

FORWORLD TANZANIA COMPANY LIMITED

CRUSTACEAN FARMING (LOBSTERS AND CRABS)



1.0 Executive Summary

FORWORLD TANZANIA COMPANY LIMITED is a company incorporated in Tanzania with a certificate of incorporation No.164353702 dated 16th March 2023 planning to be engaged in Crustacean Seafood(lobsters and crabs) Aquaculture Company with a strong bias crustacean farming. Forworld Tanzania Ltd is a seafood farming company that will be based in the outskirts of Dar es lam,Kisiju. We have done our detailed market research and feasibility studies and we were able to secure land to start our lobster and crab farming.

we will be involved in the cultivation of Panulirus Ornatus species of lobsters Scylla serrata of crabs. Within the first year of officially running Forworld Lobster and crabs Farms we will start our food processing and packaging plant and also start exporting our processed and packaged lobsters and crabs to other parts of the world.

Which is why aside from the fact that we've secured the required farming land and most of the equipment, we have also hired some key employees who are fit into the ideal picture of the 21st century seafood farming business workforce that we want to build.

FORWORLD TANZANIA COMPANY LIMITED is well positioned to become one of the leading crustacean farms in the United Republic of Tanzania, which is why we have been able to source the best hands to run the business with. We have put processes and strategies in place that will help us employ best practices when it comes to seafood/lobster and crab farming and processing, which is why we have been able to source for the best hands to run the company. We have put processes and strategies in place that will help us employ best practices when it comes to crustacean farming. We are in the seafood farming business because we want to leverage on the vast opportunities available in the agriculture industry, to contribute our quota in growing the Tanzania economy, in national food production, to export sea food produce from the Tanzania to China and other countries and above to make profit.

At **FORWORLD TANZANIA COMPANY LIMITED**, our customer's best interests will always come first, and everything we do will be guided by our values and professional ethics. We will ensure that we hold ourselves accountable

to the highest standards by meeting our client's needs precisely and completely.

FORWORLD TANZANIA COMPANY LIMITED is a privately registered Crustacean farming company that is owned by two shareholders with over 8 years of hands-on experience in the Crustacean seafood aquaculture industry.

Name	%of shareholders	Nationality
Yongbin Fu	60	China
Shuanguo Li	40	China

2.0 Our Products and Services

FORWORLD TANZANIA COMPANY LIMITED is a seafood farming company that will be involved in farming lobsters and crabs and other seafood for both China Market market and the global market. We will also ensure that we operate a standard food processing and packaging plant as part of our complimentary business.

These are the areas we will concentrate on in our seafood farms. If need arises, we will definitely add more seafood to our list;

These are the areas we will concentrate on in our ornamental fish farming business;

- Cultivation of different species of lobsters and crabs
- Processing and packaging of lobsters and crabs

3.0 Our Mission and Vision Statement

- Our vision is bold, To Lead The Charge in Making Seafood Healthy, and we stand behind every word.
- Our lobster and crabs is fresh food, not frozen. Our lobster and crabs are organic where possible.
- We are set to become the standard of how world – class lobster and crabs farms should be run not just in Tanzania, but also the global market
- We want our well – packaged and processed seafood to flood every nooks and crannies of China and other countries of the world.

4.0 Our Business Structure

FORWORLD TANZANIA COMPANY LIMITED is a privately owned and managed crustacean and seafood business that intends to start small but hopes to grow big in order to compete favorably with leading crustacean farms in Tanzania and in the world. We are aware of the importance of building a solid business structure that can support the kind of world-class business we want to own.

At FORWORLD TANZANIA COMPANY LIMITED, we will ensure that we hire people that are qualified, hardworking, creative, result-driven, customer- centric, and ready to work to help us build a prosperous business that will benefit all the stakeholders.

As a matter of fact, a profit-sharing arrangement will be made available to all our senior management staff and it will be based on their performance for a period of five years or more as agreed by the board of trustees of the company. In view of the above, we have decided to hire qualified and competent hands to occupy the following positions;

- Chief Operating Officer
- General Crustacean Farm Manager
- Human Resources and Admin Manager
- Accountant/Cashier
- Sales and Marketing Executive
- Cage Builders and Field Employees
- Front Desk Officer

Total of 10 people to be employed

5.0 Job Roles and Responsibilities

5.0.1 Chief Executive Officer – CEO:

Increases management's effectiveness by recruiting, selecting, orienting, training, coaching, counseling, and disciplining managers; communicating values, strategies, and objectives; assigning accountabilities; planning, monitoring, and appraising job results

Creating, communicating, and implementing the organization's vision, mission, and overall direction – i.e. leading the development and implementation of the overall organization's strategy.

Responsible for fixing prices and signing business deals

Responsible for providing direction for the business

Responsible for signing checks and documents on behalf of the company

Evaluates the success of the organization

Reports to the board

5.0.2 General Crustacean Farm Manager

Responsible for the planning, management and coordinating all farm activities across the various sections on behalf of the organization

Supervise other section managers

Ensure compliance during project executions

Providing advice on the management of farming activities across all section

Responsible for carrying out risk assessment

Using IT systems and software to keep track of people and progress of crustacean in ourcages.

Represent the organization's interest at various stakeholders' meetings
Ensures that farming goals desired result are achieved, the most efficient resources (manpower, equipment, tools and chemicals et al) are utilized and different interests involved are satisfied.

Responsible for preparing financial reports, budgets, and financial statements for the organization.

5.0.3 Admin and HR Manager

Responsible for overseeing the smooth running of HR and administrative tasks for the organization

Maintains office supplies by checking stocks; placing and expediting orders; evaluating new products.

Ensures operation of equipment by completing preventive maintenance requirements; calling for repairs.

Defining job positions for recruitment and managing interviewing process

Carrying out induction for new team members

Responsible for training, evaluation and assessment of employees

Responsible for arranging travel, meetings and appointments

Oversee the smooth running of the daily office activities.

5.0.4 Accountant/Cashier:

- ◆ Responsible for preparing financial reports, budgets, and financial statements for the organization
- ◆ Provides managements with financial analyses, development budgets, and accounting reports
- ◆ Responsible for financial forecasting and risks analysis.

- ◆ Performs cash management, general ledger accounting, and financial reporting for one or more properties.
- ◆ Responsible for developing and managing financial systems and policies
Responsible for administering payrolls
- ◆ Ensuring compliance with taxation legislation
Handles all financial transactions for the company
Serves as an internal auditor for the company.

5.0.5 Sales and Marketing Manager

- ✓ Manage external research and coordinate all the internal sources of information to retain the organizations' best customers and attract new ones
Model demographic information and analyze the volumes of transactional data generated by customer
- ✓ Identifies development opportunities; follows up on development leads and contacts
- ✓ Writing winning proposal documents, negotiating fees and rates in line with organizations' policy
- ✓ Responsible for handling business research, market surveys, and feasibility studies for clients
- ✓ Responsible for supervising implementation, advocating for the customer's needs, and communicating with clients
- ✓ Create new markets cum businesses for the organization
- ✓ Empower and motivates the sales team to meet and surpass agreed targets.

5.0.6 Field Workers/Contract Staff

- ✓ Responsible for feeding lobsters and crabs as instructed by the supervisor
Responsible for cleaning the crustacean farming environment
- ✓ Carries out tasks in line with the stated job description
- ✓ Assist in transporting working tools and equipment from the crustacean farming business and back to the designated storeroom
- ✓ Handles any other duties as assigned by the line manager.

5.0.7 Front Desk/Customer Service Officer

- ✓ Welcomes/receives clients by greeting them in person or on the telephone; answering or directing inquiries.
- ✓ Ensures that all contacts with clients (e-mail, walk-In center, SMS, or phone) provide the client with a personalized customer service experience of the highest level
- ✓ Manages administrative duties assigned by the HR and Admin Manager in an effective and timely manner
- ✓ Consistently stays abreast of any new information on the organizations' products, promotional campaigns, etc. to ensure accurate and helpful information is supplied to clients when they make inquiries
- ✓ Receives parcels/documents for the company and distribute mail in the organization
- ✓ Handles any other duties as assigned by HR and Admin Manager

6.0 SWOT Analysis

FORWORLD TANZANIA COMPANY LIMITED does not intend to launch out with trial and error hence the need to conduct a proper SWOT analysis. We know that if we get it right from the onset, we would have succeeded in creating the foundation that will help us build a standard crustacean farming company that will favorably compete with leading players in the Seafood Aquaculture industry.

We engaged the services of a core professional in the area of business consulting and structuring to assist our organization in building a well-structured crustacean farming company that can favorably compete in the industry.

Part of what the team of business consultants did was to work with the management of our organization in conducting a SWOT analysis for FORWORLD TANZANIA COMPANY LIMITED. Here is a summary of the result of the SWOT analysis that was conducted on behalf of FORWORLD TANZANIA COMPANY LIMITED;

SWOT ANALYSIS FOR LOBSTERS AND CRABS

Strength:

Our strength as an crustacean farming company is the fact that we have healthy relationships with loads of major players that are into the construction and sale of cages, suppliers of lobsters and crabs feeds, and medications, and buyers of crustacean within and outside of Tanzania.

We have some of the latest crustacean equipment that will help us raise lobsters in commercial quantities with less stress. Aside from our relationship (network) and equipment, we can confidently boast that we have some of the most experienced hands in Tanzania on our payroll.

Weakness:

Our weakness could be that we are a new lobsters farming company in Tanzania, and it might take us some time to attract big-time customers and high-paying clients. We are aware of this and from our projection, we will overcome this weakness with time and turn it into a major advantage for the business.

Opportunities:

The opportunities that are available to us as a crustacean farming company with a strong bias for crustacean farming cannot be quantified, we know that there are loads of households, and cages construction and sales companies that can't do without a supply of juveniles. We are well-positioned to take advantage of this opportunity

Threats:

Some of the threats and challenges that we are likely going to face when we start our own crustacean farming company are global economic downturn, bad weather cum natural disasters, unfavorable government policies, and the arrival of a competitor within the same location.

7.0 MARKET ANALYSIS

7.1 Market Trends

The crustacean business has steadily remained relevant over the years these lobsters and crabs have remained common companions in many households. Pet owners who treat their pet friends as family members have grown increasingly hence the increase in demand for lobsters and crabs.

The industry has expanded strongly over the five-year period due to economic recovery in China, despite increased competition from supermarkets, mass merchandisers, and online retailers that typically offer consumers greater convenience and competitive prices. Going forward, the crustacean farming business is projected to maintain strong growth.

7.2. Our Target Market

The end consumer of seafood and lobsters and also those who benefits from the business value chain is all encompassing.

We have positioned our lobster farming business to service supermarkets, grocery stores, hotels, restaurants and other outlets all across china and other key cities all over the world. We are in business to retail our lobsters to the following groups of people and businesses;

In China, people keep pets in their household and they ensure that they take proper care of them. As a matter of fact, in China and in most countries, there are laws guiding how pets should be handled. This goes to show that if a crustacean farming business is well positioned, then it will continue to sell its products to a wide range of clients on a regular basis.

We are in business to sell a wide range of crustacean to;

- Supermarkets
- Grocery Stores
- Hotels
- Restaurants
- Outdoor caterers
- Households

7.3 Our Competitive Advantage

A close study of the seafood farming industry reveals that the market has become much more intensely competitive over the last decade. As a matter of fact, you have to be highly creative, customer centric and proactive if you must survive in this industry. We are aware of the stiff competition and we are prepared to compete favorably with other seafood / lobster farms in the world.

FOR WORLD TANZANIA COMPANY LIMITED is fully aware that there is competition when it comes to selling fish and seafood all over the globe, which is why we decided to carry out thorough market research so as to know how to take advantage of the market.

We have done our homework and we have been able to highlight some factors that will give us a competitive advantage in the marketplace; some of the factors are effective and reliable crustacean farming processes that can help us sell our lobsters and crabs at competitive prices, good network and excellent relationship management.

Another competitive advantage that we are bringing to the industry is the fact that we have a healthy relationship with major players in the industry. We have some of the latest hatchery, tools and equipment that will help us raise juveniles commercial quantities with less stress. Aside from our relationship (network) and equipment, we can confidently boast that we have some the most experienced hands in Tanzania in our payroll.

Lastly, all our employees will be well taken care of, and their welfare package will be among the best within our category in the industry. It will enable

to be more than willing to build the business with us and help deliver our set goals and achieve all our business aims and objectives.

9.0 SALES AND MARKETING STRATEGY

Our sales and marketing team will be recruited based on their vast experience in the seafood aquaculture industry and they will be trained on a regular basis so as to be well equipped to meet their targets and the overall business goal of FORWORLD TANZANIA COMPANY LIMITED.

We have perfected our sale and marketing strategies first by networking with lobsters and crabs merchants and businesses that rely on daily supply of crustaceans. In summary, FORWORLD TANZANIA COMPANY LIMITED will adopt the following strategies in marketing our seafood;

- Introduce our business by sending introductory letters alongside our brochure to stake holders in the agriculture industry, aquariums and garden pools construction companies and crustacean merchants et al.
- Advertise our business in related magazines and websites
- List our business on yellow pages ads
- Attend related crustacean farming expos, seminars, and business fairs et al
- Leverage on the internet to promote our business
- Engage in direct marketing
- Encourage the use of Word of mouth marketing (referrals)

- Join local chambers of commerce and industry to network and market our crustaceans.

10.0 PUBLICITY AND ADVERTISING STRATEGY

Any business that wants to grow beyond the corner of the street or the city they are operating from must be ready to utilize every available means to advertise and promote the business. We intend growing our business which is why we have perfected plans to build our brand via every available means.

Below are the platforms we will leverage on to boost our crustacean farming brand and to promote and advertise our business;

- Place adverts on community based newspapers, radio and TV stations.
- Encourage the use of word of mouth publicity from our loyal customers
- Leverage on the internet and social media platforms like; YouTube, Instagram, Facebook, Twitter, LinkedIn, Snapchat, Pinterest, Google+ and other platforms to promote our business.
- Distribute our fliers and handbills in target areas in and around our neighborhood
- Advertise our business in our official website and employ strategies that will help us pull traffic to the site
- Brand all our official cars and trucks and ensure that all our staff members and management staff wears our branded shirt or cap at regular intervals.

11.0 OUR PRICING STRATEGY

We are quite aware that one of the easiest means of penetrating the market and acquiring loads of customers for our crustacean(lobsters and crabs) is to sell them at competitive prices hence we will do all we can to ensure that the prices of our lobsters and crabs are going to be what other farmers would look towards beating.

One thing is certain, the nature of the business makes it possible for crustacean farmers to place prices on their lobsters based on their discretion without following the benchmark in the industry. It is one of the means of avoiding running into loss.

We will ensure that we leverage price to win over customers; our prices will be affordable and negotiable. The fact that our business door is open to both smaller and big-time crustaceans suppliers means that we will have different price ranges for different categories of clients. As the business grows, we will continue to review our pricing system to accommodate a wide range of clientele.

12.0 SUSTAINABILITY AND EXPANSION STRATEGY

Part of the plans we have in place to sustain FORWORLD TANZANIA COMPANY LIMITED is to ensure that we continue to make available a wide range of crustacean, deliver quality after-sales services, and improvise on how to do things faster and cheaper. We are not going to relent in providing a conducive environment for our workers and

also the

required training that will help them deliver excellent services at all times.

We are quite aware that our customers are key components to the growth and survival of our business hence we are going to continuously engage them to give us ideas on how to serve them better and the products they want to see in our store.

We will not waste time in adopting new technology, best practices and diversifying our services. FORWORLD TANZANIA COMPANY LIMITED will make sure that the right foundation, structures, and processes are put in place to ensure that our staff welfare is well taken of.

Our company's corporate culture is designed to drive our business to greater heights and training and retraining of our workforce is at the top burner. We know that if that is put in place, we will be able to successfully hire and retain the best hands we can get in the industry; they will be more committed to helping us build the business of our dreams.

13.0 PROJECT MANAGEMENT POLICY

The day-to-day operations will be managed by the Managing Director, to be assisted by the Production and Technical Director of Production who will be overall in charge of production, Business Development and Logistics Director and financing and

administration Director who will

take care of all matters related to financial resources and human resources of the company

Gender	Foreign Skilled	Local Skilled	Local Unskilled
Women	2	5	5
Men	3	10	15
TOTAL	5	15	20

14.0 FORWORLD TANZANIA COMPANY LIMITED COST STRUCTURE

PARTICULAR	US\$
Land and Buildings	50,000.00
Vehicles	120,000.00
Plant and Machinery	200,000.00
Furniture & Fittings	2,000.00
Others	10,000.00
Working Capital	150,000.00
TOTAL	532,000.00

For the project to be a reality a total investment amounting to US \$ **532,000** is needed

14.1 FINANCING PATTERN

The project will be financed by equity US\$ 282,000 and a loan US \$250,000

14.2 PRODUCTION CAPACITY

The company has estimated to produce 52 tones Package per year

14.3 FINANCIAL ANALYSIS

14.3 Considerations and Assumptions:

The corporate tax charged is 30% of the profits. The capital investment allowance is 50%. The capital assets are exempted from customs duty and Value Added Tax. The straight-line method to depreciate the project's capital items has been applied.

14.4 Projected Profit and Loss Statement

The Income and Expenditure Statement shows the projected income for the 5 years period. The position depicted is that the project earns profit throughout its life. Accumulated after-tax profits grow from. US **\$157,360** in the first year to **US \$ 880,625** in the 5 year

FORWORLD TANZANIA COMPANY LIMITED PROJECTED INCOME & EXPENDITURE
STATEMENT (US\$)

-	1	2	3	4	5
Revenue (850,000.00	892,500.00	937,125.00	983,981.25	1,033,180.31
Operating Expenses:	595,000	624,750	655,988	688,787	723,226
Gross Profit Before Interest and Depreciation	255,000	267,750	281,138	295,194	309,954
Interest	20,000	20,000	20,000	20,000	20,000
Depreciation	10,200	10,200	10,200	10,200	10,200
Gross Profit	224,800	237,550	250,938	264,994	279,754
Tax (30%)	67,440	71,265	75,281	79,498	83,926
Profit After Tax	157,360	166,285	175,656	185,496	195,828
Accumulated Profit	157,360	323,645	499,301	684,797	880,625

14.5 Projected Cash Flows

This is shown in the financial statements. The project has a positive end-of-year cash flow from year1, i. e US 187,560 of operation to the 5th year i.e. US \$ 1,031,625

FORWORLD TANZANIA COMPANY LIMITED PROJECTED STATEMENT (US\$)

SOURCES:	0	1	2	3	4	5
Profit before interest and depreciation	-	255,000	267,750	281,138	295,194	309,954
Equity	282,000					
Loan	250,000					
Total Sources	532,000	255,000	267,750	281,138	295,194	309,954
Applications :						
Capital expenditure	422,000		-	-	-	-
working Capital & Others	110,000					
Cash	-	187,560	196,485	205,856	215,696	226,028
Tax	-	67,440.00	71,265.00	75,281.25	79,498.31	83,926.23
Sub total	532,000	255,000	267,750	281,138	295,194	309,954
Total applications	532,000	255,000	267,750	281,138	295,194	309,954
Accumulated cash		187,560	384,045	589,901	805,597	1,031,625

14.5 Projected Balance Sheet

The projected Balance Sheet of the projected is shown in the financial statements under the same heading. The net worth of the project increases from US\$ 282,000 in the first year of operation to US \$ 1,162,625 in the 5th year.

FORWORLD TANZANIA COMPANY LIMITED PROJECTED BALANCE SHEET
(US\$)

Fixed Assets	1	1	2	3	4	5
Opening balance	-	422,000	411,800	401,600	391,400	381,200
Total Long-term Assets	-	422,000	411,800	401,600	391,400	381,200
Less depreciation	-	10,200	10,200	10,200	10,200	10,200
Closing balance	-	411,800	401,600	391,400	381,200	371,000
Working capital	110,000	110,000	110,000	110,000	110,000	110,000
Accumulated cash	-	187,560	384,045	589,901	805,597	1,031,625
Total assets	110,000	709,360	895,645	1,091,301	1,296,797	1,512,625
Financed by						
Equity	282,000	282,000	282,000	282,000	282,000	282,000
Accumulated profit	-	157,360	323,645	499,301	684,797	880,625
Total equity	282,000	439,360	605,645	781,301	966,797	1,162,625
Bank Loan	250,000	200,000	150,000	100,000	50,000	-
Total debts	250,000	150,000	150,000	100,000	50,000	-
Total equity and debts	532,000	589,360	755,645	881,301	1,016,797	1,162,625

15.0 ECONOMIC ASPECTS OF THE PROJECTS

Besides the financial/monetary returns to the owners, there are other benefits to be derived for the whole country viz.

(i) Employment Opportunities

Employment and poverty reduction are among the major concern of the Central and Local Government authorities. It is gratifying to note that the project is going to provide employment for **20** people. This is a significant contribution coming from investors.

(ii) Revenue to the Government

The Project is expected to pay a substantial annual amount in the form of corporation tax amounting and other taxes will be paid directly to the government during the project's 5 years covered under our project review.

(iii) Foreign Exchange Earning

Since the project's final products will be exported, the project will thus earn foreign currency for the United Republic of Tanzania.

16.0 CONCLUSION AND RECOMMENDATION

16.1 CONCLUSION

- (i) The project is profitable and contributes to government revenue by way of taxes.
- (ii) The project provides employment to 40 people all of whom are national Tanzanians.
- (iii) The project is an encouraging sign to prove that we have minerals value addition could be done in Tanzania.

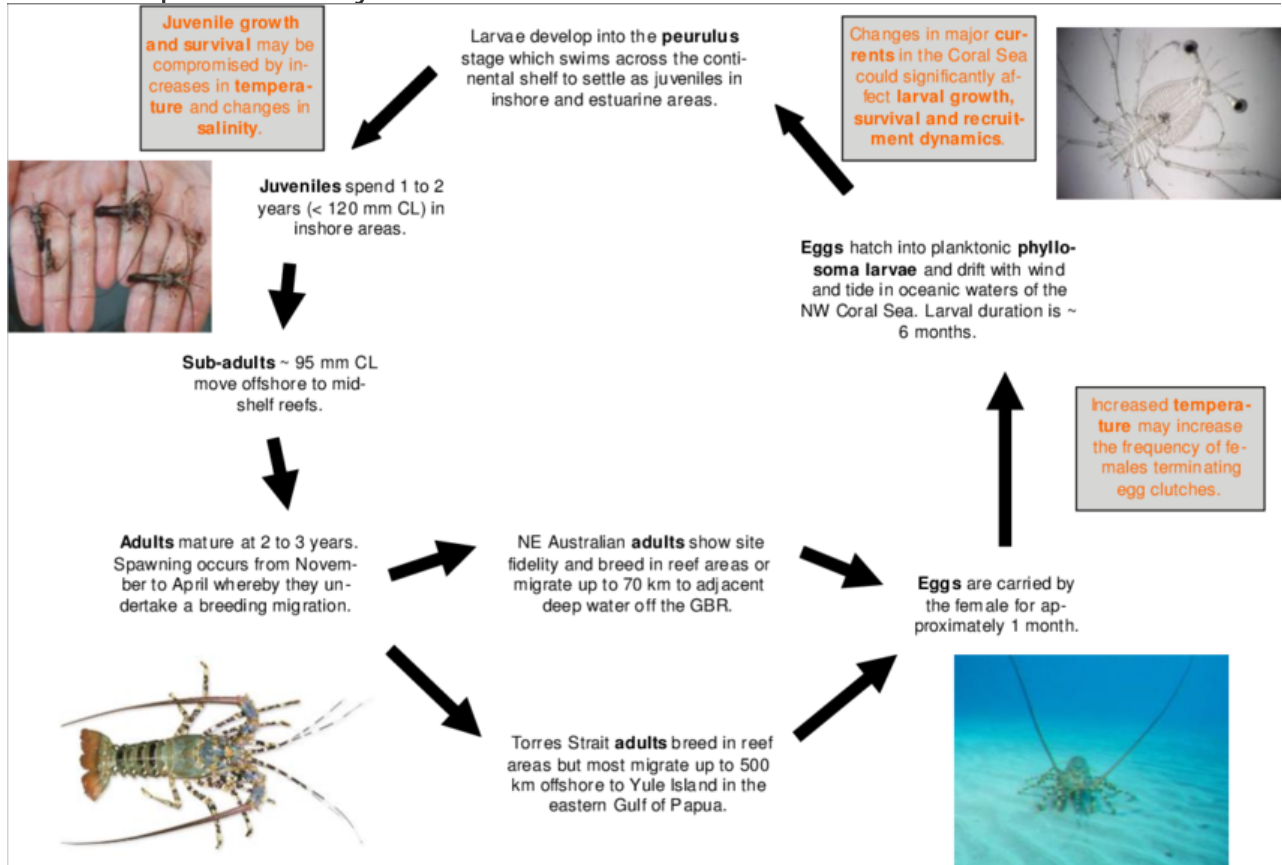
17.0 RECOMMENDATION

After the foregoing economic and financial evaluation of the project, we strongly recommend that this project be implemented and be given all the support required by all the concerned Government Ministries and Agencies, including the Tanzania Revenue Authority (TRA) and the Tanzania Investment Centre – (TIC) The project deserves this support because of its viability, since it is technically feasible, economically viable and socially acceptable.

CAGE FARMING FOR LOBSTERS

In this area, Female lobster catch is carried out with the use of iron based structures in the form of cages (with measurements of 3mX3mX3m) which are submerged and laid on the sea floor at a depth of 5-10 meters and it can hold upto 200-300 kilograms of lobsters.

The Complete Life Cycle Of Lobsters



Mating

After the male lets the female move into his burrow, they start stroking each other with antennae and with feet that are covered in taste receptors. This foreplay can last several days, and when the couple is ready, the female sheds her shell.

She slowly removes her old hard shell together with the old pouch where she had banked sperm from a previous mate. Next, the male suspends himself above the female and lifts her gently to face him, cradling her in his legs. He puts a packet of his sperm into her new sperm pouch, using his first pair of abdominal appendages, called gonopods.

The sperm packets are located underside of the female's body. After the male deposits sperm, the female stores it for up to 15 months before she releases eggs to fertilize them, which I'll explain more in the life cycle paragraph.

FEMALE LOBSTER

A female lobster mates primarily when she is in the soft-shell state, right after she has shed her shell (molted). Photo to the left shows an egg bearing lobster, also known as a "berried" lobster

Eggs

A freshly laid lobster egg is the size of the head of a pin (1/16"). A 1-pound female lobster usually carries approximately 8,000 eggs. A 9-pound female may carry more than 100,000 eggs. The female lobster carries the eggs inside for 9 to 12 months and then for another externally attached to the swimmers under her tail by a glue like substance. when the eggs are hatched the mother releases them by fanning her swimmers.

Larval stage

Now in the first larval state the new born lobsters will float near the surface for 4 to 6 weeks. They are very susceptible to prey during this stage and will go through three molts or stages.

Post-Larval

After the fourth molt the few that survive will settle to the bottom; look for hiding places in rocks, grassy areas, etc. and continue to develop as post-larval lobsters. From every 50,000 eggs only about 2 lobsters are expected to survive to legal size.

Juvenile

As the lobsters grow, they become more adventuresome and hide less. Their habits are similar to adult lobsters. It takes 5 to 7 years for a lobster to grow to the legal size to harvest. A lobster at minimum legal size will weight approximately 1 pound. (Based on Maine's legal minimum of 3 1/4" carapace size. Legal sizes can vary by state/country.) Juvenile lobsters can molt as many as 25 times before reaching adulthood. See photo of juvenile lobsters on the right.

Adult

Lobsters reach adulthood after 5–8 years. As adults, males typically will shed or molt once a year, and females once every two years.

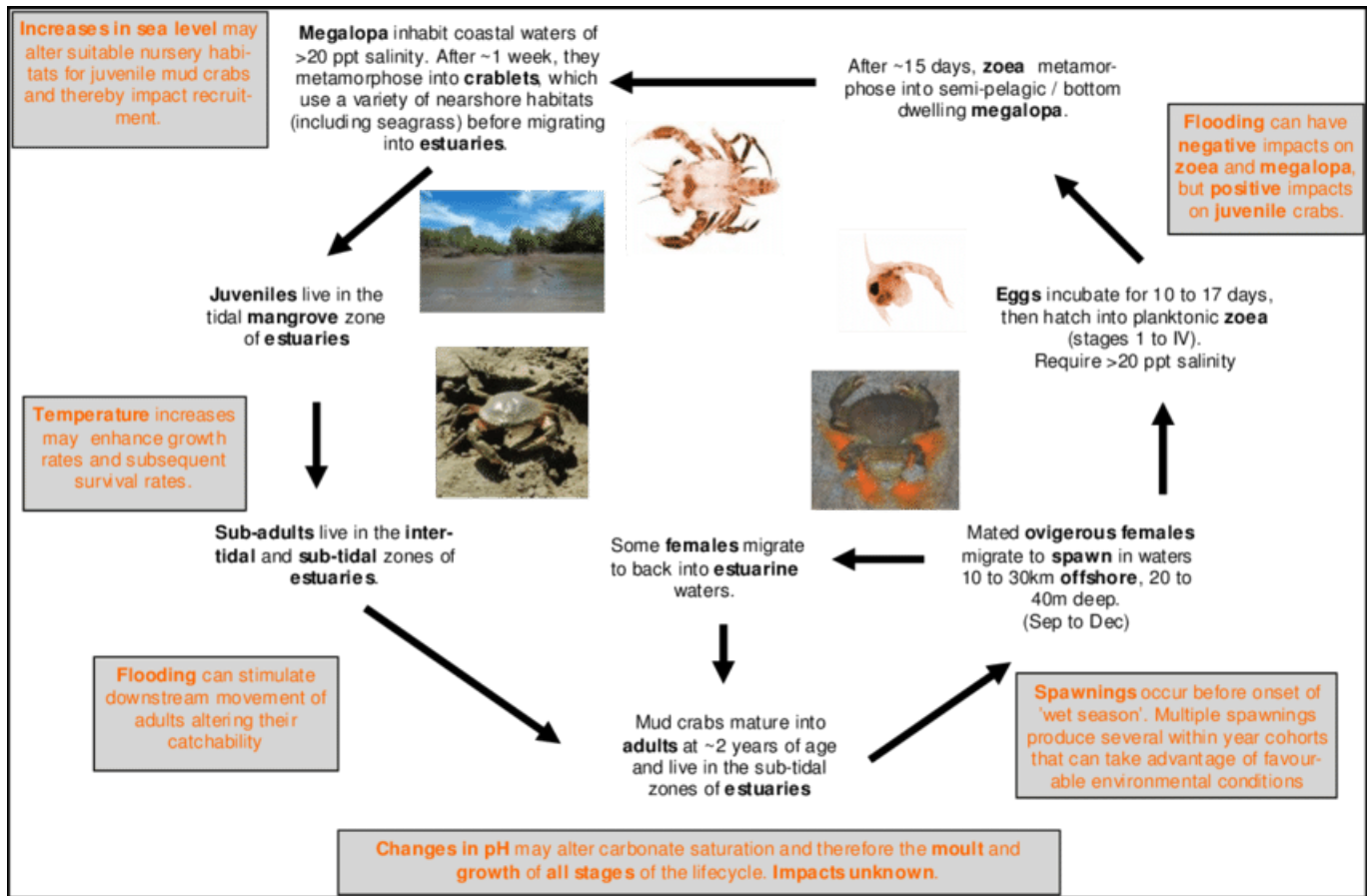
Molting:

Lobsters grow by molting. This is the process in which they struggle out of their old shells while simultaneously absorbing water which expands their body size. After molting, lobsters will eat voraciously, often devouring the shells they just shed. This replenishes lost calcium and hastens the hardening of the new shell. This molting, or shedding, occurs about 25 times in the first 5–7 years of life. Following this cycle, the lobster will weigh approximately one pound. After this time, the lobster may then only molt once per year (males) or once every two years (female). At this point, with each molt the lobster will increase about 15% in length and 40% in weight. No one has yet found a way to determine the exact age of a lobster. However, based on scientific knowledge of body size at age, the maximum age attained may approach 100 years. Lobsters can grow to be 3 feet or more in overall body length.

MUD CRAB

The complete Life cycle of crabs

Grow-out system – In the grow-out farming system, young crabs are reared and grown for 5 to 6 months until they reach marketing size and weight.



Crab farming A system of preserving or protecting crabs by keeping them in shallow saltwater pens, where they are fattened for market. Outsiders are investing heavily in crab farming due to its profit margins.

Moulting crabs

The moulting process depends on body size and environmental factors. For example, moulting of big crabs takes longer than for small ones.

- Newly moulted mud crabs lose their swimming ability and sink to the bottom of the pond.

- It takes two to three hours for soft-shell individuals to regain this swimming ability.

With each moult, shell width, shell length and body weight generally increase by about 28.4 percent, 30 percent and 41 percent respectively.

- Strong stimuli or mechanical damages often result in the loss of appendages, a process called self-cutting.

- New appendages can be regenerated several times.

BREEDING

A sandy substratum should be provided in the spawning tank. Half of the broodstock tank can be provided with 10 cm sand layer and another half can be bare floor for feeding purpose. Alternatively sand filled trays can be provided. Crabs can be stocked at the rate of 1-2 animal per sq.metre.

Sea Cucumber/holothurian farming



The Complete Life Cycle Of A Sea Cucumber

Sea cucumbers are one of the most fascinating marine creatures thanks to their unique ways of adaptation and defense mechanisms. They also have a unique way of reproduction, and if you wonder what the life cycle of the sea cucumber is and how they reproduce, in this blog post we'll talk all about that.

The life cycle of sea cucumbers has five stages: spawning, egg, larvae, juvenile, and adult. They can reproduce sexually and asexually through the fission or fragmentation of the body, and they can live for about 5-10 years.

However, this certainly doesn't tell the whole story. Below, I'll explain more about each stage of the sea cucumber's life cycle and their reproduction method. Furthermore, I'll explain more about how they reproduce asexually and about the brooding species that lay eggs inside their bodies.

Spawning

Sea cucumbers reproduce by a process called spawning – the first stage of sea cucumbers' life cycle. During this event, several females release their eggs, and several males release their sperm into the water column, all at the same time. It's a common way of reproduction for all echinoderms (a group of animals that sea cucumbers belong to), such as sea stars, sand dollars, and sea urchins.

During spawning, sea cucumbers adopt a cobra-like appearance, with the front end of the body raised from the bottom. They release eggs or sperm from their gonad located in front of the body, right behind their mouth.

Egg

Once free-floating eggs and sperm interact, they successfully fertilize and form a zygote (fertilized egg). Successive cell divisions divide the zygote into smaller and more numerous cells forming two, four, eight, and more cell embryos.

The following stages of egg development are blastula and gastrula, which begin to form 35 hours after fertilization and take on the appearance of a ball.

Larva

The next stage of the sea cucumber's life cycle is the larval stage. The first typical larval stage is auricularia which is only around 1 mm (39 mils) in length. This larva is characterized by a functional, visible mouth, other parts of the digestive system, and hair-like organelles used for feeding and locomotion.

At this stage, these larvae eat suspended food particles and float freely for about a few weeks before transforming into the next larval stage, called doliolaria. Doliolaria is a non-feeding larva that has a barrel-shaped body and three to five separate rings of cilia.

After a few days, the larva transforms into the last larval stage called pentactula. This larva starts developing tentacles surrounding sea cucumbers' mouths. It also changes from planktonic larvae to benthic larvae, which means it settles on the bottom of the ocean. Once on the bottom, the larva begins a metamorphosis into a juvenile.

Juvenile

After the metamorphosis, the animal's body begins looking like a miniature sea cucumber, reaching a length between 0.5 mm (0.02 in) and 1.5 mm (0.06 in). It forms the rest of the organs that later help the animal to function.

The juvenile sea cucumbers grow very slowly for the next months or years. They mostly hide from [predators](#) under rocks, among seaweeds, or by burrowing themselves in the sand. Moreover, they [extend their tentacles to feed](#) on suspended food particles and algae. After a few years, sea cucumbers reach sexual maturity and begin spawning.

Adult

Adult sea cucumbers normally grow to about 10 to 30 centimeters (4-12 in) in length. However, their size depends on the species, and some can grow even to 2-3 meters (6.5 – 10 ft) like the tiger's tail or the giant red sea cucumber.

Most sea cucumbers live for 5 to 10 years. They adapted to many different habitats, living in almost all depths and water temperatures. Their main habitat includes coral reefs, sandy bottoms, rocky intertidal shores, seagrass meadows, mud, and even kelp forests. You can read more about it in my other post: [“Where Do Sea Cucumbers Live?”](#).

Sea cucumbers survive thanks to their unique [defense system](#). They can swim away when threatened, release toxins and their internal organs to scare away predators, or liquefy their bodies and escape through narrow spaces.

TRENCH FARMING

1. Identify an area with a sandy bottom and little to no vegetation. This will be the site of your farm.
2. Prepare the area by clearing any debris and creating trenches for your sea cucumber lines.
3. Plant your sea cucumbers in the trenches or in pens or cages in shallow or deep water, depending on the species and the environment.
4. Wait for your crop to mature, which can take from six months to three years, depending on the species and the conditions.
5. Harvest your sea cucumbers by hand or with a net, and process them for sale or consumption.



Preparation of sea cucumbers for exports

As sea cucumbers autolyse after they are taken out of seawater, immediate processing of fresh sea cucumbers after the landing is vital in order to preserve them for consumption (Duan et al., 2010). Although methods are available to process sea cucumbers, more than 80% of world harvests are usually processed into beche-de-mer (Duan et al., 2007). In addition to beche-de-mer, salted, frozen and vacuum-packed sea cucumbers are also available in the markets (Purcell et al., 2012). Almost, all the edible sea cucumber species can be used to produce beche-de-mer and commonly used species include: *H. scabra* (sandfish), *H. spinifera* (brown sandfish), *H. fuscogilva* (white teatfish), *A. mauritiana* (spiny sea cucumber), *S. japonicus*, *P. californicus* (giant California sea cucumber), *T. ananas* (prickly redfish) and *Acaudina molpadioides* (Quyen, 2012). Processing of fresh sea cucumbers into beche-de-mer is done using a simple process of cleaning, boiling, salting, and drying. At the first stage, animals are cleaned in sea water to remove dried slime, sand and other extraneous particles. Then, the internal organs are removed by making a small slit either in the posterior end or mid ventral surface. Eviscerated sea cucumbers are boiled and stored in salt or buried in moist sand. The boiling time and the storage time in salt or sand vary with the species. However, processing steps may vary with species, the final product to be achieved and the market to which the product is being sold (Purcell et al., 2012).

Beche-de-mer is normally consumed as steamed, grilled or roasted forms and it is usually served with sauce. When preparing sea cucumber dishes from beche-de-mer, they are soaked and boiled until the product turns to the preferred consistency. Beche-de-mer is often braised with chicken, fish or tofu and combined with one or more varieties of mushroom in a thick sauce (Toral-Granda et al., 2008).

Quick-frozen sea cucumbers are another popular processed product of sea cucumbers. Major species used to produce quick frozen sea cucumbers include *H. scabra*, *C. [rondosa]*, *P. californicus*, *Cucumaria miniata* and *S.nasa* (Choo & Conand, 2015). When producing frozen sea cucumbers, salted individuals are soaked in water for 24 hours and mouthparts are removed. Then, they are boiled in water for 30 minutes, soaked in clean water and stored under refrigeration at -4°C for 24 hours. This process of boiling, soaking and refrigerating is continued every day until sea cucumbers gain five times weight of their initial salted weight. Then, these individuals are stored in a container filled with potable water. The container is covered with a lid and frozen in an instant freezer at -40°C . The sea cucumbers are transferred and vacuum packaging is done to obtain the quick-frozen sea cucumber products. These products are

normally consumed after thawing with hot water and cooking for 5 minutes (Zhang, 2015).

As soon as sea cucumbers are landed, they are graded into three categories: small, medium and large based on their body size. Either intermediate buyers or processors do this grading process based on their experiences. The graded sea cucumbers are cleaned using salt water to remove slime and sand particles. After grading and cleaning, evisceration is done in order to remove the internal organs of the animals. The evisceration is done by making a small cut (2.5–4.0 cm) at the posterior end of their body. However, in *S. chlaronatus* and *S.nasa* internal organs are removed by placing a small cut (2.0–2.5 cm) at their ventral body surface. The evisceration of sea cucumber species (*H. Juscogilva* and *H. nabilis*) is done by making a longitudinal slit along the midline of the dorsal body surface and in species like *H. spinifera*, internal organs are removed by pressing the abdomen without performing any cut (Figure 3.2). Occasionally, the evisceration of some low-value species (*H. vitiensis* and *H. atra*) are done on board the vessel to reduce the weight loaded and harvest more individuals. This activity is usually carried out by the boat operators while fishers are collecting sea cucumbers.

(Nishanthan,2019).Eviscerated individuals are boiled either using saline (87%) or freshwater(13%) and boiling time varies with species (Table 3.1). According to Nishanthan the highest boiling time was reported for *H. scabra* and *H. spini* (2413 min) followed by *T. anax* (166 min). The lowest boiling time was reported in *S. nasa* (6 ± 03) and this species is boiled before evisceration to reduce the high rate of postharvest losses of this species due to self-autolysis. Processors decided the boiling time based on their traditional knowledge and experience. As it is believed that the type and shape of the processing container has a significant impact on the appearance of the final product, majority of processors (87%) use rounded iron saucepans to get nice cylindrical shape products while others use cylindrical iron barrels. Firewood (93.3%) and gasoline (6.7%) are widely used as the power sources for boiling.