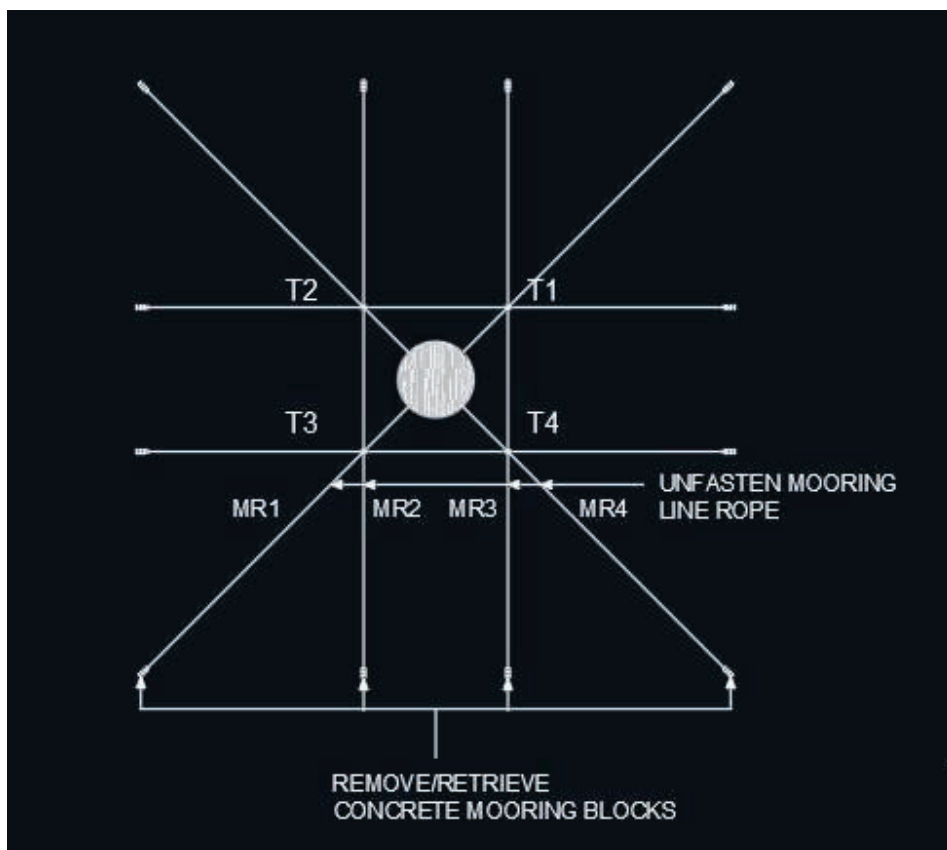
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Procedure for system expansion from the current one cage grid mooring system to three cells grid mooring system:

1. Fabricate additional 26 pcs. concrete mooring blocks.
2. Fabricate additional 2 grid cells 20 meters by 20 meters.
3. Unfasten mooring line rope MR1, MR2, MR3 & MR4 as shown in figure below.
4. Remove/Retrieve 12 pcs. concrete mooring blocks as shown in figure below.



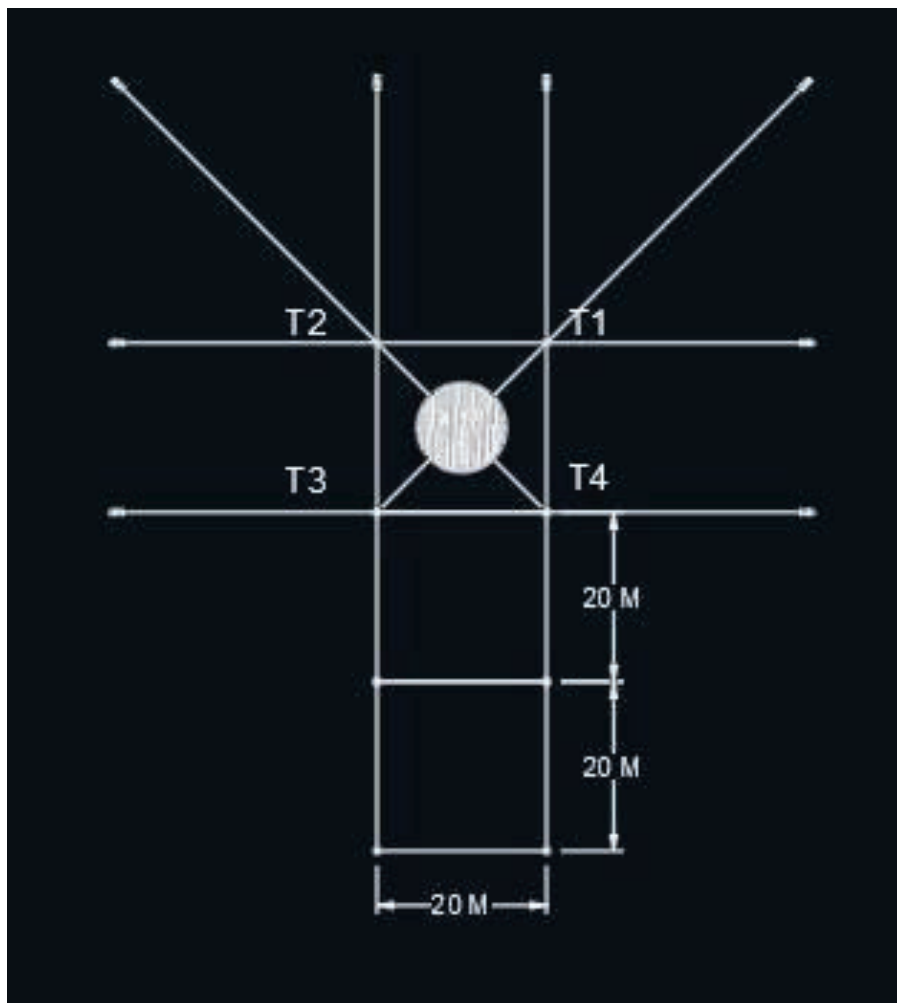


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5. Add additional two (2) grid cells.



6. Fasten the mooring line rope MR1, MR2, MR3 & MR4 as shown in figure below.
7. Relocate the 12 pcs. concrete mooring blocks as shown in figure below.

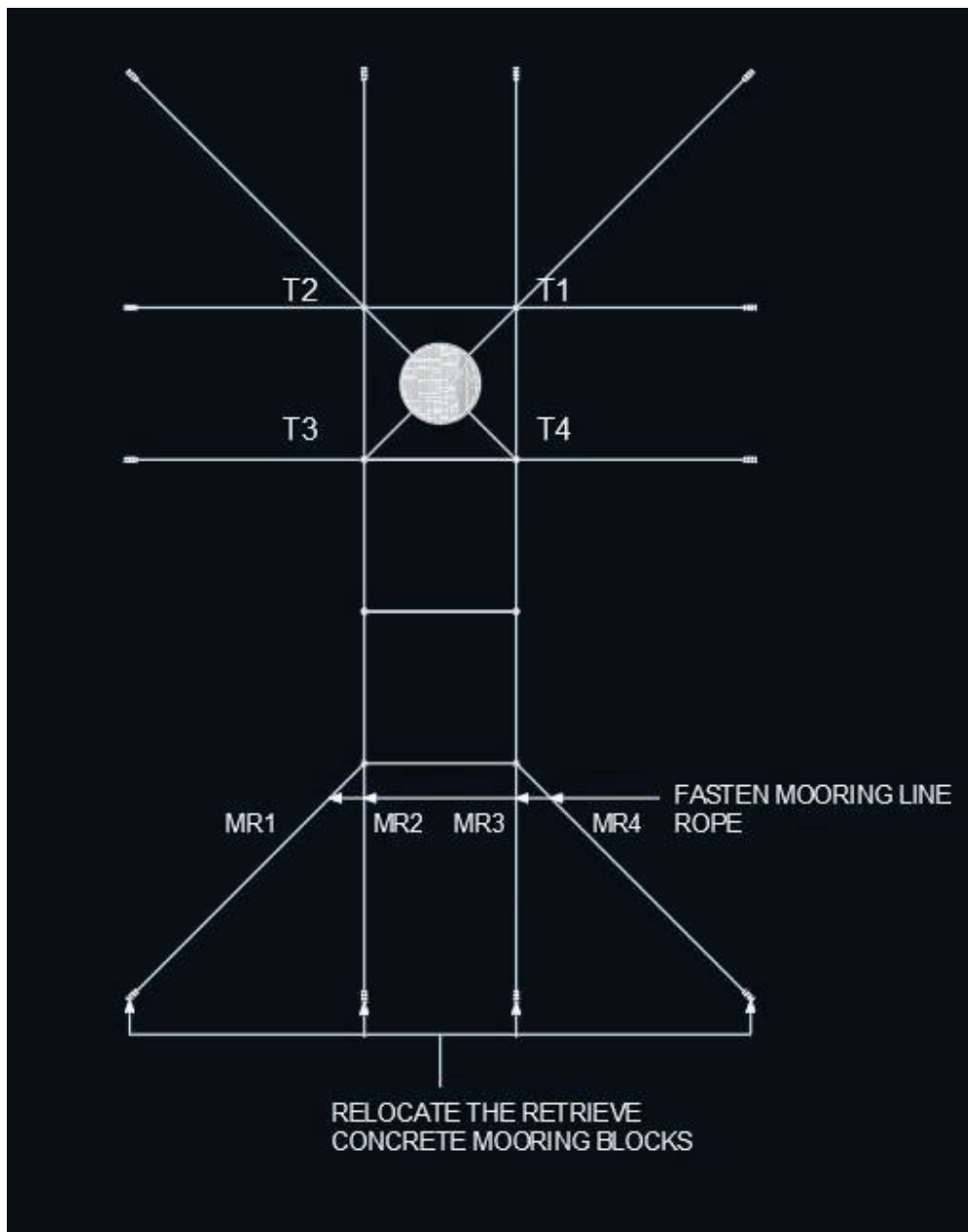




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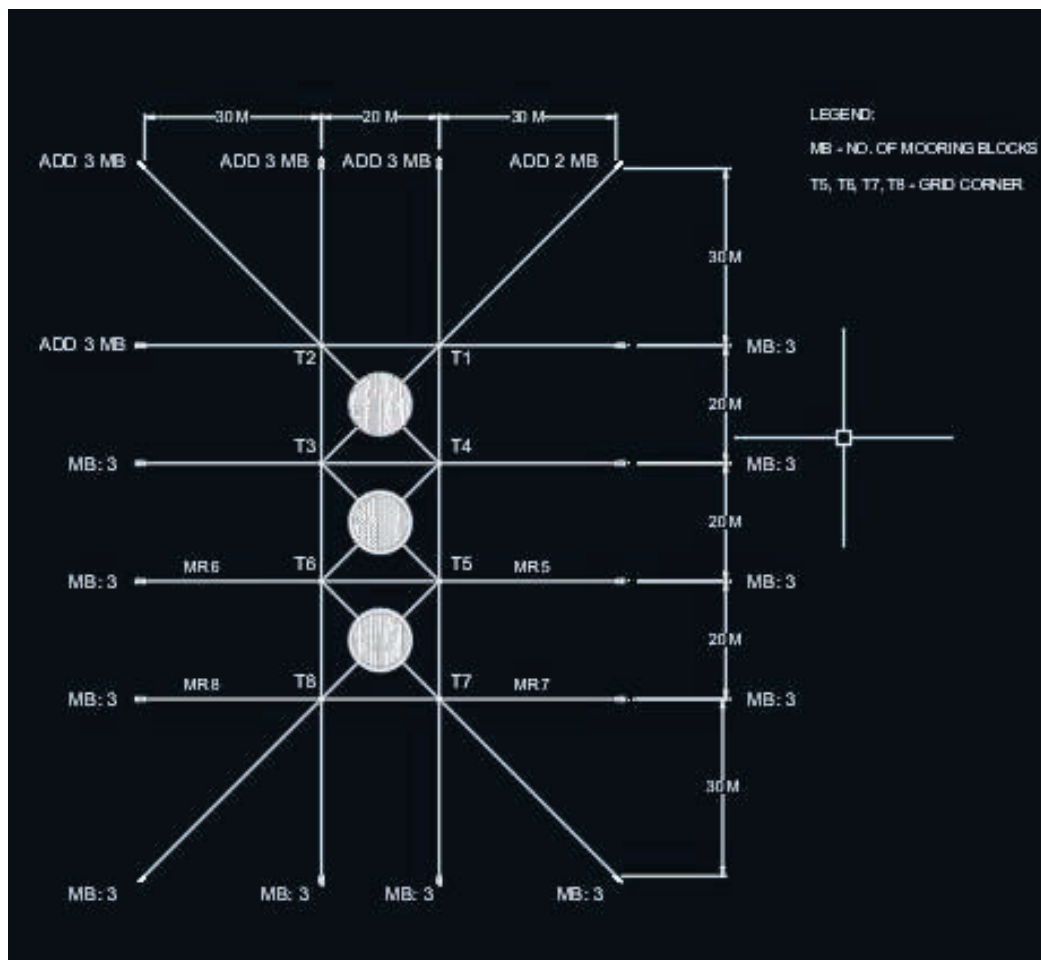


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8. Cut 4 pcs. polypropylene 24 mm mooring line rope for MR5, MR6, MR7 & MR8
9. Haul and drop the additional 26 pcs. mooring blocks as shown in final design below.



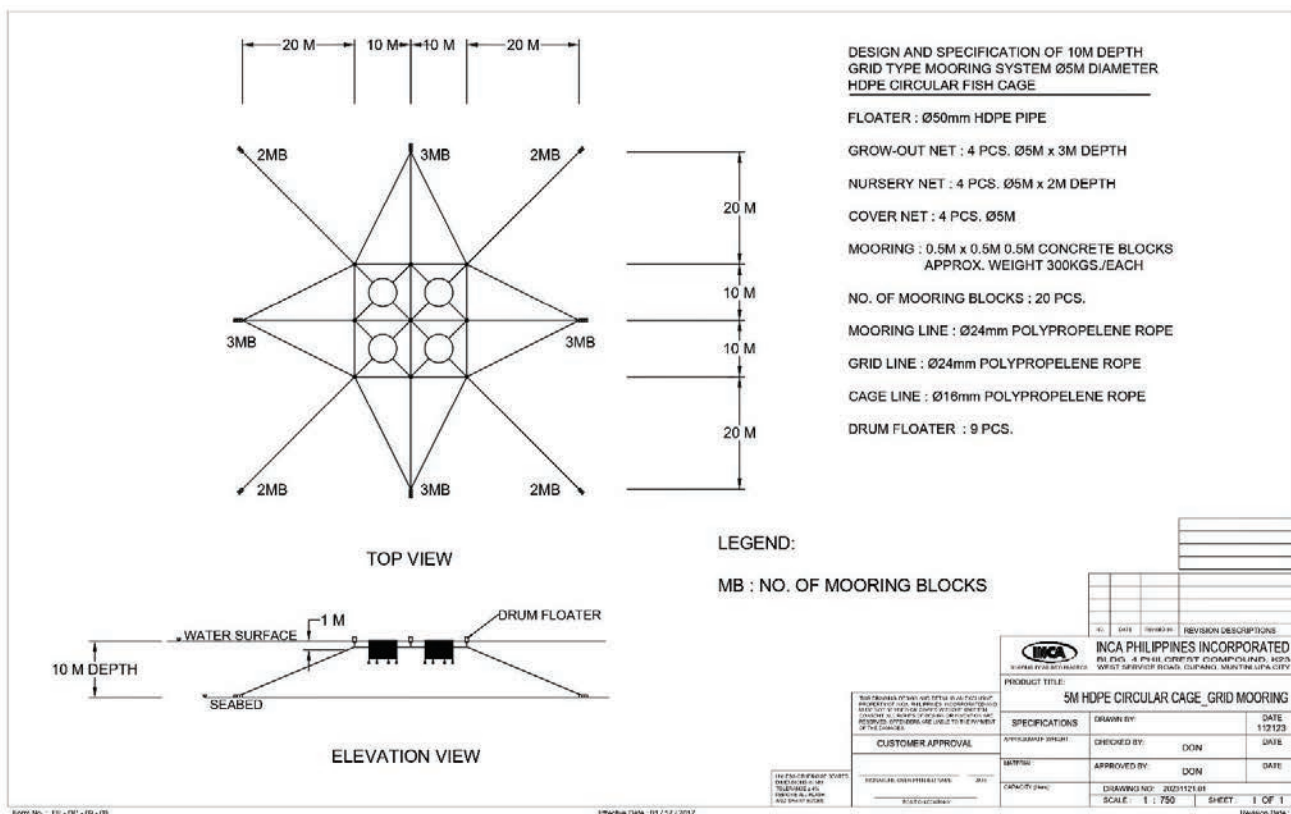


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Appendix: 5 meter cage system (Design & Specification)



For more information please visit our website at <http://www.inca.com.ph> or contact the following personnel:

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APPENDIX 10

Materials for Presentation on the Kenyan Fisheries
Situation and Debriefing for the 1st Third Country
Training (Seychelles)

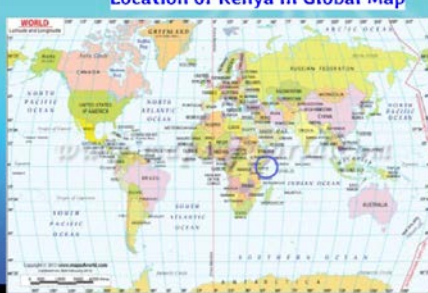
Appendix 10-1: Fisheries Situation in Kenya Presented by Kenyan Participants in the First Third Country Training

**KENYA'S CAPABILITIES IN OCEAN SCIENCE: KMFRI
TECHNICAL CAPABILITIES AND COMPETENCE**



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Location of Kenya in Global Map




Kenya's Governance Structure

- After the 2010 constitution was adopted, management of the countries resources is by two levels of government
- 1. National Government
- 2. County Government (47 Counties)

Establishment and Role of KMFRI

- A State Corporation established in 1979 by the Science and Technology Act, Cap 250 of the Laws of Kenya, (repealed by the Science, Technology and Innovation Act No. 28 of 2013)
- Mandate:** To generate and disseminate scientific information for sustainable development of the Blue Economy.
- Vision:** A Centre of Excellence in innovative research in marine, fisheries and the Blue Economy for development

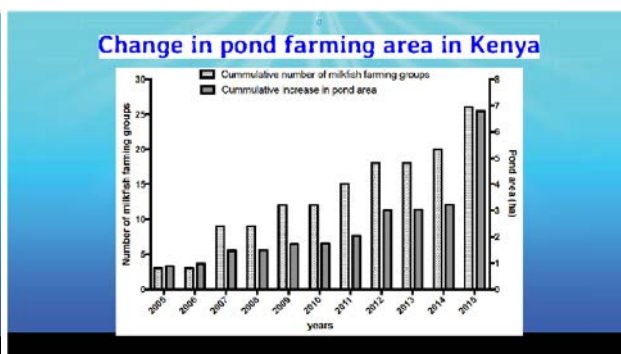
KMFRI main programs

- Oceanography and hydrography
- Fisheries
- Aquaculture
- Post Harvest Technology
- MARITIME DEPARTMENT
- Laboratory services in all the above areas

Mariculture Development and Potential

Conceivable Area for Mariculture Development

The Ocean coverage in Kenya is Equivalent to about 40% of Kenya's total land area (582,644Km²)



Current Farmed Marine species

1. Mud crab (*Scylla serrata*) culture



Plastic -long lasting cages



2. Milkfish (*Chanos chanos*) farming



Area increased under milkfish farming has increased and is estimated at 30 ha currently



3. Prawn farming along the coast of Kenya



4. Artemia production in Kenya

One of the key live feeds supporting fish breeding in hatcheries



5. Seaweed farming



Seaweed farming is changing lives including housing



6. Culture of acclimatized *Oreochromis niloticus* to sea water (Marine Tilapia)



7. Rabbit fish (*Siganus Sutor*)



8. "Farming of saline tilapia in arid and semi arid lands in coastal areas



9. Sea cucumber culture

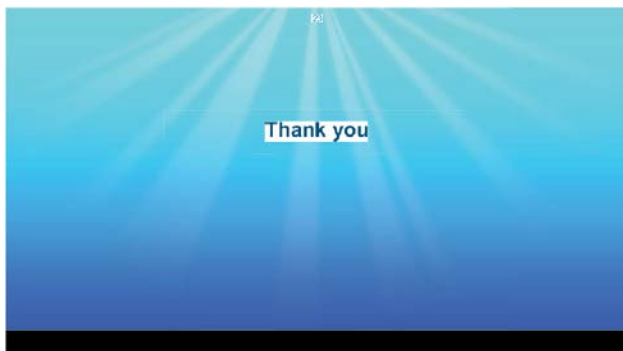
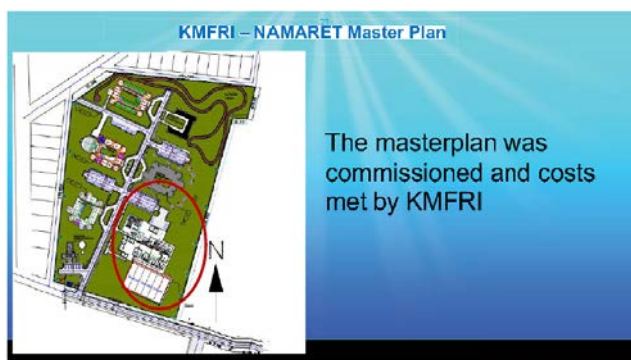


Broodstock

10. Black soldier fly aqua feed

Managing decomposable wastes to produce fertilizers and animal feed ingredients







Overview of Fisheries in Kenya

31st August 2023

HENDRICAH NABWIRE
KENYA FISHERIES SERVICE, MOMBASA

Overview of Kenya Fisheries Service

- There are two levels of government in Kenya: the national and County government
- Kenya Fisheries Service (KeFS) is a corporate body established under the Fisheries Management and Development Act no. 35 of 2016.
- KeFS is under the national government.
- The purpose is to conserve and manage Kenya Fisheries resources and aquaculture.
- Some of the general functions include:
 - Set and meet the goals for fisheries conservation, management, development and sustainable use.
 - Collecting and analysing fisheries statistical data
 - Licensing of fishers and vessels
 - Undertake Monitoring, Control and Surveillance
 - Ensure good quality of fish through quality assurance
 - Develop standards for the management of all fisheries and aquaculture activities.

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Overview of KeFS-Cont.

The directorates in KeFS include:

Corporation Secretary & Legal services directorate
Capture Fisheries Directorate
Aquaculture Directorate
Fish quality, safety and trade directorate
Kenya Fishing School Directorate
Corporate Services Directorate

3

Introduction-Fisheries in Kenya

- In Kenya, fisheries are mainly composed of freshwater, coastal and marine and aquaculture.
- The sector contributes to about 0.5% of the Gross Domestic Product (GDP).
- Kenya's marine fishery includes the Coastal nearshore water and the 200 Nautical miles EEZ.
- The Kenyan coastline extends for about 640 kilometers and 880km including the inlets and bays along the Indian Ocean.
- Kenya's marine capture fisheries provide 80% of the total income to 70% of the coastal communities
- Catch value of marine capture fishery is at KES 2.4 billion
- The coastal and marine waters fisheries give employment to over 13,000 fishers (FAO, 2022)

4

Types of Marine Capture Fisheries

The different types of fisheries include:

- The industrial longline fishery- 2 Kenyan longline flagged vessels with an average production of 1000-1500 Kg/day
- Semi-industrial fishery: 4 semi-industrial trawl vessels targeting shallow water prawns (400mt annually). These are restricted to the Malindi-Ungwana bay (3-5 nm)
- Near shore capture fisheries: Artisanal, recreational/sport fishing and aquarium fishery.

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Nearshore Capture Fisheries

Subsistence / Artisanal



Recreational/sport Fishing



Aquarium fisheries



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Artisanal Fisheries

- This sector contributes to 80% of total landed catches annually
- It has an estimated total of 13,000 fishers and over 3,000 vessels
- The vessels and gears commonly used are traditional.
- About 80% of the vessels are non-motorized dominated by sails (43%) and paddles (40%)

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Common Fishing Gears By Artisanal Fishers



Basket Trap (Malema/Dema)



Handline/Hook & Line (Mshipi)



Longline (Zulumati)



Stationary Gillnets (Jarife/Nyavu ya Kutega)



Drifting Gillnets (Jarife/Nyavu ya Kuogelesha)

Illegal/ Destructive Gears



Monofilament Gillnet (Nyavu ya Mkano)



Speargun (Bunduki)



Beach Seine/Reef Seine (Juya/ Nyavu ya Kukokota)



Mosquito net (Uduvi/Tandilo)

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Common Fishing Crafts By Artisanal Fishers



Dugout canoe



Hori



Ngalawa



Dau

Common Fishing Crafts By Artisanal Fishers-Cont.



Mashua



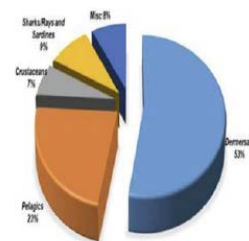
Mtori

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Common Species landed

The most common species landed by local fishers:

Demersals: including rabbit fish,
Pelagics: Tuna, Kingfish,
Crustaceans: Prawns, lobsters
Sharks/ Rays and sardines
Miscellaneous: Octopus etc..



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Challenges to Fisheries Resources

- Fishing in the breeding and Nursery grounds
- Excess fishing effort (Overcapacity)
- Pollution from Industrial and Municipal effluents
- Use of prohibited fishing gears and methods
- The ever-increasing market for undersized fish amongst rural poor
- Illegal, Unreported and Unregulated Fishing (IUU)

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Fisheries Management

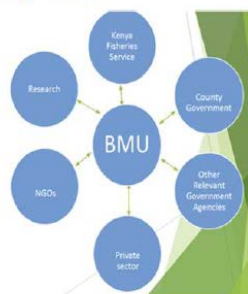
Fisheries Management

- Traditionally, fisheries management was often undertaken by local communities themselves, with local knowledge used to determine rules and local social structures used to enforce these or impose sanctions when needed.
- More recently, central governments have taken the lead role in fisheries management with fisheries regulations being determined centrally on the basis of scientific research and enforcement being done at the national or county level.
- In the last 10 years, there has been a move towards sharing responsibilities for fisheries management among different stakeholders. This shared approach is known as **fisheries co-management**

Fisheries Co-management

Fisheries Co-management

Partnership arrangement between Government, resource users (Beach Management Units) and other stakeholders in fisheries management.



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Legal Framework-Fisheries co-management

Legal Framework to support Fisheries co-management

- The Constitution of Kenya 2010
- Article 69 (1) The State shall—
 - (a) ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;
 - (d) encourage public participation in the management, protection and conservation of the environment;
 - (h) utilise the environment and natural resources for the benefit of the people of Kenya.

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Legal Framework-Fisheries co-management Cont.

Legal Framework to support Fisheries co-management

- Kenya Fisheries Policy
- Fisheries Management and Development Act (FMDA) No 35 of 2016
- Revised Beach Management Unit Regulations 2021
- National Co-management Area Guidelines
- Beach Management Unit By-laws

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Fisheries Co-management

- In Kenya, Fisheries Co-management is community based, through formation of Beach Management Units (BMUs)
- **Beach Management Unit (BMU)** means an organization of fishers, fish traders/ boat owners, fish processors and other beach stakeholders who have traditionally depended on beach fisheries activities for their livelihoods

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Role of Kenya Fisheries Service in Co-management

- i. Policy formulation and issuance of policy guidelines, formulation of legislation and enforcement.
- ii. Provide technical assistance for fisheries development
- iii. Set standards and prepare guidelines to ensure fish quality and safety;
- iv. Design fisheries information collection systems for implementation
- v. Production of development plans and access to central government grants

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Role of Kenya Fisheries Service in Co-management- Cont.

- vi. Arbitrator in resource use conflicts
- vii. Support the development of BMUs through awareness raising and training programs;
- viii. In collaboration with BMUs, develop and implement fisheries management plans;
- ix. Licensing of fishers and vessels

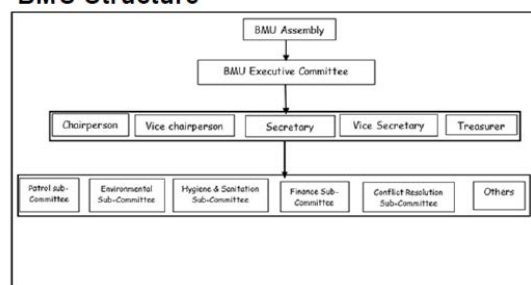
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Establishment of BMUs

- All BMUs must be located in gazetted or designated fish-landing site.
- BMUs will be located within existing County government boundaries.
- Each BMU operational area will have a well-defined boundary agreed in consultation with County government/authorized fisheries officer.
- A BMU shall apply to be registered to the County Executive Committee Member through the County Director of Fisheries. To be registered, the BMU's members must fulfill the following criteria:
 - Be over the age of eighteen years;
 - Intend to operate within the landing site;
- Practice legal fishing and legal fisheries activities; and in form FDA5 set out in the revised Fisheries (BMU) Regulations 2021.

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BMU Structure



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BMU Structure-Cont.

- BMU Assembly: Membership to those who depend directly or indirectly on fisheries activities done at the beach within the jurisdiction of a BMU, may be affected by the temporary or permanent closure of fisheries activities in the beach.
- The BMU Executive Committee: They will have 9-15 members democratically elected by the BMU Assembly.
- The representation of the BMU committee should be as close as possible to the following distribution:
 - (a) Thirty percent representing boat owners;
 - (b) Thirty percent representing crew members ;
 - (c) Thirty percent representing traders
 - (d) Ten percent representing other members.
- Sub-committees: These are headed by members of the main executive committee.

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Role of BMUs

- i. Maintain and keep a register of all boat owners and their fishing equipment, fishers and BMU members operating from the beach.
- ii. Decide on local markings for identification of fishing gears and outboard engines
- iii. Participate in vetting of boat owners and fishers for licensing and, in collaboration with government officials, ensure licenses are granted to those registered with the BMU;
- iv. Propose by-laws for endorsement by the County Directors of Fisheries and Director General, KeFS and enforce them;

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Role of BMUs Cont.

- viii. Inspect and record visiting boats and give permission to land where appropriate;
- ix. Improve sanitation and hygiene at landing sites.
- x. Network with other BMUs to ensure marketing and fair pricing of fish and fish products;
- xi. Be part of the development organ in their areas of jurisdiction;
- xii. Preparation of annual work plans, budgets and present them to the BMU Assembly for approval;
- xiii. Formulate funding proposals, make financial reports and present them to the BMU Assembly for approval;
- xiv. Prepare development plans and solicit for funding

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Role of BMUs in Fisheries Co-management

- i. The only legal right of access to fishing.
- ii. Allows for involvement of all stakeholders in decision-making
- iii. Entry point to Control of access to fishing
- iv. Formulation of BMU by-laws and ordinances for co-managing the fishery
- v. Provides a powerful lobbying force



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Benefits of BMUs in Fisheries Co-management

- The only legal right of access to fishing
- Allows for involvement of all stakeholders in decision making
- Entry point to control of access to fishing
- Formulation of BMU by-laws for co-managing the fishery.
- Attraction of government and other funding
- Attraction of training opportunities
- Improvement in fisheries data collection
- Improvement in sanitation.
- Avenue for conflict resolution
- Avenue for mobilization and other development programmes.

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Risks of Engaging BMUs in Fisheries Co-management

- Possibility of executive committees being compromised by illegal fishers
- Possibility of electing BMU officials who are illegal fishers because of their influence and economic power, this will maintain the status quo.
- Antagonism by other interested agencies or other government ministries over revenue collections.
- Lack of proper source of funding for the BMUs, which may stifle their sustainability.
- Political interference: influencing decision making

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Co-management areas

- **Co-management Area (CMA):** is an area in which the BMU shall undertake fisheries management activities jointly with government (National and County).
- **Co-management area plan (CMAP):** a plan of management for a CMA.
- **By-laws:** the internal administrative rules developed and enforced by BMU.

Examples of Existing CMAs & Joint CMAs

- **Kuruwitu CMA- Kilifi County.**
- **Shimoni-Vanga JCMA:** 7 BMUs in Kwale County (Wasini, Shimoni, Majoreni, Vanga, Kibuyuni, Jimbo & Mkwiro)
- **Malindi-Ungwana Bay JCMA:** 10 BMUs covering 2 counties (Tana River and Kilifi). Includes Watamu, Mayungu, Shella,

Conclusion

- BMUs are an integral part of fisheries management as the community is actively involved in decision making on sustainable management of the resource hence the need to effectively engage them and capacity build them to fulfill their mandate.

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Asanteni Sana!



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Marine Fisheries Promotion Advisor Project for Blue Economy Training in Kenya



FISHING PORT MANAGEMENT IN KENYA

County Secretariat
Fisheries Officer
County Government of Baringo
Date: 08 August 2023

Contents

- Ports in Kenya
- Infrastructure at Fish landing sites along the Kenyan Coast
- Facilities and Services offered in fish landing stations
- Conditions for fish landing in Kenya
- Co-management of fish landing sites
- Fisheries Management Regulations
- Institutional Arrangements for establishment of co-management Areas
- The BMU Structure
- Our Strengths, Challenges, Processes and Technologies used and Future Plans

What is a Port?

- A Port is a point where goods are transferred from one mode of transport to another.
- Seaports are areas where there are facilities for berthing or anchoring ships and for transfer of goods from ship to shore or ship to ship.
- Not only is a port a gateway for trade but most ports attract commercial infrastructure in the form of banks, agencies, as well as industrial activities.
- Fishing ports, or fish landing stations are seaports.

The 9 major ports in Kenya are.

1. Port of Mombasa,
2. Port Reitz
3. Port of Lamu
4. Port of Shimoni – to be upgraded to a fishing port
5. Port of Kilifi - to be upgraded to a fishing port.
6. Port of Mtwapa
7. Port of Kiunga
8. Port of Malindi
9. Port of Kisumu

Fish landing sites

- ▶ The fish landing sites in Kenya are mostly smaller ports
- ▶ "Fish landing station" means a point on the shore of any waters or coastline of which the Director-General has by notice in the gazette designated as a point to land fish.
- ▶ Designated fish landing sites such as (Liwatoni, Shimeni and Mkakoni) and many unofficial landing sites.
- ▶ "Landing" means bringing any fish or fish product to the harbour, port, or beach from within or outside the Kenya fishery waters and offloading.
- ▶ The coast region has 197 major fish landing sites, however, those with some infrastructures are 81. There are many more undesignated fish landing sites.

Major infrastructure at Fish landing sites in the Kenyan Coast

Kichwa cha Kali Landing site with Fish market, Cold store and Ice Plant



Malindi fish landing site under construction



Major infrastructure at Fish landing sites in the Kenyan Coast

Ngomeni fish landing site, has a fish market, cold store and ice plant



Kipini landing site with ice plant and cold store



Mayungu fish landing site, cold store and ice plant



Mtwapa fish landing site with solar powered ice plant



Vanga fish landing site with solar-powered cold store and dice plant



- ▶ The fish landing sites are co-managed directly by the Beach Management Units

Facilities and Services offered in fish landing stations

- ▶ Provide infrastructure and space for ship/ boat berthing, anchorage, boat repair, security.

Administrative functions

- ▶ They have Control for entry and exit of persons goods and services.
- ▶ Regularly manned by Kenya Fisheries Service, County Department of Fisheries, National Police Service, Department of Immigration, Customs, Public Health, Ship /boat agents.
- ▶ Only the major ports have, Chandlers, Waste Disposal services, Kenya Maritime Authority, Port Police, National Environment Management Authority, Kenya Bureau of Standards,

Services offered at the major ports.

- ▶ Cargo handling, Loading, Discharging, Storage and distribution of cargo, Transport, Storage, Warehousing, Weighing, Surveying,
- ▶ Sanitary control, Customs documentation, Clearing and forwarding.
- ▶ The management of commercial ports are under the Kenya Ports Authority. However, the smaller fishing ports are managed by the BMU under the fisheries department.

Conditions for fish landing by in Kenya

Industrial fishing vessels

- ▶ Maintain fishing and navigational logbooks.
- ▶ Install automatic location communicator.
- ▶ Have an observer.
- ▶ Observer to report daily on catch and vessel position.
- ▶ All or a portion of the catch to be landed for sale in the local market.
- i) purse seiners: 30% (ii) long liners 30% (iii) shrimp trawlers: 70% of the bycatch 5% of the shrimp

Conditions for fish landing by in Kenya

Semi-industrial fishing vessels

- i) undecked semi-industrial fishing vessels: 100%; and
- ii) decked semi-industrial fishing vessels: 50%.
- ▶ Kenyan registered vessels to be authorised to operate in the high seas.
- ▶ Observe laws of foreign states where they operate.
- ▶ Comply with international agreement and treaties entered by the republic on conservation and management.

Fisheries Management Regulations

Fisheries management regulations include:

- ▶ Imposition of fishing bans.
- ▶ Observation of minimum catch sizes;
- ▶ Fishing gear restriction;
- ▶ Control of fishing effort i.e., number of boats, number of fishers etc.
- ▶ Restriction of mesh sizes.
- ▶ Closed areas and seasons.

Institutional Arrangements for establishment of co-management Areas

Fisheries Stakeholders

- ▶ Beach Management Units (BMUs)
- ▶ County Department of Fisheries (CDF)
- ▶ Kenya Fisheries Service (KeFS)
- ▶ State Department for the Blue Economy and Fisheries

Stakeholders in fisheries co-management

- ▶ Administration Ward Administrators, Sub county and County leaders Chiefs County Commissioners
- ▶ Tourism/recreation hotels, Dive institutions Boat-owners associations
- ▶ Development partners/Non state actors/Non-governmental organisations (NGOs) Donors, Community based organisations (CBO's).
- ▶ Research Institutions: Kenya Marine and Fisheries Research Institute (KEMFRI)/Kenya Forests Research Institute (KEFRI)/ Academics
- ▶ Social support:- Judiciary, Religious organisations/ Institutions
- ▶ Traders:- Fish traders, Fish processing industry, Fish processors
- ▶ National government, Kenya Fisheries Service (KeFS), National Environment Management Authority (NEMA), Ports, Police, Coast Guards

The BMU Structure

- ▶ Led by the BMU Assembly
- ▶ That elect BMU executive
- ▶ The BMU sub-committees (Patrol, Environment, Hygiene and sanitation, Finance, Conflict resolution)

The BMU Network

- ▶ The Ward network
- ▶ The Sub-county network
- ▶ The County network
- ▶ The Water body network
- ▶ The National network

Our Strengths

- ▶ **Availability of Legal, Policy and Institutional Framework**
- ▶ *Regional level* (The African Blue Economy Strategy, The African Union Agenda 2063, The East African Community Regional Blue Economy Strategy, The FAO Blue Growth Initiative
- ▶ *National level*, The Constitution of Kenya 2010, The Fisheries Management and Development Act, 2016, The National Spatial Plan 2015- 2045

Our Strengths

Adequate Water Resources

- Kenya has 640 km coastline, of Indian Ocean
- Lakes: Turkana, Victoria, Naivasha, Baringo, Challa, Jipe, Kenyatta, Kanyaboli
- Major Rivers: Tana, Athi, Ewaso-Ngiro North, Kerio, Suam-Turkweil, Mara, Nzoia, Voi, Yala, Ewaso-Ngiro-south, Sondu, Malewa and Kuja.
- ▶ Availability of cheap labor
- ▶ Ready market – (Kenya imports fish from China).

Challenges

- ▶ Climate change experienced as drought and floods and rise in sea temperatures – leading to coastline erosion.
- ▶ Poor fish handling and hygiene at landing sites
- ▶ Encroachment of landing sites by private investors
- ▶ Pollution
- ▶ Inadequate infrastructure at fish landing sites
- ▶ Fishing only during the calm seas (Northeast monsoon winds).
- ▶ Lack of sea safety equipment and training

Challenges

- ▶ Illegal, Unreported and Unregulated (IUU) fishing.
- ▶ Deforestation
- ▶ Exploitation of fishermen by middlemen
- ▶ Agencies working in siloes without coordination and harmonisation of activities.
- ▶ Insecurity in some areas, and in a neighbouring country.
- ▶ Inadequate capacity in fisheries data collection and analysis
- ▶ Inadequate policies, legal, regulatory, and institutional frameworks.

Processes and Technologies used.

- ▶ Artisanal fishers use smoking, sun-drying, salting, and icing for fish processing.
- ▶ Industrial vessels fitted with location communicator.
- ▶ Fisheries catch and effort data collected through smartphones on the Open Data Kit app (ODK app).

Future Plans

- ▶ Establish fisher cooperatives.
- ▶ Construct a model fish landing site at each county.
- ▶ Acquisition of modern gears by artisanal fishers to venture high seas.
- ▶ Curb IUU fishing

Eco-labelling and Value Addition Status of the Kenyan Marine Fisheries Products

Presentation by:
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Eco-labelling and Value Addition Status of the Kenyan Marine Fisheries Products

What is Eco-labelling?

What is an eco-label? Eco-labels are marks placed on product packaging or in e-catalogs that can help consumers and institutional purchasers quickly and easily identify those products that meet specific environmental performance criteria and are therefore deemed "environmentally preferable"

Eco-labels are a specific type of product labeling that certifies the environmental performance of products and services. To be certified with an eco-label, the product or service must demonstrate that it can reduce the overall environmental impact of its production or use through by fulfilling specific, predefined criteria.

Eco-labelling and Value Addition Status of the Kenyan Marine Fisheries Products

Examples of some eco-label schemes

- Marine Stewardship Council (MSC)
- Forest Stewardship Council (FSC)
- European Union Eco-label

Eco-labelling and Value Addition Status of the Kenyan Marine Fisheries Products



Eco-labelling and Value Addition



Eco-labelling and Value Addition Status of the Kenyan Marine Fisheries Products

Advantages of Eco-labelling

Eco-labelling allows consumers to make more informed choices about the products they purchase, giving them the ability to choose products that are better for the environment. This can help to drive demand for environmentally friendly products, which can in turn encourage companies to adopt more sustainable practices.

Eco-labelling and Value Addition Status of the Kenyan Marine Fisheries Products

Further Advantages include:

- Stimulation of innovation as more sustainable products are invented
- Development of markets that cater to evolving consumer interests
- Opportunities for education
- Creation of new value chains by establishing new networks of production
- Monitoring of environmental claims
- Influencing consumer behavior towards more environmentally friendly products
- Promotion of economic efficiency in response to predefined standards
- Economic support for sustainability
- Reallocation of the costs of environmental improvement

Eco-labelling and Value Addition Status of the Kenyan Marine Fisheries Products

Disadvantages of Eco-labelling

- Potential green-washing when private, unregulated eco-labels are used
- Consumer/producer disinterest in paying a premium for sustainable products
- Difficulty in proving a positive impact
- Potential redundancy if a number of eco-labels certify the same characteristics
- Prohibitive costs for certification, especially for smaller producers
- Provide a basis for price markups
- Certification process for eco-labelling is very tedious and at times costly

Eco-labelling and Value Addition

- Eco-labelling has also increased the rate at which products are valued added.....this includes processing and packaging with eco-labels for markets that are sensitive to environmental sustainability and biodiversity conservation

Eco-labelling and Value Addition

- While strides have been made by community groups utilizing marine resources for livelihoods to do value addition of marine fisheries products, the process of eco-labeling has not been effectively utilized by both private sector and community groups handling marine products
- Some of the products made by groups in Kenya include fish samosa, fish burgers, fish flour for porridge, fish cakes, seaweed soaps.
- Eco-labelling needs certification by certified bodies and the level of value addition of many of the community groups in Kenya

Eco-labelling and value addition

Wholly unprocessed fish



Eco-labelling and Value Addition

An unprocessed fresh fish in a tray without any value addition or labelling done



Value Addition

Crab samosa prepared by one of the conservation groups in Kilifi County



Value Addition

Crab samosa prepared by one of the conservation groups in Kilifi County



Value Addition

A fried fish ready for consumption at one of the conservation in Mida Creek, Kilifi County



Eco-labelling and Value Addition

A fried fish ready for consumption at one of the conservation in Mida Creek, Kilifi County



Eco-labelling and Value Addition

With reference to eco-labelling and value addition of products as depicted in above, the status of eco-labelling of Kenyan marine products is generally very minimal in almost all coastal counties with only Kwale having some few of the marine products (soap from seaweeds by Kibuyuni Women group) certified by the Kenya Bureau of Standards (KeBS) whose mandate extends beyond the Kenyan marine fisheries products

Eco-labelling and Value Addition Status of the Kenyan Marine Fisheries Products

- In conclusion:
 - The Kenyan marine fishery products are not eco-labeled and efforts to have them certified for eco-labelling are required
 - Tasks by Marine Stewardship Council failed, other schemes need to be tried
 - There is great need to increase aspects of value addition (basic or minimal processing) for the processes of eco-labelling to start

OVERVIEW OF FISH PROCESSING IN KENYA

TO BE PRESENTED DURING THE STUDY TOUR IN SEYCHELLES
PREPARED BY RICHARD NGETICH - KFIC

- Kenya is a coastal country with a coastline of 640KM and with a jurisdiction of 200 nautical miles of EEZ from its shore. The country is also blessed with several lakes and rivers abundant with various fish species
- The communities living along these water bodies have been fishing since time immemorial using traditional methods including traps and spears.
- Fishing was mainly undertaken for subsistence food and trading within the community and other local neighbouring communities.
- The species caught were indigenous including tilapia, *Rastrineobola argentea*, *haplochromis* among other several species
- Fishermen were using traditional preservation and processing methods. These included smoking, sun drying and salting.

- Modern fishing methods with advanced fishing gears boats around early 1970's. As a consequence of the higher catch, commercial fish processing started developing.
- This coincided with an abundance of Nile perch fish species Lake Victoria, the largest fresh water lake in Africa. The species had been introduced in the early 1950's but reached its peak in the 1970's.
- The earliest commercial fish processing factories in Kenya were therefore those processing Nile perch fish. The factories were located within the towns along the shores of Lake Victoria.
- The main product processed and which was mainly for export was both frozen and fresh filleted Nile perch (skin on and sin off). Other products were fresh or frozen whole fish and Head and gutted.
- By the year 1990, There were around 12 Nile perch fish processing factories in Lake Victoria region and some were located in Nairobi.

- These fish products were mainly exported to Israel, Australia, Netherlands, America and Greece
- By the year 2000, fish catches had started declining in Lake Victoria. This was attributed to changes in climate and pollution. There was also proliferation of a water weed called water hyacinth which was suffocating the lake.
- The decline was also attributed to overfishing and use of unsuitable fishing methods and gears
- As at the moment, there is minimal commercial fish processing in the region.

- In the marine waters at the coastal region of the country, small scale commercial fish processing started in the 1970's. All the products were marketed locally.
- One factory of the fish processor was a government owned factory called Kenya Fishing Industries. The factory was later taken up a private fish processor in the 1980's and it started large scale commercial processing and export of cooked frozen tuna loins.
- Other commercial private fish processors also came up around that period. They were processing frozen Octopus by removing the ink sac, the teeth and softening before freezing.
- By the years, the processing establishments have gotten fully established and although the major product is frozen Octopus, they have diversified to other species and products for both local and export markets.

- Current products from these processors include frozen Octopus, whole frozen lobsters, whole and gutted finfish dominated by snapper fish species and groupers and fillets of the same species.
- These fish products are mainly exported to Europe including Italy, Spain, Netherlands, Portugal, China and India
- Fish processing in Kenya is still modest as most of the processors are exporting 25MT to 100MT per month. The average export per year is 1000 MT from five active processors.
- The factory which was processing cooked tuna loins was one of the largest fish processor in the region and was processing approximately 50MT of raw materials per day.

- Some of the fish processing establishments have their own laboratories for own controls but fisheries usually submit samples for microbiological physico-chemical analysis for official controls.
- The Customers and authorities of importing countries occasionally follow up on the analysis results
- All the processing factories implement HACCP system to manage processing to produce safe food
- Most of the fish products in Kenya are processed and exported as frozen products

- The company was exporting its product mainly to Italy and Spain. However collapsed in 2014 and processing stopped.
- The government of Kenya has taken it over and handed it to a corporation called Kenya Fishing Industries Corporation.
- The corporation is in the process of rebuilding and expanding the fish processing plant.
- The construction of Fresh and frozen line is 90% complete and has a capacity of handling 100MT of raw materials (fish) per day. The tuna processing part of the complex is 50% complete and is expected to handle 50MT of tuna fish and a cannery producing 25MT per day.

- A 250 MT Cold store is complete and another Cold store of 1000 MT is 40% complete
- The new processing plant is planned to be operated under Public private partnership arrangement once completed
- Kenya Fishing Corporation is planning to diversify to other areas and develop more fish processing plants and cold stores
- Below are photos of the construction works at Liwatoni Fisheries Port managed by Kenya Fishing Industries Corporation

Ongoing construction works - Tuna Fish Processing Plant at KFIC



KFIC Fresh and Frozen Fish Processing Factory under construction



Vessels docking at Liwatoni Fishing Port - KFIC





SEYCHELLES STUDY TOUR

28th August-1st September 2023

ACKNOWLEDGEMENT

I would like to thank

- The Japanese International Development Agency (JICA), for this wonderful opportunity for the exchange program to Seychelles.
- The Japanese Ambassador in Seychelles.
- The JICA delegation from Kenya, Madam Azusa, and Mr John for their support throughout the tour.
- The project consultant Mr Ogina.
- The SFA staff, The Seychelles Fisher Associations, the BAQF Providence Port staff, and the Fish processing firms (Ocean Basket and Oceana Fisheries).
- Lastly the Kenyan delegation, for their presentations and exchange of information and ideas with their Seychelles counterparts.

INTRODUCTION

- The Japanese International Co-operation Agency (JICA) is implementing a 2 year project (2022-2024) in Kenya focused on building the capacity of fisheries officers.
- JICA organized a study tour to Seychelles for government officers within the fisheries sector to acquaint themselves with knowledge in fisheries.
- The objective of the Study tour was to contribute to the human resource development of government institutions and counties, supporting the sustainable development of marine fisheries in Kenya through the exchange of information with Seychelles.
- The Study tour was focusing on the four themes: I. Fishing port management II. Marine fish processing III. Fisheries co-management activities IV. Aquaculture
- The participants were drawn from SDBE&F, KeFS, KFIC, KMFRI, County government of Kilifi and Tana River.

OVERVIEW OF THE ACTIVITIES

	Date	Activity	Location
Day 1.	28 th August 23	Travelling	
Day 2.	29 th August 23	Presentations, Discussions and Exchange of information on Blue Economy between fisheries officers Visit to SFA lab	SFA conference room SFA lab
Day 3	30 th August 23	Courtesy call at SFA, CEO's office Visit to Artisanal fishing port, Port Victoria. Visit to BAQF at Providence Port Visit to processing company (Ocean Basket)	CEO's office SFA headquarters Fishing Port Victoria
Day 4	31 st August 23	Meeting with artisanal and semi-industrial fishers Presentations, info sharing and discussions with the Blue Economy Research Institute (BERI) Courtesy call to the Vice Chancellor University of Seychelles.	SFA conference room University of Seychelles
Day 5	1 st September 23	Visit to fish processing company (Oceana fisheries) Wrap up session with SFA CEO and staff Travelling back	Oceana fisheries SFA headquarters

COURTESY CALL TO THE CEO SEYCHELLES FISHING AUTHORITY(SFA)



Figure. Mr Lospicho handing over a processed fish skin made in Kenya to SFA staff.

ACTIVITIES DONE BY SFA

- **Research:** Carry out fisheries dependent and fisheries independent surveys. Use of the underwater cameras to get data on species abundance
- **Fisheries resources management:** Implementation of tuna development plan, Mahe plateau Co-management plan
- **Statistics:** Established and maintained FIMS. Prepare statistical bulletins, technical reports, SIH. Capture data in real time at the landing site.
- **Monitoring, Control and Surveillance:** VMS, EMS. Digitalization of licenses, Catch certificate and Compliance.
- **Aquaculture:**
- **Fish Quality and assurance**



Figure. Interactions and exchange of ideas between officers from Kenya and Seychelles on the five thematic areas.

SFA FISH PROCESSING PLANT TOUR



Figure. SFA officer displaying a filleted and vacuum packed fish product

- For packaging, there are vacuum machines used.
- Fish value added products include the fish burger. There are success stories of investors starting the fish burgers.
- Creating awareness for children and other people to eat fish through events such as the food week
- There is need to explore on the fish skin and seaweed.
- Exchange visits on value addition.
- They provide avenues for investors to learn and market the product.
- Mobile app developed for marketing.
- Searching for markets for sea urchins.
- Testing of mercury done by the mercury analysers as it is one of the requirements for exportation.

COURTESY CALL TO THE AMBASSADOR OF JAPAN TO SEYCHELLES

- The discussions with the ambassador were geared towards development of the capture and aquaculture sectors in the country.
- Resource management access to the resources, value addition, capacity building to catch more fish.
- Encouraging investments in aquaculture through hands on training, installation of infrastructure.



Figure. The Kenyan delegation paying His Excellency Ken Okaniwa, the Japanese Ambassador a courtesy call at his office

VISIT TO SFA LABORATORY

- They get samples on a weekly basis, directly from the fishing vessels, and they also get information from where they are fished.
- Two types of labs: the wet and dry labs.
- Specific size requirements-30 cm and above.
- The parameters taken include: biometrics and length.



Figure: SFA lab staff receiving samples for analysis

PORT MANAGEMENT

VICTORIA ARTISANAL FISHING PORT



PORT MANAGEMENT-CONT.

PROVIDENCE SEMI-INDUSTRIAL FISHING PORT



AQUACULTURE



Figure: SFA officers explaining on the species cultured in the SFA aquaculture centre.

SFA AQUACULTURE SITE VISIT

- Water pumped at the mid water column.
- The pump works for 4 minutes and stops for 2 minutes. Inlet buoy
- After 6 months the pipes are taken out for cleaning and scrapping off barnacles and oysters.
- Power stable. They also have generators that pump automatically incase power goes out.
- System is automated i.e. electrical. Aquaculture systems are manual.
- Ornamental fish- experiments are to be conducted.
- Holding Tanks: For mangrove snappers, camouflage movers (8,000,000 eggs per spawn),
- Water quality tests done monthly for the first 2 years but now done on a quarterly basis.
- There is a blower for aerating the tanks.
- The younger fish fed every day whereas the bigger fish are fed twice a week.

FISH PROCESSING



Figure: Group photo of the Kenyan team with Oceana Director

OCEAN BASKET

- Started 15 years ago.
- Centralized cold storage in town with capacity of 3000 MT per month.
- There are 4 receiving tanks for fish each with a capacity of 500 Kgs.
- Tuna fish processing in the port.
- 100 tonnes a month for fresh tuna.
- Filleting of the fish. Vacuum packaging machine.
- When exporting, use ice in small packs. Fish kept in the foil bag which is water proof. Buy boxes and foil bags from different manufacturers.
- The government is giving subsidies to fishers (fuel and ice).
- Waste management: Waste is disposed in the dump site.

FISH PROCESSING-CONT.

OCEANA FISH PROCESSING COMPANY

- Largest fish processing facility.
- Fishing is seasonal.
- Targets groupers, snappers, pelagics, crabs, lobsters.
- The main species are the demersals and pelagics.
- Eco-labelling- No international certification. Aim- Future certification of the products.
- Export to USA, China, Australia. Main market- EU, Spain, Germany, UK. Israel is also a good market
- Any issues with histamine- 2 machines for histamine testing.
- Established traceability system, code for the species.
- Waste Management- Machinery need to be maintained. Sold at 18 rupees for 50kg, i.e 1.3-1/4 USD. Processed into cubes.
- Challenges: Many local operators, accessibility of raw materials, high freight costs, high electricity costs.



Figure: Oceana staff showing and explaining on fish processing and HACCP

FISHERIES CO-MANAGEMENT



Figure. Ms Hendrich making a presentation on fisheries co-management model in Kenya at the SFA Headquarters.

Meeting With Artisanal and Semi-Industrial Fishers

- Quota for 3 open species- 9600 pcs per vessel. Brittle red- 1800 pcs, Golden sea cucumbers-4000 pcs. Quota system has been effective in reducing fishing effort.
- There is lack of supply of labour in the fisheries sector.
- Closed season for sea cucumbers- As from July- August- September
- In terms of fisheries management: Mahe plateau Co-management plan. Management plans are in the SFA Website. Fishers not allowed to fish for a species less than 32 cm. Fishers trained on bio-trauma.
- Recreational sport fishers not allowed to sell, only limited to 20 pieces for Emperor red snapper
- Trawling is illegal. Bottom longline- Monofilament Gillnet- only used to catch sharks.
- Fish sold on a kg basis from 7-10 USD, prices in fish are influenced by foreigners.
- Most artisanal fishers feel sport fishers are threatening the market.

BLUE ECONOMY RESEARCH INSTITUTE VISIT (BERI)



Figure. Group photo of Kenyan team with BERI researchers

- Built in 2009. BERI-support research in environmental science, resulting to Blue Economy.
- Ocean Acidification Monitoring Program. Seychelles sea grass and blue carbon mapping project-Development of a field validated seagrass map for Seychelles.
- Develop field data sampling protocols.
- Support for policy development, strategy development and decision making. Ocean Knowledge Action Network
- BERI developed Blue Economy Massive open online course (free).
- Challenges to research: Data management, knowledge sharing, capacity development, collaboration, translating science to policy.
- Marine Aquaculture conference from 23rd -25th Oct 2023 presentation organized by KMFRI/ IRD. To partner with BERI.

RECOMMENDATIONS

- Encourage transparency and accountability in the fisheries sector.
- Continuous linkages and networking are important. Encourage continuous collaborations between Kenya and Seychelles.
- There should be exchange visits between the Kenyan and Seychelloise fishers to learn on the fishing techniques and fisheries management.
- There should be an exchange visit on value addition for the Seychelles experts to learn on sea weed and fish skin.



Figure. The Acting CEO of SFA chairing the wrap-up meeting with the Teams.

MERCI!



APPENDIX 11

Materials for Presentation on the Kenyan Fisheries
Situation and Debriefing for the Second Third Country
Training (Zanzibar)

Appendix 11-1 : Fisheries Situation in Kenya Presented by Kenyan Participants in the Second Third Country Training in Zanzibar



INTRODUCTION

Kenya has a coastline stretching ~ 536 Km characterized by sandy beaches, coral reefs, mangrove forests, and rocky shores

Fisheries is an important sector in Kenya, providing livelihoods to over 0.7 million people and contributing significantly to the country's food security and economy.

The Kenyan fishery is mainly artisanal with few commercial/industrial vessels targeting mainly shallow water shrimps, deep water shrimps and lobsters.

The sector supports ~ 65,000 people directly as fishermen and 70,000 fish farmers with 149,000 stocked fish ponds

~ 1.5 million people are supported directly and indirectly, working as fishers, traders, processors, suppliers and merchants of fishing accessories and employees and their dependents



ISSUES ADDRESSED BY MPAS IN KENYA

Conservation of reef systems and fisheries;

- Improved coral reef habitat quality over the years
- An example of Mombasa Marine Park, established in 1986. The coral cover and fish biomass increased significantly in the first 10 years of its establishment (McClanahan and Kaunda-Arara 1996; Rodwell et al. 2003).
- The improved coral reef ecosystem has provided an important breeding ground for fish.
- MPAs enhance fisheries, through the emigration or spillover of exploitable fishes

Tourism and livelihoods.

- MPAs serve as important tourist attractions.
- The total number of visitors in Kenyan MPAs has been ranging from 70,000 to 160,000 visitors annually from 1997 to 2010.
- The revenues generated from MPAs entry fees are above US\$1.5 million annually (KWS, unpublished reports).
- The MPAs support close to 2,000 local boat operators who conduct marine park tours and excursions.

THREATS TO MPAS IN KENYA

¾ Loss of biodiversity; habitat degradation, overexploitation, and development.

f Human-related pressures; from overfishing and fisheries related damage, urbanization, tourism development, agriculture, and industrialization.

f The impacts of climate change; including temperature increases, irregular precipitation, sea level rise, and ocean acidification

f These pose great challenges to the health, structure, and function of the marine ecosystems.

¾The high poverty levels of coastal communities; dependence on natural resources and high population growth rates, resulting to overexploitation of natural resources.

f The growing coastal populations; rising global demand for fisheries products,

f Introduction of new technologies are creating increasingly severe threats to many coral reef and mangrove ecosystems

f Reduced number of sea urchin predators due to increased fishing intensity

¾Climate change effects; Coral reefs bleaching and mortality

¾Land use changes in adjacent watersheds ;sedimentation in coral reefs.

¾Land based pollution including; urban runoff, industrial discharges, drainage schemes, and coastal developments. Ships further threaten coral reef areas through ballast discharges, oil spills, and sewage.

MANAGEMENT MEASURES

Monitoring climate impacts; KWS has partnered with marine scientists in the region to monitor coral bleaching, mortality, and effects on the benthic structure.

- f Coral bleaching impacts are monitored by use of sea temperature maps generated from satellite sea-surface temperature data.
- f KWS is establishing a network of temperature loggers throughout the MPAs. Most of these are downloaded about once per year and provide a historical picture of sea temperatures.
- f Surveys of corals through rapid assessments and line transects are also used to monitor the effects of bleaching on the benthic community.

Adaptive resource management; strategy to manage its marine resources.

The strategy involves setting clear and measurable objectives to assess the success of management efforts. Biological parameters and human use patterns in parks ~~mon~~itored to determine if objectives are being met. The key feature of adaptive management is strong feedback between monitoring (data) and decision-making in a process of "learning by doing."

Improving management, including training MPA managers.

- f The availability of skilled personnel is fundamental to the successful management of MPAs. To enhance the skills of its managers, KWS has encouraged the capacity-building of its MPA staff through various regional trainings.
- f The Western Indian Ocean Marine Science Association (WIOMSA) has been in the fore at advancing opportunities for training of MPA managers in the Western Indian Ocean region.

¼ **Management effectiveness monitoring.** Through conducting assessments of management effectiveness of the MPAs with an overall objective to identify trends and issues that need to be addressed for improving management effectiveness of MPAs in Kenya.

¼ Species recovery action plans to address the decline of marine turtle populations, KWS and the Fisheries Department have established a national task force to advice on the development and implementation of a national conservation and management strategy for sea turtles.

- f Tools used include; advocacy, communication, education, public awareness, targeted research and monitoring, and threat mitigation.

Integrated Coastal Zone Management (ICZM) and state of the coast assessments

- f Kenya's MPAs are essential components of an (ICZM) program.
- f They protect biodiversity and ecological processes on which human use of the coastal zone depends.
- f Are a major contributor to sustainable development and have tremendous economic benefit.
- f The management of MPAs is coordinated and integrated with management activities outside the boundaries and linked to development programs that address the needs of local people.
- f Kenya's MPAs are multiple-use areas that allow for different uses of marine and coastal resources, and the involvement of large numbers of stakeholders in the management process.

THANK YOU

Seaweed farming in Kenya



Presenter: Mealii Mbodze Mwaruwa

What is seaweed?

- This is a multicellular marine plant and algae that grows in the ocean.
- Varies in size, shape and color (green, red and brown)
- There are about 1200 species in the world



Seaweed farming

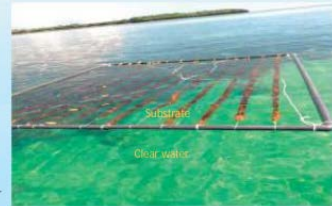
- 3 Seaweed farming involves the cultivation and harvesting of marine algae for various purposes such as food, biofuels, fertilizers, and pharmaceuticals
- 3 It is one of the most sustainable types of Mariculture. Expanding seaweed farming enhances carbon sequestration and boosts production of biomass that can be used for biofuel, bioplastic, livestock feed, and human consumption



Seaweed farming in Shimoni, Kwale county

Conditions for growth

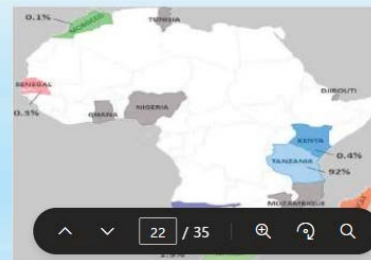
- Seaweed requires clean water rich in nutrients for growth
- Adequate sunlight for photosynthesis
- Optimal temperature range between 15-30 degrees
- Suitable substrate for attachment
- Salinity of ranging from 20ppt – 28ppt



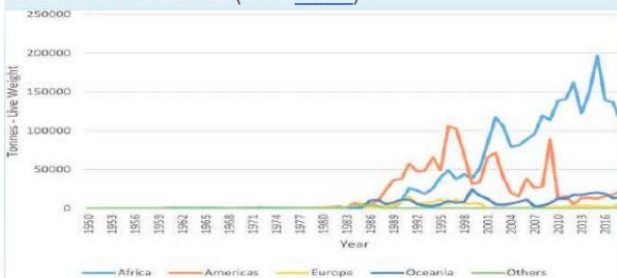
Seaweed production in the world

- Seaweed production is a growing industry worldwide, with major producers including China, Indonesia, the Philippines and South Korea.
- Used in various industries such as food, pharmaceuticals, cosmetics, and agriculture
- Global production has been increasing due to the growing demand for seaweed-based products

Status of seaweed farming in Africa



Continental aquatic plant production (excluding Asia) from 1950 to 2018 (FAO 2020)



Seaweed production in Kenya

- The first seaweed model farm in Kenya was established in 2012 with the help of Kenya Marine and Fisheries Research Institute (KMFRRI) at Kibuyuni village in Kwale county.
- Over the years, other farms have been developed in Mkwiro, Wasini and Funzi Island, Gazi village and the latest in Mwazaro beach
- Two strains of seaweed known as *Kappaphycus alvarezii* (cottonii) and *Eucheuma denticulatum* (spinosum) is grown in Kenya



Seaweed harvest in Kwale county

- 3 The harvested seaweed take 3 to 6 days to dry.
- 3 Then the product is cleaned and packed and sold presently to local cooperatives at Sh.35-40 per kilogram while the cooperative sells it at Sh. 40-45 per kilo.



Seaweed drying rack in Kibuyuni village, Kwale county



Dried seaweed baled ready to be exported

Benefits of seaweed farming in Kenya

- In 2019 Kwale county made history after local farmers exported 100 tonnes of seaweed to Europe worthy Sh.2 million.
- The 100-ton consignment was loaded at the Kibuyuni Seaweed yard in Kibuyuni village, Lungalunga sub-county.
- Locally the county residents and its neighbors enjoy the products of seaweed which are body lotions, bar soaps, shower gels, shampoos, juice as well as hair food.
- Over 700 people directly benefit from seaweed farming drawn from :
 - Mwandamu BMU
 - Gazi BMU
 - Shimoni BMU
 - Kibuyuni BMU
 - Mkwiro BMU

Value chain of seaweed

- 3 Seaweed processing factory was built in Kibuyuni to enable value addition and boost incomes for small scale farmers.
- 3 seaweed products which include body lotions, bar soaps, shower gels, shampoos, juice as well as hair food.
- 3 soil fertilizer



Seaweed smoothie made with a teaspoon of seaweed powder



Cosmetic products from seaweed

UNTAPPED POTENTIAL OF SEAWEED

- Expansion of seaweed farms has the potential to boost local incomes, food security, and environmental conservation
- the local farmers could cultivate kelp (brown algae) specifically to sequester it for the so-called "blue carbon farming."
- They could then sell carbon credits, in the same manner that tree planting can generate carbon credits, and this could be a vital revenue stream for the industry.
- Established market for the processed seaweed products
- seaweed farming has a bright prospect and offers alternative livelihood options to coastal communities and increases food security
- Seaweed also has potential as animal feed and a packaging replacement for plastics.

Challenges

- seaweed farmers would like to access the benefits available to their land-based counterparts such as **crop insurance** and **loan programs** to fuel growth in the new farming venture.
- Damage of the rafts by storms
- Flooding that leads to high turbidity and reduced salinity
- Sourcing Seed
- Climate change
- Value chain challenges



Damaged raft system at Shimoni, Kenya

Interventions of the county & other agencies

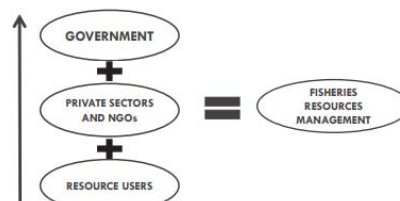
- the county recognizes seaweed production as one of its most important Mari – culture commodities.
- offering farmer's capacity building training and providing them with planting materials
- KMFRI plays a very crucial role in providing scientific support to the farmers for sustainability and growth of the industry
- Plan intentional Kenya is now running a 3 year project focusing on sea weed production.



FISHERIES CO-MANAGEMENT IN KENYA

MUSWAIB ALI SHAHIB
FISHERIES OFFICER
KENYA FISHERIES SERVICE

1. FISHERIES CO-MANAGEMENT



2. HISTORY OF CO-MANAGEMENT

- The top-down approach of fisheries management has frequently failed as it often goes against the community and their internal structure.
- Without proper enforcement or Co-management, the community would often disregard the law and continue as they previously were.
- 2005 Kenya began in Lake Victoria with the adoption of co-management arrangements within the East African community
- By 2007 each country including Kenya mainstreamed BMus into its legal framework where BMU regulations of 2007.

3. ADVANTAGES OF CO-MANAGEMENT



1. Management is localised and increases a sense of resource ownership.

2. Make use of indigenous knowledge to complement scientific information for management.

3. More economic and cost-effective.

4. FISHERIES CO-MANAGEMENT STAKEHOLDERS



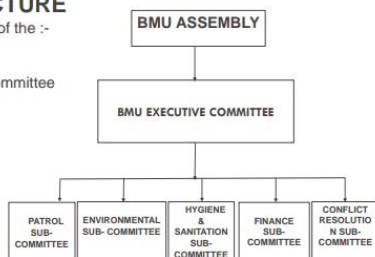
5. BMU DEFINITION



A BMU is an organization of fishers, fish traders, boat owners, fish processors and other beach stakeholders who traditionally depend on fisheries activities for their livelihoods

6. BMU STRUCTURE

- A BMU is made up of the :-
 - a) BMU Assembly,
 - b) BMU Executive Committee
 - c) Sub committees.



7. BMUs IN KENYA

- Enactment of BMU regulations 2007, has provided necessary legal framework for the BMUs to operate, More than 200 BMUs have been formed in Kenya and about 99 BMUs are situated along the 640km Kenyan coastline since the introduction 2006.
- The coastline is traversed by 5 counties namely:- Kwale (23 BMUs), Mombasa (15 BMUs), Kilifi (17 BMUs), Tana river (3 BMUs) and Lamu (41 BMUs).

8. BMU NETWORK AND NETWORKING

- BMU Network is a platform that brings together BMUs from different communities to collaborate, share knowledge and experiences, and collectively address common challenges related to fisheries management.
- Networking within the BMU Network in Kenya is essential for strengthening community-based fisheries management, promoting sustainable fisheries practices and ensuring the long-term conservation of fisheries resources.

9. LEVELS OF NETWORKS

There are five levels of networks;

- Ward level
- Sub-county level
- County level
- Water body level
- National level

10. PARTNERS IN NETWORKING

There are two linkages in networking;

- The **horizontal** linkages; include neighboring BMUs, NGOs/CBOs, local Communities, private sector and other Institutions at grass-root levels.
- The **vertical** linkages; include sub county, county, regional and national committees in Co-management forum; and at all levels other stakeholders already mentioned at grass-root level apply.

11. FISHERIES CO-MANAGEMENT AREAS



12. EXAMPLE OF EXISTING JCMAS IN KENYAN INDIAN OCEAN

- Shimoni-Vanga JCMA
- Funzi-Mwandamu JCMA
- Gazi-Chale JCMA
- Malindi-Ungwana JCMA
- Takaungu-Bofa JCMA
- Kidongo-Kuruwitu JCMA
- Amu-Mokowe-Kiongwe JCMA
- Tana-Delta JCMA

13. CHALLENGES OF FISHERIES CO-MANAGEMENT

- Insufficient Resources (funding, manpower and technical expertise)
- Limited Capacity and skills (data collection, monitoring and enforcement)
- Weak institutional support
- Lack of political will
- Climate Change and Environmental degradation.
- External Pressure (market demand, globalisation and industrial fishing operations)



Meeting with Captain Hamad Bakar Hamad, The Principal Secretary of the Ministry of Blue Economy and Fisheries at the Zanzibar Utilities and Regulatory Authority (ZURA) Building, where the ministry's office is located

JICA ZANZIBAR STUDY TOUR REPORT

Study of Blue Economy and Fisheries

State Department for Blue
Economy and Fisheries

4/29/24

STUDY TOUR



APPRECIATION

With profound gratitude, we extend our appreciation to the Revolutionary Government of Zanzibar through the Ministry of Blue Economy and Fisheries for hosting us. The Ministry of Blue Economy and Fisheries linked the Kenyan delegation with key players in the Blue Economy Sector who shared the pitfalls and challenges they have surmounted, opportunities they have optimized, and success recorded in ameliorating the economic well-being of the people of Zanzibar through vital interventions in Blue Economy Sector. Specifically, we acknowledge and appreciate the Department of Fisheries & Aquaculture, Department of Marine Conservation, Zanzibar Fisheries and Marine Resource Research Institute (ZAFIRI), Zanzibar Fishing Corporation (ZAFICO), Zanzibar Seaweed Corporation (ZASCO), Zanzibar Hatchery Limited (Z AHL), Institute of Marine Science (IMS) and Deep Sea Fishing Authority (DSFA) for sparing valuable time to share their experience, knowledge, and expertise with us.

In the same breadth, we extend our heartfelt appreciation to JICA for their generous sponsorship of our study tour to Zanzibar. Their vision and commitment to promoting the capacity of marine practitioners have been instrumental in shaping our understanding and perspective concerning the Blue Economy and Fisheries. The opportunity to immerse ourselves in the vibrant tapestry of Zanzibar's marine ecosystem would not have been possible without JICA's support.

The impact of JICA's sponsorship transcends mere knowledge acquisition; it embodies a transformative journey toward sustainable development. Through immersive experiences, interactive meetings, and insightful discussions facilitated by JICA support, we have gained invaluable insights into the challenges and opportunities inherent in Zanzibar's Blue Economy and Fisheries Sector. Armed with this knowledge, we are empowered to advocate for lessons learned in management and conservation to gain sustainable economic prosperity for the people of Kenya.

With profound gratitude, we extend our heartfelt appreciation to the State Department for Blue Economy and Fisheries, Kenya Fisheries Service, and the County Governments of Kwale, Mombasa, and Lamu for allowing their staff to be part of the delegation that participated in the study tour to Zanzibar. Thank you very much for having confidence in us and granting us this lifetime opportunity to represent the country in this important study tour.

Finally, yet importantly, we acknowledge and appreciate the technical working group for JICA's Marine Fisheries Promotion Advisor Project at the coast. Your support and advice before the departure of the delegation to Zanzibar and after that, your input in report writing is highly appreciated.

JICA ZANZIBAR STUDY TOUR

OVERVIEW OF THE BLUE ECONOMY AND FISHERIES IN ZANZIBAR

Zanzibar has 2-major Islands *Unguja* and *Pemba* and 53 islets. The government sources for investors to invest in the islets to boost its economy. The feasibility study has been conducted in 23 islets and 16 already received donors and investors for funding of high-end tourism centers. There is room for more investors. Money from renting the islets is used for government development projects

Though the Blue Economy aspect is a novice concept, its activities began way before through the 2012 strategy. Blue Economy is currently the eighth government major focus/ manifesto and has 5 priority areas;

- Fisheries and aquaculture
- Sustainable tourism
- Energy (Oil, gas, and offshore development)
- Marine trade and infrastructure
- Blue Economy governance (MSP, maritime safety and security, Blue diplomacy, blue finance)

Policies that support and assist in the coordination of Blue Economy in Zanzibar include;

- Blue Economy Policy 2022
- Blue Economy Strategy 2022
- Intervention plan for strategy sector 2021
- Implementation of IMF Covid-19 recovery fund (Tshs. 36.5B)
- Working together with Vice President's Office (VPO) to develop three different Marine Spatial Plans

1. Fisheries and aquaculture

Fishing is mostly by local artisanal fisheries within 6 Nm due to inadequate/low capacity to venture into deeper waters with over 95%. The main species is the anchovy, which is majorly exported to Congo. Fishing is within two areas ie *Unguja* and *Pemba* (more reef and pelagic species). The average consumption of fish in Zanzibar is 23 Kg per person annually. Aquaculture is dominated by seaweed farming (80% women), where 10% of farms are in *Unguja* while 90% are in *Pemba*.

2. Sustainable tourism

Zanzibar is more of a tourist development center. It has a competitive advantage due to nature, cultural heritage, history, and renowned tradition of hospitality.

3. Maritime trade and infrastructure Investment Opportunities in Zanzibar

The main competitor for the port of Zanzibar is Dar es Salam and the port of Mombasa. Looking forward to the construction of a major port within to be multi-purpose and enable more activities to take place.

4. Blue Economy governance and policy framework in Zanzibar

Focus/ encompass components such as;

- Maritime security
- Marine Spatial Plan
- Sustainable financing
- Research and Development, Regional cooperation, International Advocacy
- Public health consideration
- Empowerment of women in Blue Economy - 80% doing seaweed, swimming, and diving and a 5-metre boat to allow them to do seaweed in deeper waters

What has been done to enhance governance of the Blue Economy in Zanzibar

- Institutional capacity building
- Policy Development and Implementation
- Marine spatial planning
- Marine conservation and protected areas- 75% of Zanzibar territorial waters gazetted as marine conservation areas
- Fisheries management patrol vessels, surveillance equipment, and personnel training (community, ministry, and coast guard) - 10 Search and Rescue Centres in Zanzibar, training fishers in swimming. Two NGOs are assisting in fisheries management.
- Maritime law enforcement and surveillance
- Data collection and research; Investing in oceanographic processes
- Community engagement and participation- Shehia Fisheries Management Committees (deal with all activities in the ocean, not just fisheries)

5. Energy

Dependence on Tanzania mainland. Use a cable from the mainland running underwater to transmit energy.

Challenges include;

- Funding and resources- including human and sector resources
- Declining health of the oceans, seas, lakes and rivers
- Data, science/ technology and information

Overall ocean space is 91% compared to land area. The ocean is underutilized thus ways to utilize the ocean to revitalize the economy to meet the people's needs are required. More than 90% of people are fishers and seaweed farmers in the area. Awareness creation is done for the people to understand the Blue Economy sector. The government has supported the community in various ways such as;

- Provide 75 fishing boats in cooperative groups of fishers (minimum of 10 persons per group) through loans. The major challenge in this is loan recovery.
- 500 seaweed farmers empowered, to enable them to do offshore seaweed farming other than inshore
- 800 fishing boats provided with assistance from banks, after approval from the local government and then verification by the bank before being provided
- 6000 fishers trained, and provided with fully equipped vessels for offshore fishing
- 10 pens for sea cucumber fishers (a total of 100 fishers)
- 20 fish ponds constructed (10 Pemba and 10 Unguja)
- 60 for crab farming

INSTITUTION VISITED (21ST - 27TH APRIL 2024), KEY ISSUES DISCUSSED AND LESSONS LEARNED

S.NO.	INSTITUTION	KEY ISSUES	LESSONS LEARNT
1	MINISTRY OF BLUE ECONOMY AND FISHERIES	Definition of Blue Economy Zanzibar has defined its Blue Economy based on its current situations or circumstances. In this regard, they defined the Blue Economy as <i>"The sustainable use and conservation of aquatic resources in both marine and freshwater environments."</i>	The country has adopted the definition of the Blue Economy concept according to the nature of the country's needs and this is crucial and essential to enhance optimization of resources from aquatic resources (freshwater and marine) in the country rather than relying on the definition that focuses on marine aquatic resources alone.
		Priority areas	The Ministry has prioritized five areas; 1. Fisheries and aquaculture 2. Sustainable tourism 3. Energy (Oil, gas, and offshore R.E Development) 4. Marine trade and infrastructure 5. Blue Economy governance (MSP, maritime safety and security, Blue diplomacy, blue finance)
		Policy and legal framework	Zanzibar's Blue Economy is anchored in policies below; 1. Blue Economy Policy 2022 2. Blue Economy Strategy 2022 3. Intervention plan for strategy sector 2021 4. Implementation of IMF Covid-19 recovery fund (Tshs. 36.5B) Working together with the Vice President's Office (VPO) to develop three different Marine Spatial Plans
		Marine Spatial plan Zanzibar is planning for 3 marine spatial plans, one in Zanzibar territorial waters, the other in Tanzania's territorial waters, and the third in the EEZ.	Kenya can adopt this method by having MSPs as per its priority areas and the nature of the environment.
		Resource mobilization	Leasing islands to investors under PPP is one source of funding for the Blue Economy sector The government supports fishers by giving them soft loans applied under cooperatives of not less than 10 people
2	DDEPARTMENT OF FISHERIES AND AQUACULTURE DEVELOPMENT	The government assists fishers by providing them with fully equipped fishing boats (fish finders, gears, GPS, safety equipment)	It is possible to have a loan scheme without interest targeting fishermen along the coast whose majority are Muslim.

S.NO.	INSTITUTION	KEY ISSUES	LESSONS LEARNT
		The support is through a loan scheme with zero interest return (<i>Sharia-compliant</i>) and the government bonding the bank as collateral	
		Co-management	Co-management in Zanzibar is implemented through Shehia Fishermen Committees appointed by the Regional commissioner. They can operate without by-laws but are guided by the Fisheries Act The smallest unit of fisheries management is the Shehia Fishermen Committee, comprising 12 members. Main functions include; Ensuring compliance with fisheries regulations and data collection The main Fisheries Act managing fisheries in the country supports their functions since Shehia's do not have customized by-laws. Its members are elected from the fisher clusters and appointed by the Regional Commissioner
		Recreational Fisheries	Recreational fisheries is an important aspect of tourism comprising sport fishing and snorkeling. Other recreational products include kite surfing, kayaking, ski diving, water horse riding, and motorbike riding at the beach.
		Seaweed production Zanzibar is the leading seaweed-producing country in Africa and 3rd in the world. 80% of seaweed farming is done in Pemba and 20% in Unguja. The majority of seaweed is exported as a raw product, however, value-addition processes are underway e.g. the development of a seaweed processing factory in Pemba and a collaboration with an university in the UK to manufacture organic fertilizer by using seaweed. Various interventions have been undertaken to support women to expand seaweed farming e.g. provision of boats for seaweed farmers to access seaweed farms, training on sea safety etc	Seaweed is a viable investment venture, especially in supporting women Interventions such as fishing boats is a shot in the arm for women who venture into seaweed farming along with other skills such as swimming, value addition (processing), sea safety etc Research of chemical compounds in seaweed is critical as it can lead to processing of key products such as processing of organic fertilizer Kenya should consider certification of processed seaweed products from accredited bodies to access regional and international markets

S.NO.	INSTITUTION	KEY ISSUES	LESSONS LEARNT
	DEPARTMENT OF MARINE CONSERVATION	Conservation areas 75% of Zanzibar's territorial waters is under marine conservation areas where fishing activities are allowed through gear selectivity with a few areas identified as no-take zones and no armed forces are involved The Department of Conservation in Zanzibar through legislation collects entry fees whereby 25% of this goes to the National Government, 75% to the Department. The 75% is further shared between the department and the community in a ratio of 7:3 respectively.	Non-militarization of conservation activities Kenya through currently created Joint Co-management Areas (JCMA) along the coast will expand territorial waters under conservation status to 60 %. These conservation areas will be managed based on gear selection, mesh size, and identification of certain areas as no-take zones to rejuvenate and replenish marine resources. Sharing of revenue to the community is a form of compensation/motivation for the communities to support and continue with conservation activities.
	DAY 2		
3	ZANZIBAR FISHERIES AND MARINE RESOURCE RESEARCH INSTITUTE (ZAFIRI) Zanzibar Fisheries Research Institute was established on 19th April 2019 under the legal notice number 32. Objectives of the Institution. To conduct research and development studies to solve challenges related to fisheries and natural resource sector. Develop quality control guidelines and certification of marine products to meet required standards for export market	Under the Marine Spatial Planning and other marine-related research, ZAFIRI has taken up the vital role of being a data hub for all the activities conducted. The institution is open to any collaborative research with the Kenyan government related to marine space and it is in an MOU with TAFRI in matter regarding marine waters	It is recommended that Kenya should have a centralized place where all data related to fisheries is stored and it will be easy to control the access of the data by authorized people. The data collected is used by the institution to advise the policymaker in making informed decisions It was noted that ZAFIRI is open to collaboration with its neighboring country because each country's exploitation of marine resources can affect the neighbors' marine space. ZAFIRI undertakes research in mariculture and other marine-related issues KeMFRI can collaborate with ZAFIRI to undertake research in areas of mutual interest. Already identified areas are in the culture of rabbitfish, milkfish, marine carp, seaweed, and silver pompano. For easy understanding of data amongst states, it is recommended that the EAC develop a standard data protocol so that data from different states can be shared to each other.

S.NO.	INSTITUTION	KEY ISSUES	LESSONS LEARNT
		The institution pinpointed the challenge of data sharing amongst states because data sharing is not anchored in any legal document.	To facilitate data sharing amongst countries, it is recommended that data sharing should be incorporated in a law that obligates countries to share data.
4	ZANZIBAR HATCHERY LIMITED (ZAH) is a marine hatchery that comprises of 3 main sections Sea Cucumber Fresh & marine tilapia Sensitive room for cucumber algae production room. The company intends to export sea cucumber in to the Asian countries hence it will be involve in not only production but also processing of sea cucumber.	Zanzibar has a well-established hatchery, which produces sea cucumber, milkfish, and marine tilapia. The hatchery is established in a PPP arrangement between a private investor and TAFIRI (a research institute). The facility so far has been providing free seeds to the farmers since a public institution (TAFIRI) holds 49% of the shares in the hatchery.	It is recommended that Kenya to fast track the establishment of the marine hatchery and also include sea cucumber. For the efficiency and effectiveness of the facility Kenya needs to adopt the public-private partnership type of investment Importantly, all key investments in Zanzibar are modeled around a PPP arrangement and this has ensured government/fishers/farmers interests are safeguarded and unscrupulous investors are mitigated in the country.
	DAY 3		
5	MALINDI FISH MARKET	-The Malindi Fish Market was established with the JICA's funding support. -The Malindi Fish Market is divided into different sections:- 1. The office area 2. The restaurant area 3. Vessel landing area a) Big Vessels b) Small Vessels 4. Auctioning Area 5. Preservation Area a) Ice-making area for both Block and Flakes ice. b) Cold rooms and refrigeration area. 6. Retailer Area a) Processing area mainly for gutting and scaling. b) Small pelagic area. c) Large reef and pelagic area. -The fish market has different facilities, which are being managed	The Government of Kenya can establish similar facilities with financial assistance from JICA. -We recommend the Management of the existing facilities should be by Private

S.NO.	INSTITUTION	KEY ISSUES	LESSONS LEARNT
		by the private and monitored by a committee that draws membership from key market stakeholders such as the Department of Fisheries, Local Government, auctioneers, traders, fishermen, women, youths, etc	investors and monitored by a similar committee akin to how corporate institutions are managed with the board of directors overseeing the daily running of the institution by the general manager or chief executive officer
6	ZANZIBAR FISHING CORPORATION (ZAFICO)	-It was established in 2017 and mandated to carry out the business of deep-sea fishing, fish processing, and Mariculture activities. -Despite the fact the company conducts fishing activities, it's still facing some challenges such as:- 1. Lack of technical expertise on deep-sea fishing. 2. High cost of operation. 3. They lack remote sensing tools to identify key fishing grounds based on currents and algae. ZAFICO is owned by different shareholders that includes:- 1. Zanzibar Social Security Fund. 2. Zanzibar State Trading Cooperation. 3. Zanzibar Port Cooperation. 4. Zanzibar Insurance Cooperation. Plans are underway to develop a market information system where fishers will be uploading the catch and buyers will be making an order through the system.	The government of Kenya through the State Department of Blue Economy and Fisheries can work with the Revolutionary Government of Zanzibar through ZAFICO to engage the trained Kenyan fishing crew in their Zanzibar fishing vessel. -To enhance effectiveness, and efficiency and avoid overreliance on ex-chequer, KFIC and any other fisheries-related business-oriented SAGAs should be owned and managed through shareholding. The Government of Kenya may take into consideration the same idea to increase the accessibility of fish and fish products to the market.
7	ZANZIBAR SEAWEED CORPORATION (ZASCO)	-It was established in 2022 under the Company Act, No. 15 of 2013. It is managed by a Board of Directors. Ownership and management of ZASCO is through shareholding by: Zanzibar Social Security Fund; Zanzibar State Trading Cooperation; Zanzibar Port Cooperation; and Zanzibar Insurance Cooperation. ZASCO is currently establishing an industry in Pemba Island for seaweed processing activities.	To inject more capital into seaweed farming, the government should consider establishing or opening existing business-oriented fisheries-related SAGAs to shareholding arrangements. This will provide extra funding to seaweed farmers for production purposes and the development of key infrastructures like seaweed processing facility for value-addition. This will support BETA by reducing imports while increasing exports. -The Government of Kenya can put more emphasis on seaweed production by even establishing a Seaweed company, to create a market for seaweed for the local farmers.
	DAY 4		
8	INSTITUTE OF MARINE SCIENCE	The marine resource supports the socioeconomic aspects of a majority	Kenyans should take note of this opportunity and explore ways of collecting washed Ulva seaweed along the

S.NO.	INSTITUTION	KEY ISSUES	LESSONS LEARNT
		of communities inhabiting areas along the shore. In this regard, it is imperative for any research undertaking or project to incorporate socioeconomic aspects. The Revolutionary Government of Zanzibar through the Ministry of Blue Economy and Fisheries is implementing a program of supporting seaweed farmers (80% are women) to undertake deep-water seaweed farming. The support includes the provision of fiber boats to enable farmers to access seaweed farms and training in diverse topics of importance to seaweed farming The institute has developed a strategy for communicating research findings Collection of seaweed (Ulva species) washed into the shore is a recent occurrence along Zanzibar's beaches. Ulva, a seaweed species is collected, dried, and packaged for export to Vietnam where it is used in formulating animal feeds. Currently, it is being collected from the beaches after being washed onshore by the ocean. However, some unscrupulous traders are engaging fishermen to harvest the same from the ocean. This is ecologically inappropriate and is discouraged absolutely.	shore albeit with a caveat of not harvesting the same from the wild. The government should consider engaging Vietnam Government and other Asian markets to explore the possibility of exporting Ulva seaweed. Equally, over 80% of women are involved in seaweed farming in Kenya. The government and other players should consider supporting women and other farmers with inputs, infrastructures, and training to support farmers increase seaweed production
9	DEEP SEA FISHING AUTHORITY (DSFA)	DSFA is a semi-autonomous body funded by the government of the United Republic of Tanzania with its headquarters in Zanzibar. The agency is mandated to formulate, implement, and monitor the implementation of national policies and strategies in the EEZ, and develop & manage fisheries activities in the EEZ, among other functions.	A majority of DWFN land fish harvested in the Western Indian Ocean in Seychelles due to the elaborate infrastructures it has developed to support the landing of fish in that country and other services like fuel bunkering. Kenya is facing the same challenges as Tanzania and it should consider establishing a fishing port with key cold

S.NO.	INSTITUTION	KEY ISSUES	LESSONS LEARNT
		The authority charges license fees for Purse seiners @ USD6000/3 months and its catch constitutes 45% of the total catch and earns Tanzania USD70000/year. Long-liners pay a license fee of USD 3000/3 Months. The Authority unsuccessfully tried to impose compulsory landing of all fish caught in Tanzania EEZ. The measure caused the foreign fishing vessels to leave Tanzania waters and the authority had to withdraw the measure. The authority is piloting electronic monitoring using cameras to monitor fishing operations on board three national fishing fleets, which are fitted with cameras. Transfer of deep sea fishing management from the ministry to a semi-autonomous body ensured the smooth operationalization of resource management and an increase in revenue generation from EEZ resources. The authority has established an elaborate strategy for collecting data on tuna and tuna-like catches, which entails gathering data through observers onboard fishing vessels.	chain infrastructures through PPPP arrangement. Such investment will place the country in a pivotal position to compete with Seychelles on the East Coast of Africa and in the Western Indian Ocean. Kenya Fisheries Service should consider borrowing some best practices from DFSA and establish a directorate within its administrative structure to enhance the management of EEZ resources and support the government in increasing revenue from the EEZ space. Kenya like Tanzania has similar strategies in place and should explore how contemporary and novel technologies such as artificial intelligence can be incorporated into data collection methods currently deployed in other jurisdictions.
10	Wrap-Up Meeting with Mr. Zahor Kassim El-Kharousy – Deputy Permanent Secretary, Ministry of Blue Economy and Fisheries	75% of Zanzibar's marine coastal waters are under conservation and few areas under a no-take zone management regime. Malindi Fish Market and fish landing facility is a complex infrastructure put up with JICA funding. It has a fish landing bay, an auction center, retail stalls, ice ice-making plants. Key critical sections of the market such as the ice-making facilities and toilets are managed by private investors Seaweed Farming in Zanzibar is advanced (has been going on for over 30 years) and the Revolutionary	Only some specific fishing gears are allowed in the conservation areas. Kenya has similar approach save for militarization of its enforcement approaches. The effectiveness of non-militarization of Zanzibar's enforcement approach should be assessed and found how best it can be inculcated in Kenya's enforcement practices. The SDBEF and the County Governments should engage interested private investors to manage all existing beach infrastructures and facilities. There is a huge market for seaweed in Zanzibar thus presenting a huge business opportunity (demand) that

S.NO.	INSTITUTION	KEY ISSUES	LESSONS LEARNT
		Government of Zanzibar through Zanzibar Seaweed Corporation (ZASCO) is putting up a seaweed factory with a capacity to process 30,000 MT. At operational phase, the facility will have a 18,000 MT shortfall as the current seaweed production in Zanzibar is 12,000MT.	seaweed farmers in Kenya can exploit through supply of seaweed. To prepare seaweed farmers for this opportunity, farmers need to be organized into a cooperative
		Zanzibar Fishing Corporation The corporation does not depend on the exchequer for funding but is managed through shareholdings. Lack of technical expertise on deep-sea fishing is one of the challenges facing the corporation. The Corporation has two commercial fishing vessels but lacks skilled fishing crews	The operations and management of Kenya Fishing Industry Corporation should change from total reliance on the exchequer to management through shareholdings. The more than 880 trained Kenyan fishing crews can fill the skills and knowledge gaps in deep sea fishing in Zanzibar. The SDBEF and the Ministry of Blue Economy in Zanzibar can engage bilaterally with their counterparts in Zanzibar to get job opportunities for the trained fishing crews.
		Currently, The Revolutionary Government of Zanzibar sends their fishing crews for training on STCW in South Africa but the Ministry of Blue Economy Zanzibar is willing to train their fishing crews in Kenya	Bandari Maritime Academy and Kenya Maritime Authority (KMA) are certified by IMO to train and certify trainees on STCW. Ministry of Mining, Blue Economy and Maritime Affairs can engage her counterpart in Zanzibar to offer training to Zanzibar deep sea fishing crews
		Fisheries Co-management. The fishers are involved in fisheries conservation through committees referred to as ' Shehia '. The Shehia committees are only engaged in fisheries conservation. The Regional Commissioners appoint the chairpersons. The respective security committees work closely with the shehia in fisheries conservation.	The Shehia concept is recommended for co-management in Kenya. The BMUs should have only one function of fisheries conservation. In Kenya, the BMUs perform more functions including conservation, MCS, fish quality assurance, and beach hygiene and marketing. The functions are overwhelming hence, the BMUs are ineffective. We recommend that BMUs should be assigned only one function of fisheries conservation.

ACTION PLAN FOR THE IMPLEMENTATION OF THE KEY FINDINGS OF THE ZANZIBAR STUDY TOUR

S.NO	Key Findings	Objectives	Activities	Time Frame	Responsibility
1	Adapted definition of Blue Economy	To define a Blue Economy that considers the unique nature and need of Kenya to include inland lakes, rivers, and dams	To support the adoption of the African Union definition of Blue Economy – <i>"The Blue Economy describes the sustainable use and conservation of aquatic resources in both marine and freshwater environments. This includes oceans and seas, coastlines and banks, lakes, rivers and groundwater"</i> .	Already the country has adopted the definition of the Blue Economy as defined by the African Union	State Department for Blue Economy and Fisheries
2	Policy Framework for Blue Economy in Kenya	To develop a Blue Economy Policy and a strategy document for Kenya	Sensitize policymakers on the need to develop an overarching Blue Economy Policy	1 month	The team State Department for Blue Economy and Fisheries Kenya Fisheries Service
3	Tailored Loan scheme without interest for fishers	To establish a loan scheme suitable for coastal fishermen communities	Sensitize the policymakers on the tour finding where coastal fishermen are provided interest-free loan products	1 month	The team State Department for Blue Economy and Fisheries Kenya Fisheries Service Gulf Bank/First Community Bank/Kenya Bankers Association

S.NO	Key Findings	Objectives	Activities	Time Frame	Responsibility
4	Fisheries Conservation Areas	To conserve fisheries resources through conservation areas based on fishing gear selection	Sensitize policymakers and stakeholders on the need to increase the marine areas under the conservation regimes Engage KEMFSED who are establishing JCMA to expand marine areas under the conservation regimes KMFRI to undertake scientific research on suitable gears to be used in areas designated as conservation area	1 month Ongoing	The team State Department for Blue Economy and Fisheries Kenya Fisheries Service KMFRI
5	Role of BMUs in Fisheries co-management	To review and re-design the functions of BMUs with primary emphasis on fisheries resource conservation	Sensitize policymakers and stakeholders on the need to review and re-model the functions of BMUs around fisheries resource conservation	6 months	The team County Governments State Department for Blue Economy and Fisheries Kenya Fisheries Service
6	Construction of a Fish Market at a fish Landing Station	To establish a multi-purpose fish market on the Kenyan coast	Sensitize policymakers and stakeholders on the willingness of JICA to support the construction of a multi-purpose fish market in the Kenyan coastal area To prepare and submit a project concept to be funded by JICA	1 month	The team State Department for Blue Economy and Fisheries

S.NO	Key Findings	Objectives	Activities	Time Frame	Responsibility
7	Seaweed Market in Zanzibar	To formally engage Zanzibar Seaweed Corporation to buy seaweed from Kenyan farmers	Sensitize policymakers and stakeholders on existing opportunities and areas of collaboration with Zanzibar seaweed players	6 months	The team State Department for Blue Economy and Fisheries County Governments
8	Management of Fish Landing Station facilities	To engage private investors in the management of fish handling, ice making, and cold storage facilities at the fish landing stations in Kenya	Sensitize policymakers and stakeholders on the model of engaging private investors in the management of existing markets and cold chain infrastructures Map out markets and cold chain infrastructures that are non-operational or operating below capacity	6 months	The team State Department for Blue Economy and Fisheries Kenya Fisheries Service County Governments
9	Effective management and operations of state-owned fishing corporations	To reduce overreliance on the exchequer and adopt shareholdings	Sensitize policymakers and stakeholders on the model adopted by the Revolutionary Government of Zanzibar in running State Owned Corporations in the Blue Economy Sector e.g. ZAFICO and ZASCO	6 months	The team State Department for Blue Economy and Fisheries Kenya Fisheries Service Kenya Fishing Industry Company

ANNEX 1: CONTACTS OF KEY INFORMANTS IN ZANZIBAR

S.No.	Name	Institution	Position	Phone contact	Email address
1	Captain Hamad Bakar Hamad	Ministry of Blue Economy and Fisheries	Principal Secretary		
2	Zahor El. Kharousy	Ministry of Blue Economy and Fisheries	Deputy Principal Secretary		
3	Omar S. Mohammed	Ministry of Blue Economy and Fisheries			
4	Innocent william	Ministry of Blue Economy and Fisheries			
5	Saada Iddi Ali	Ministry of Blue Economy and Fisheries	Public relations		
6	Najla Abdalla Mussa	Ministry of Blue Economy and Fisheries			
7	Hamida Abdalla Mohammed	Ministry of Blue Economy and Fisheries	Coordinator		
8	Nunuu Ali	Ministry of Blue Economy and Fisheries	Coordinator		
9	Dr. Salim S. Hamed	Ministry of Blue Economy and Fisheries Department of Fisheries and Aquaculture Development	Director		
10	Dr. Makame Makame	Ministry of Blue Economy and Fisheries Department of Marine Conservation	Director		
11	Ali Said Ali	ZAFIRI			
12	Abdulfahad A. Othman	ZAFIRI			
13	Zakaria Ali Khamis	ZAFIRI	Director		
14	Mudafihir Said	Zanzibar Marine Hatchery Co. Ltd	Technician		
15	Zahor S. Khatib	ZAFICO			
16	Buriyan M. Hassan	ZAFICO			
17	Ali Said Ali	ZAFICO			
18	Daudi Haji	Ministry of Blue Economy and Fisheries -Department of Fisheries and Aquaculture development -Malindi Fish Market Committee			
19	Ashura Mwinyi	Ministry of Blue Economy and Fisheries			
20	Mohammed I. Mohammed	Ministry of Blue Economy and Fisheries			
21	Mwadini M. Haji	ZASCO	Director		
22	Dr. Daudi Msangameno	Institute of Marine Science			
23	Dr. Mbiru Moses	Institute of Marine Science			

S.No.	Name	Institution	Position	Phone contact	Email address
24	Dr. Rukia	Institute of Marine Science Department of Seaweed Research			
25	Mr. Florence Jovinary Peter	Institute of Marine Sciences			
26	Dr. Barnabas A Tarimo	Institute of Marine Sciences			
27	Dr. Batuli M. Yahya	Institute of Marine Sciences			
28	Prof Ntahondi M Nyaundwi	Institute of Marine Sciences	Oceanographer		
29	Mr. Hussein Nyangassa	Institute of Marine Sciences			
30	Ms. Shadya A. Ngirini	Institute of Marine Sciences			
31	Rajabu H. Rashidi	Institute of Marine Sciences			
32	Thomas B. Paschal	Institute of Marine Sciences			
33	Emmanuel A. Sweke	Deep Sea Fishing Authority	Director		
34	Dr. Saleh Yahya	Deep Sea Fishing Authority	Deputy Director		
35	Azizi M. Daudi	Deep Sea Fishing Authority			
36	Uyanjo A. Mdinka	Deep Sea Fishing Authority			
37	Honorat Kempanju	Deep Sea Fishing Authority			
38	Abdulla S. Abdulla	Deep Sea Fishing Authority			

ANNEX 3: PHOTO GALLERY



The Kenyan team with Dr Emmanuel A. Sweke, The Director of the Deep Sea Fishing Authority and his team



The Kenyan team with Dr. Salim S. Hamed, The Director of the Department of Fisheries and Aquaculture



The Kenyan team with Dr. Makame Makame, The Director of the Department of Marine Conservation



The Kenyan team with the lecturers at the Institute of Marine Science

APPENDIX 12

Video Book

Video Book Titles

No	Title	Link (Limited Access)
1	Dry Dagaa Fish Processing	https://youtu.be/9W2v20N9oyU
2	Fish processing at Huawen	https://youtu.be/iiG8fK-70bA
3	Fisheries Management and Development Practice Lecture	https://youtu.be/fUG26Hp-KNs
4	Kijiweni HDPE cage system	https://youtu.be/8PE6PBBdWms
5	Mariculture pond farming in Kibokoni	https://youtu.be/WKWOHOJCfJA
6	Offshore Fishing Techniques	https://youtu.be/EkXt_moBWl4
7	Quality Control Fish Testing Laboratory	https://youtu.be/fp54EJg2ikI
8	Seaweed farming and processing	https://youtu.be/8KoB7bDYJSc
9	Seaweed farming lecture	https://youtu.be/ksdwhKoifGA
10	Solar Cool and Drying Facility in Mwazaro	https://youtu.be/Ue5KU2nVJXc
11	Fishing Gears and Techniques - Lecture	https://youtu.be/NlC4JqsNc1A
12	Fish processing in Kenya - Lecture by KFIC	https://youtu.be/9iXfueTnGxk
13	Crab farming in Kenya	https://youtu.be/ehHfC06_0C0
14	Banca Boat	https://youtu.be/iMozQSdFnrl
15	Sea harvest	https://youtu.be/WNEDvjzPQ-4
16	Fisheries Climate change - Pascal Lecture	https://youtu.be/A2EbLZxx1eQ
17	Mariculture Development in Kenya - Lecture	https://youtu.be/L6dVkQ6n0w0
18	Status of fisheries resources and lost opportunities - Lecture	https://youtu.be/xjJfyv4ZqCc
19	Cage Lecture	https://youtu.be/r7NbrQV7sSY
20	KWS Lecture	https://youtu.be/cM9Tg_Yg3nw
21	Ocean Governance and Marine Management	https://youtu.be/dmnBP_GFbl8

APPENDIX 13

Wrap-up Seminar Handouts
(Project Overview, Brochure, Program)

Appendix 13-1: Project Overview



Background

In Kenya Vision 2030 and the Third Medium-Term Plan, the Kenyan Government has set the blue economy as one of its main pillars for economic development, and has positioned the marine sector and the promotion of fisheries as its key development goals. However, although the Kenyan fisheries sector has a high potential to contribute to the national economy, its present GDP contribution is only 0.5%. The blue economy policy has attracted much attention, and the government has greatly increased the number of officials in the fisheries sector with the aim of realizing effective and sustainable use of marine fishery resources. However, there is no systematic training program for government officials. Therefore, the project was introduced to enable the development of human resources in the Marine Fisheries Sector.

Objective

To build the capacity of marine fisheries personnel of government institutions and counties to enable the effective and sustainable exploitation of marine fishery resources.

Specific objectives

- Develop and implement in -country training for marine fisheries personnel.
- Conduct third-country training to Zanzibar and Seychelles.
- Support Marine Fisheries personnel in the application for Overseas Study programs in Japan.

Project Approach

This project was spearheaded by Government officers through the working group committee. The project planned, executed and evaluated all its activities through the working group that comprised of representatives from,

1. SDBEF	2. KFIC
3. KeFS	4. Kilifi County
5. Mombasa County	6. Kwale County

This Banca Boat is an affordable wooden motorized boat that can be used for offshore fishing of up to 15 nautical miles.

The boat was constructed by two Philippine experts assisted by boat makers from Shela BMU.

The boat has a resemblance to the ngalawa, a popular boat used by artisanal fishermen. This will boost its uptake as most fishermen already know how to use the ngalawa.

To facilitate sustainable replication of the boat, (FRP) Fiber reinforced Plastic material will be used to construct the other banca boats. Pwani Sea Boat Makers, a private investor has already begun the process of making a FRP banca boat.

5: Video Book Creation

The video book is a digital version of the in-country trainings conducted by the project. The purpose of the video book is to enable the capacity building of marine fisheries personnel even after project closure. This video book is a training resource material to be used by marine fisheries personnel seeking to build their capacity.

Conclusion

The Marine Fisheries Promotion Advisor Project has successfully contributed to the capacity building of marine fisheries personnel in Kenya, aligning with the government's blue economy development goals. Through in-country trainings, third-country study tours, and technology transfer, the project has equipped personnel with the knowledge and skills necessary for sustainable marine fisheries management.

Agriculture Studies Networks for Food Security (AGRINET)

Through the project's support two government officials from the following institutions have received fully paid scholarships to further their studies in Japan.

Institution	Course
KeFS	Doctor of Philosophy Degree in Biogenic Amines and Heavy metals
SDBEF	Master's Degree in Marine Policy and Management

The studies are set to begin in October, 2024.

4: Introduction of Philippine Technology Introduced into Kenya

In the first training, online lectures from Philippines were conducted to expose the trainees to advanced fisheries situations in the world. These trainees realized that these technologies could assist Kenya to improve its status in artisanal capture fisheries and mariculture. Therefore, the trainees recommended to the working group the Philippine technologies that should be implemented for a demonstration in order to assist in filling the gap that exists in mariculture and artisanal capture fisheries. The working group adopted the recommendation and requested for a change in the project work plan because there was no intention to implement any technologies in the initial workplan.

These technologies were constructed in October 2023, for a period of one month by a team of four Philippine Experts. The introduced technologies are:

HDPE Circular Fish Farming Cage

Two Philippine experts assisted by KMFRI and community members from Shimon and Kibuyuni BMU fabricated and deployed the cage. This was a valuable knowledge exchange experience for KMFRI and the community.

This cage has a diameter of 10 meters and a depth of 5 meters. The uses the innovative technology of a grid mooring system that is capable of withstanding harsh ocean conditions.

This cage has boosted mariculture in Kenya by offering the platform for demonstration of fish farming in cages for species like Rabbit fish. The cage is also an improvement to the ponds that are currently in use.

2: Motorized Outrigger Boat (Banca Boat)

This working group had 10 members.

Project Timeline:

Activity	Date:
Project commencement	October 2022
Training Needs Assessment Survey	November 2022
First Working Group Meeting	March 2023
Development of Training Curriculum	March 2023
1 st In-country Training	June 2023
1 st Third country training (Seychelles)	August 2023
Construction of Philippine Banca boat	October - November 2023
Construction of HDPE marine cage	October - November 2023
2 nd In country Training	November 2023
2 nd Third country Training (Zanzibar)	April 2024
3 rd In Country Training	May 2024
4 th In country Training	June 2024
Last working group meeting	August 2024

Project Achievements:

1: Conducted four In-Country Training's

Refers to the blue economy training's conducted within the country. This training was a combination of lectures and site tours, as shown in the training curriculum. The training built the capacity of marine fisheries personnel from the following institutions:

Trainee Institution	Numbers trained
KeFS	12
SDBEF	8
Tana River County	4
Mombasa County	4
Kilifi County	4
Kwale County	4
Lamu County	4
KMFRI	2
Totals	42

2: Conducted two Third-Country Training

Refers to the study tours done in Seychelles and Zanzibar.

The Themes for the Study tours were:

- Fisheries Co management
- Fish Processing
- Aquaculture
- Capture Fisheries

Seychelles Third Country Training

Institution	Participants
SDBEF	1
KeFS	1
KFIC	1
KMFRI	1
Tana River County	1
Kilifi County	1
Total	6

Institutions visited in Seychelles were;

- Victoria Artisanal Fishing Port
- Providence Semi-Industrial Fishing Port
- Seychelles Fishing Authority (SFA)
- Ocean Basket Fish Processing Company
- Blue Economy Research Institute

Zanzibar Third Country Training

Institution	Participants
SDBEF	1
KeFS	2
Kwale county	1
Mombasa County	1
Total	5

Institutions visited in Zanzibar were;

- Wizara ya Uchumi Buluu (WUBU)
- Department of Fisheries and Aquaculture Development
- Department of Marine Conservation
- Zanzibar Fisheries and Marine Resource Research Institute (ZAFIRI)
- Zanzibar Hatchery Limited (Z AHL)
- Malindi Fish Market
- Zanzibar Fishing Corporation (ZAFICO)
- Zanzibar Seaweed Corporation (ZASCO)
- Institute of Marine Science
- Deep Sea Fishing Authority

3: Support for Japan Overseas Training

Through the project, marine fisheries personnel were assisted in applying for short and long term courses conducted overseas in Japan.

Knowledge Co-Creation Program

This is a short-term course conducted for four weeks to six weeks in cities in Japan. Through the project's support three participants from the following institutions attended short course training in Japan.

Institution	Course
Tana River county	Enhancing Capacity for Sustainable Fisheries Development
KeFS	Development of Fisheries-Based Local Industry and Sustainable Use of Resources
Mombasa county	Value Chain Development for Sustainable Use of Fisheries Resources

PHOTOS HIGHLIGHTING THE PROJECT'S ACHIEVEMENTS

LEGEND:

1. Lecture at NAMARET by Dr. Mirera
2. Trainees' group photo at KMFRRI with the AG CEO DR. James Mwaluma and JICA Senior Representative Henji Hayashi
3. Trainees' site visit to Mombasa Marine Park
4. Trainees' site visit to Kibuyuni seaweed farms
5. Trainees' site visit to the hatchery at NAMARET
6. Trainees' site visit to KFIC
7. The Banca Boat
8. Local boat maker curves the keel for the Banca Boat
9. Philippine expert working with locals in making the keel
10. 10-meter HDPE float pipe of the fish farming cage system
11. Fish farming cage during trial stocking of marine tilapia
12. JICA KCCP participant at Kurosho town Mayor's Office
13. Seychelles study tour participants at a Fish processing factory
14. Zanzibar Study tour participants at the Zanzibar's Blue Economy Office

In country training








Philippine Banca Boat Technology






Seychelles Third Country Training





MARINE FISHERIES PROMOTION ADVISOR PROJECT

Building capacity for sustainable blue economy

10 M HDPE Fish cage Technology




Support for the JICA KCCP participation



Zanzibar Third Country Training





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Appendix 13-3: Program for the Wrap-up Seminar



**MARINE FISHERIES PROMOTION ADVISOR (JICA) PROJECT
WRAP UP SEMINAR, 5th SEPTEMBER 2024
VENUE: MUTHU NYALI HOTEL, MOMBASA**

Agenda

1. Prayer, Introduction and Opening Remarks
2. Presentation on the project Achievements
3. Video presentation
4. Testimonials
 - Trainee
 - Community Representative (Bangka boat Technology)
 - KMFRI (HDPE Marine cage)
5. Discussions and Way forward
6. Closing Remarks

Participants

- Principal Secretary Representative
- Director General, KeFS
- Director General, KMFRI
- CEO, KFIC
- CECMs (Mombasa, Kilifi, Kwale, Lamu and Tana River)
- County Directors of Fisheries (Mombasa, Kilifi, Kwale, Lamu and Tana River)
- Deputy Directors (KeFS, SDBE&F)
- KEMFSED NPCU
- Working Group Members (KeFS, SDBE&F, KMFRI, KFIC, County Representatives- Mombasa, Kilifi, Kwale, Lamu and Tana River).
- Facilitators (KCGS, SDBE&F, KeFS, KMA, BMA, KFIC, KWS)
- Fisheries officers (National and County Government)
- Private sector (Cheshalle crab farm, Huawein fish processors)
- Community Representatives (Shalrick, Sol cool Dry, Kibuyuni BMU, Gazi BMU, Old Town BMU, Kibokoni).

PROGRAM

TIME	ACTIVITY	FACILITATOR
	Chair: Mr. Rashid Imam	
8:30 - 9:00 AM	Arrival and Registration	Secretariat
9:00 - 9:15 AM	Prayer, Introductions and Opening remarks	Mr. Rashid Imam
9:15 - 9:30 AM	Welcoming and Opening Remarks by: • CECM (Host County) • DG, KeFS • JICA Representative • PS Representative	Mr. Rashid Imam
9:30-10:00 AM	Overview of the project	Working Group Chair
10:00 -10:30 AM	Presentation on Project Achievements • Video presentation	Mr. Yoshikazu Ogino
10:30 - 11.00 AM	HEALTH BREAK	
11:00 -1.00 PM	Testimonials • Trainee • Community representative (Bangka boat) • KMFRI (HDPE Marine cage)	Trainee/ Community/ KMFRI
1:00-1:30 PM	Discussions and Wayforward	ALL
1:30-2:00 PM	Closing Remarks	PS Representative
2:00 PM	LUNCH BREAK & DEPARTURE	

APPENDIX 14

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