

Mozambique

**Mozambique
Preparatory Survey on BOP Business for
Cultivated Tilapia
English Summary**

February, 2017

Japan International Cooperation Agency(JICA)

A-ONE Co., Ltd.

OS
JR
17-020

1 - 1 Overview of the Preparatory Survey

(1) Background

(a) Key issues of people at BOP layer

The people who are said to be living at the Base of the Economic Pyramid (hereinafter, “BOP”) layer faces issues such as malnutrition, food safety, and high unemployment rate in the Republic of Mozambique (hereinafter, “Mozambique”).

➤ Malnutrition

Regarding malnutrition, 44% of people in Mozambique are in a state of chronic malnutrition, and 24% are in a state of acute malnutrition¹. In addition, the poverty rate in Mozambique is 54.7% in 2009² and it is estimated that more than half of the citizens are unable to earn necessary income to obtain calorie intake per person per day.

The graph of food price over the years are shown below.

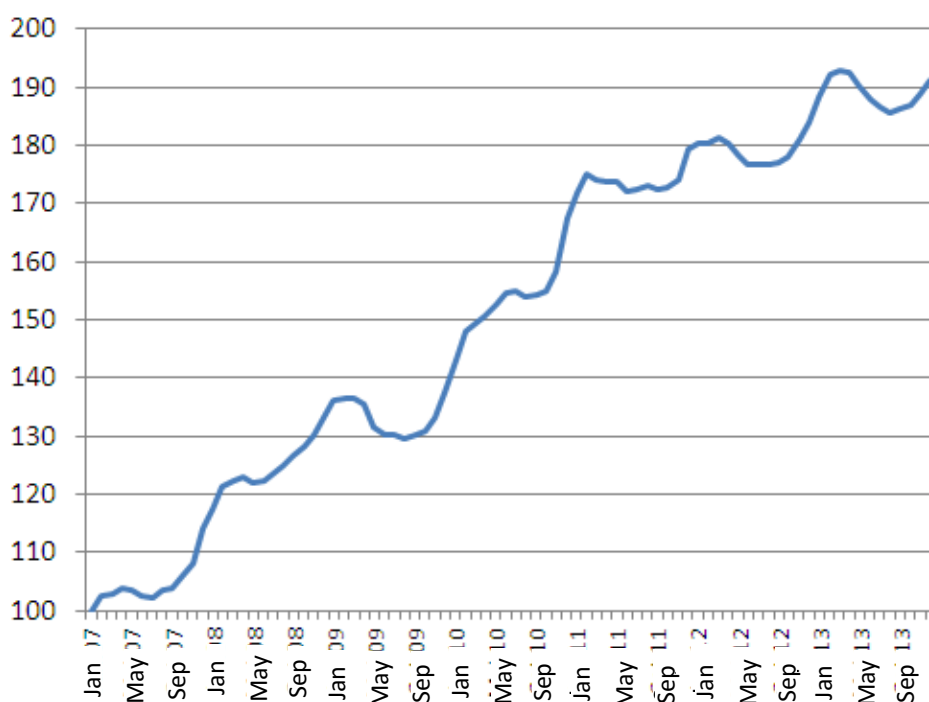


Figure 1 Food price over the years (2007 is set as 100)³

As shown in Figure 1, the food prices are rising significantly. Compared to the food prices in 2007,

¹ Interview with Dr. Isabel Andade from the International Potato Centre

² United Nations Development Program (UNDP) (2010)

³ MINAG Statistic, 2013

the food price in 2013 is about 1.9 times higher, hence, the dire state of malnutrition is worsening.

The table of the nationwide average intake ratio of animal protein is shown below.

Table 1 Intake Ratio of Animal Protein⁴

	Animal Protein				Vegetables	Oil
	Dried fish	Raw fish	Meat	Chicken		
Maputo city	14%	24%	51%	65%	88%	86%
Gaza province	15%	25%	26%	27%	88%	83%
Maputo province	12%	39%	48%	52%	88%	94%
Nationwide Average	53%	40%	35%	32%	75%	75%

As shown on Table 1 the nationwide average intake ratio of animal protein by families is 53% from dried fish, 40% from raw fish, 35% from meat (excluding chicken), and 32% from chicken. Thus, there is a wide concern about the shortage of intake of protein from animal protein and other basic food.

➤ Concern about Food safety

In Mozambique, locally produced freshwater fish are mostly sold on the streets. Since there is insufficient usage of ice and the fish are sold on the street under the hot weather, selling conditions are unsanitary and fish deteriorates quickly. Moreover, imported horse mackerel sold in the supermarkets are also preserved in bad conditions. Therefore, in Mozambique, many fish are sold below the food safety standards in Japan, yet locals and majority of people at the BOP layer have no other choices.



Figure 2 Spoiled freshwater fish (Tilapia)

⁴ MINAG Statistic, 2013



Figure 3 State of horse mackerel sold in Maputo City

➤ Unemployment rate

The unemployment rate in 2015 was about 14%, and it was especially high in the urban areas, such as the capital, Maputo, which has around 26% unemployment rate⁵. Furthermore, in Mozambique, the proportion of “salary earners” is 6.3%, because many are hired in informal sectors and living in an unstable employment situation⁶.

(b) Overview of the A-ONE’s business and Plans in Mozambique

A-ONE Co., Ltd (hereinafter, “A-ONE”) is a company that conducts fish procurement for sales. Since the establishment of its company, for around 45 years, A-ONE has had rich experience on handling food value chain from supply to sales of marine products. Moreover, at reasonable prices, A-ONE has established sanitary technique to handle freshwater fish from distribution to sales channel. In Mozambique, in May 2013, A-ONE set up a local subsidiary to supply and sell clam. Hence, it has adequate cold-chain, such as refrigerators and freezers facilities, and established management system.

A-ONE had mainly focused in export business to Japan but as Japanese market is predicted to shrink in the future. A-ONE aims to expand its business within Mozambique and target largest populations within Mozambique, which comprises people at BOP layer.

1 - 2 Aim of the Preparatory Survey

(1) Hypothesis of Business Model

A-ONE plans to cultivate Tilapia in Mozambique and targets the customers who are considered to be at the BOP layer in Mozambique. Tilapia is a type of fish that can be produced year-round, and its seedling production and cultivation could be conducted in a range from brackish water areas as well as freshwater areas. Moreover, Tilapia is a rich source of protein, it contains about 40 g protein per 200 g fillet, which provides 2/3 of 60 g of the daily protein intake required for an adult male.

⁵ Consultative Labor Commission, 2015

⁶ JETRO, 2016



Figure 4 Tilapia

A-ONE plans to obtain profits by selling cultivated fish and renting space for the fish farms to the independent fish farmers. Simultaneously, through business, firstly, A-ONE aims to provide a valuable protein source to the BOP layer, and secondly, provide new employment opportunities for the BOP layer in all of its value chains.

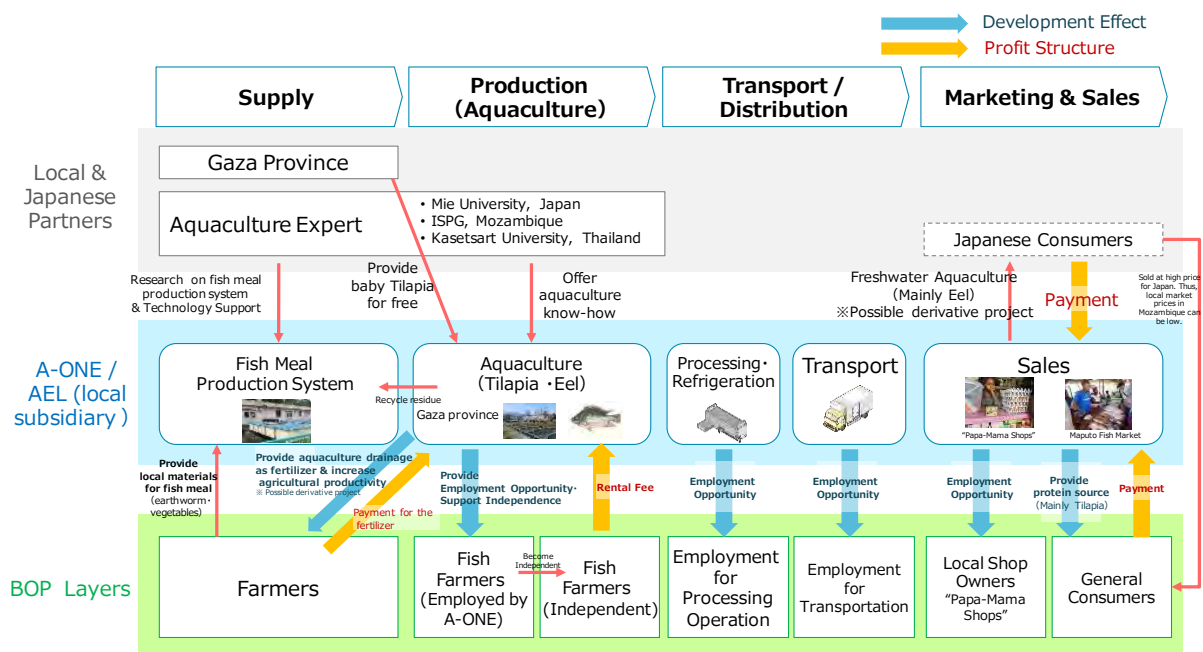


Figure 5 Business Model (Hypothesis)

(2) Aim of the Preparatory Survey

Through this Preparatory Survey, A-ONE aims to examine the hypothesis of its business model for Tilapia cultivation and sales profitability. This Preparatory Survey is vital for the preparation and assessment for its full-scale business in Mozambique.

Since this is Mozambique's first attempt to cultivate and sell Tilapia in large-scale, it aimed to answer the following six questions to assess the technical and commercial aspects in the Preparatory Survey.

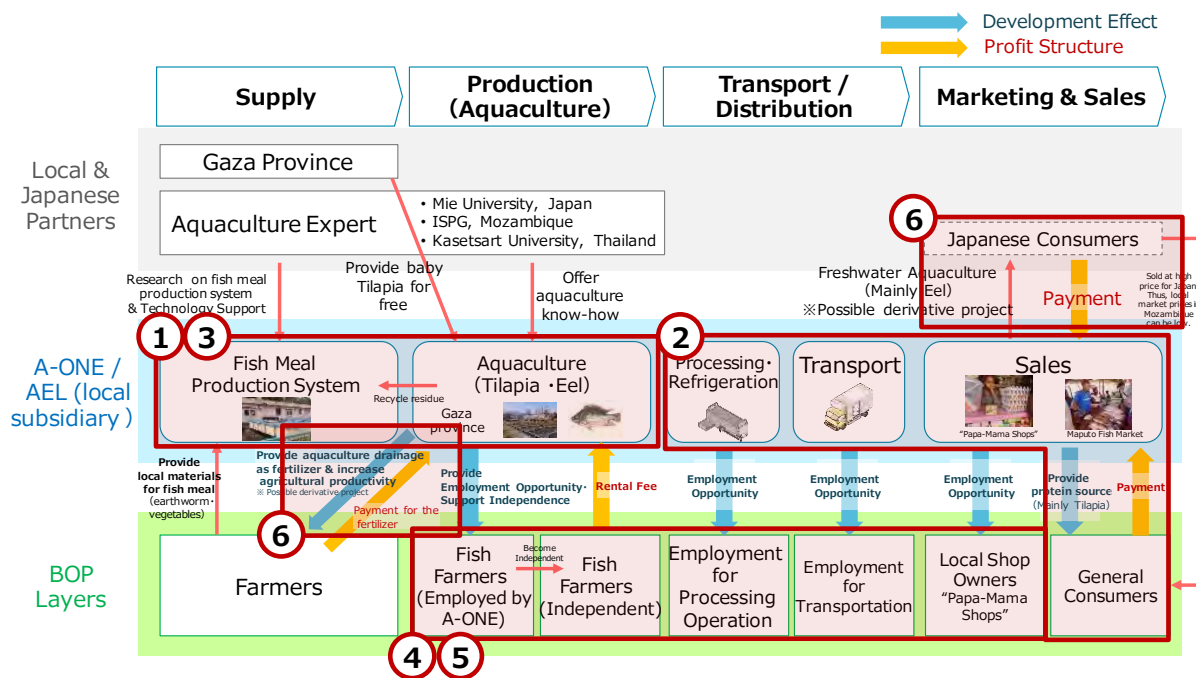


Figure 6 Aim of the Preparatory Survey

- ① Is it possible to gain profit in the large scale freshwater-aquaculture⁷ (hereinafter, “aquaculture”) business?
- ② Is there an existing distribution and sales channel for aquaculture business?
- ③ Is it feasible to set the price at the local price-level?
- ④ Is it possible to adequately conduct human resource development programs for employees at BOP layer?
- ⑤ Can A-ONE earn expected a level of cooperation from the employees at BOP layer, such as those engaged in the value chain from cultivation to sales?
- ⑥ Is it possible to gain profit for the derivative projects?

1 - 3 Research Topics and Methods

(1) Research Topics

In order to answer the six questions above, the research was designed and conducted as follows:

⁷ This paper refers the cultivation of fish in the pond and freshwater as “aquaculture”.

		Conducted Research	Mozambique Research	Responsibility
1 3 Business profitability in the large scale aquaculture business / Feasibility of low price setting	Basic research on Aquaculture	<ul style="list-style-type: none"> Environmental research for starting Aquaculture Assessment of equipment & facilities owned by research section of the counterpart Discuss collaborative research structure, schedule and topics (Clarify responsibility and tasks for Mozambique and Japan) 	1st Trip (2016.3) 2nd Trip (2016.4)	<ul style="list-style-type: none"> Mie University ISPG Thai experts
	Build collaborative research structure			
	Research development for localized Aquaculture Technique			
4 Feasibility of conducting HR development	HR development for Aquaculture Professionals	<ul style="list-style-type: none"> Review progress of collaborative research Assess and conduct HR development & dissemination programs for Aquaculture Professionals 	3rd to 8th trips (2016.7-2017.1) 5th & 6th Trips (2016.9-11)	
2 Assessment on existing distribution and sales channel for aquaculture business	Research business environment ※Including authorization	<ul style="list-style-type: none"> Regulations, law, authorization process in regards to Aquaculture business Market overview (needs assessment, competitors) Research eating habits of people at BOP layers in different segment ※research done through field work Thailand Tilapia was sold through trial sales. Information will be used to development Mozambique Tilapia Research if target market has existing distribution and sales channels 	1st Trip (2016.3) 2nd Trip (2016.4)	AEL Accenture
	Research living conditions of people at BOP layers			
	Trial sales to people at BOP layer			
	Assessment on basic infrastructure such as existing distribution & sales channels			
5 Assessment on cooperation level from BOP layer	Needs assessment through pilot sales	<ul style="list-style-type: none"> Conduct wider pilot sales using Mozambique Tilapia Provide a guide sales method to employees at BOP layer (Create manual if necessary) 	3rd Trip (2016.7) 4th Trip (2016.11)	
6 Business profitability of derivative projects	Assess profitability of derivative projects such as Aquaponics	<ul style="list-style-type: none"> Research local agricultural productivity, cost, and utilization situation of soil conditioner 	4th Trip (2016.11)	AEL Accenture

Figure 7 Research Topics

(2) Schedule for the Preparatory Survey

The Preparatory Survey was conducted according to the following schedule.

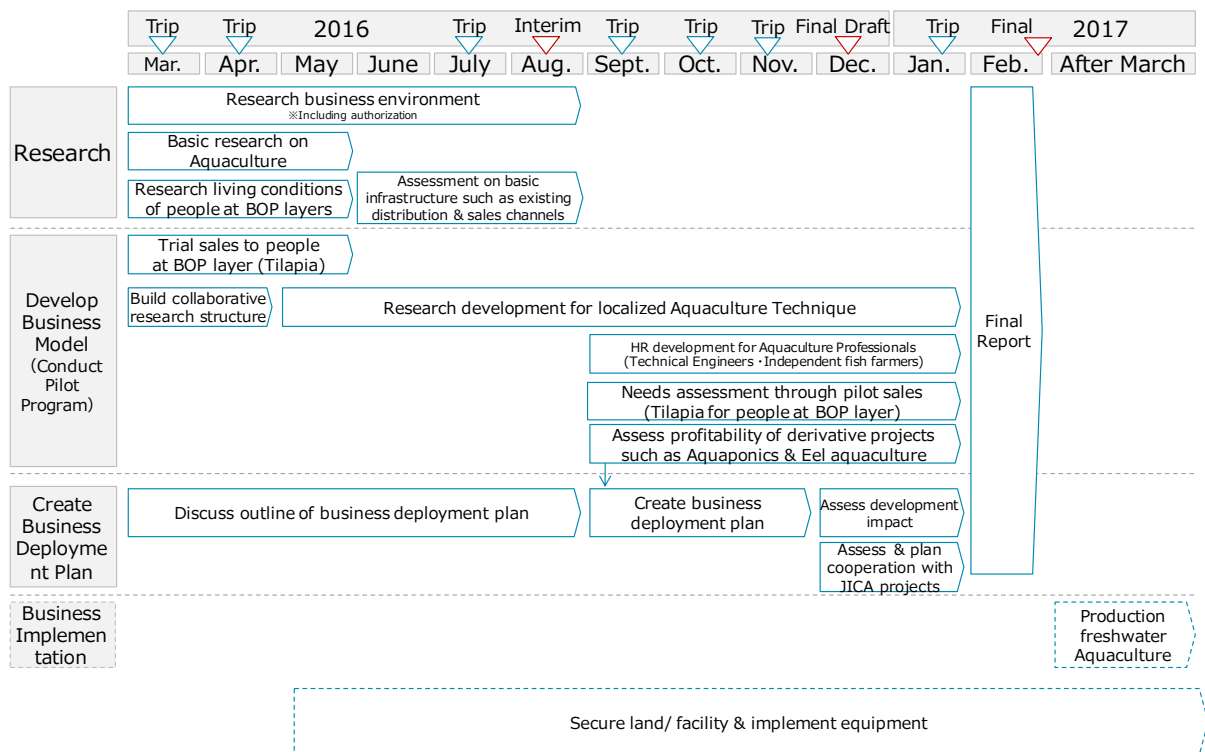


Figure 8 The Preparatory Survey Schedule

(3) Management Structure for the Preparatory Survey

A-ONE and AEL (local affiliate of A-ONE Mozambique) are the main organizations conducting the Preparatory Survey. There are also local and Japanese technical collaborators as well as external consultants involved in this Preparatory Survey.

The management structure is shown below.

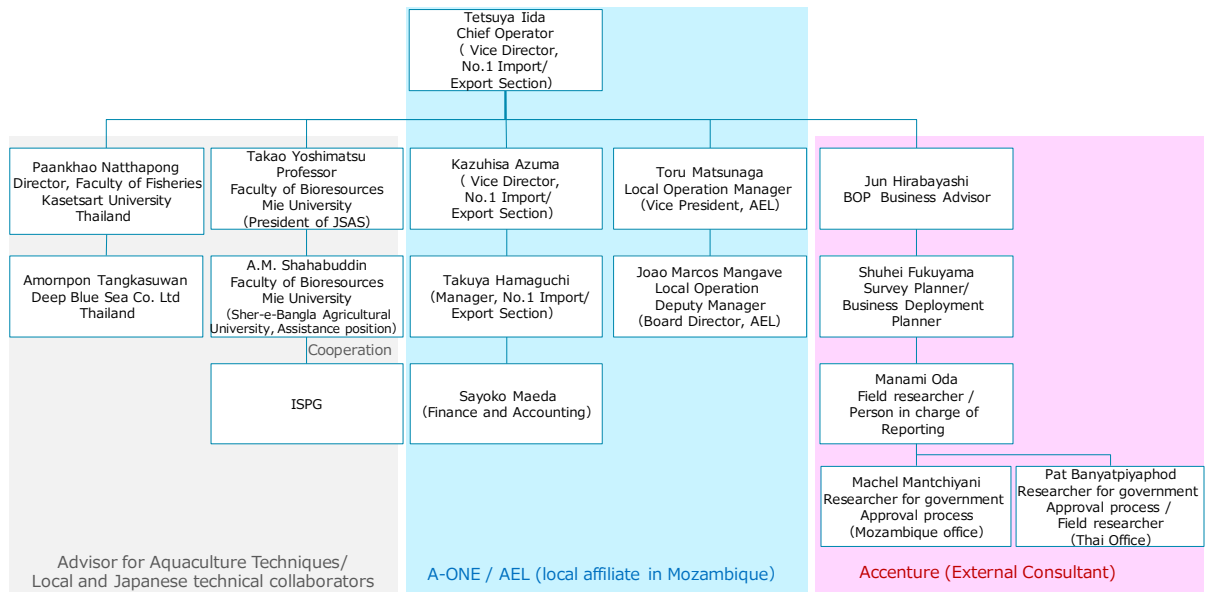


Figure 9 Management Structure

1 - 4 Locations of the Preparatory Survey

The Preparatory Survey was conducted in Gaza province, Maputo province, and the capital, Maputo city. These areas were selected for the following two reasons; Firstly, A-ONE already has processing factories in the Matola city and Maputo province, thus it will be advantageous for business development: Secondly, A-ONE has a provisional contract agreement with fish pond owners of Gaza state (HICEP: Chokwe irrigation public corporation).

1 - 5 The results and prospect of Business Deployment

(1) Business Model

The prospect of the business deployment through conducting the Preparatory Survey is shown below.

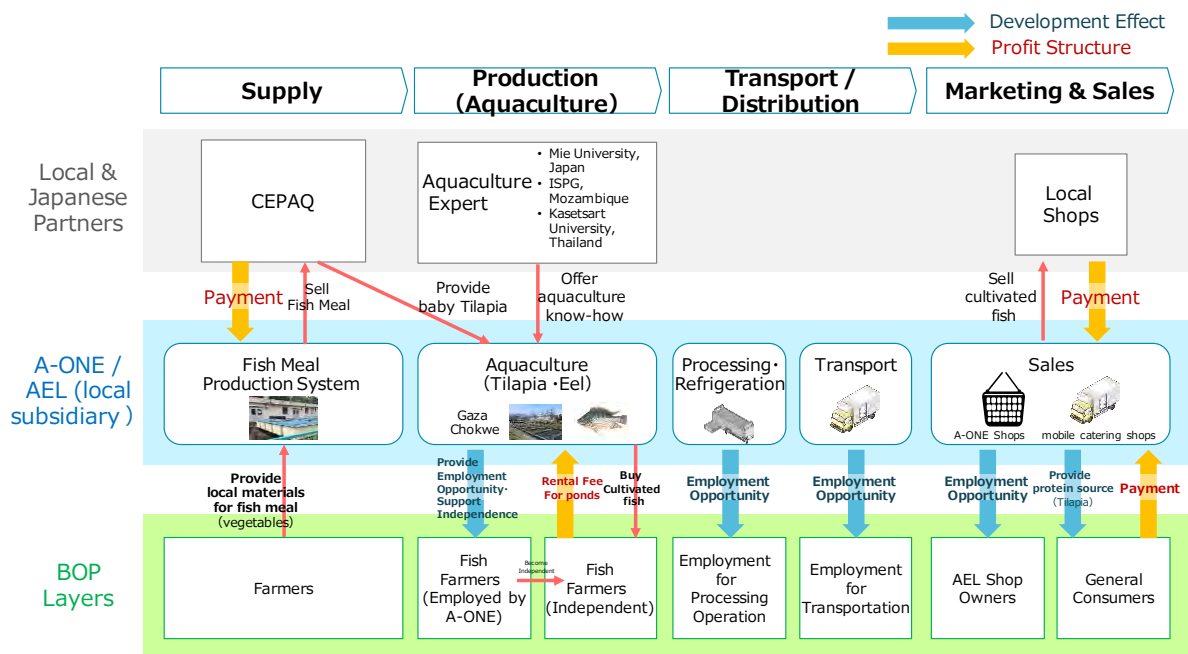


Figure 10 Business Model

Through the Preparatory Survey, it was concluded that most of the anticipated business plan is possible. A-ONE aims to obtain profits by selling cultivated fish and fish meal to the people at BOP layers and local shops. In addition, it aims to provide myriads of employment opportunities for the people at the BOP layer in all the phases, such as fish meal production phase, aquaculture phase, transportation and pre-processing phase, transportation phase and selling phase at the local market.

(2) Prospect of Business Deployment

Since there are no urgent factors hindering commercialization from the research conducted in the Preparatory Survey, A-ONE will proceed with commercialization in Mozambique. However, from the Preparatory Survey, in order to have a large-scale Tilapia production and sales at a profitable level, there are few factors that need to be looked at in depth. For example, it is necessary to research in depth regards to the fish meal production system that can produce profit for large-scale aquaculture, as well as the knowledge transfer of technology to local institutions for human resource development. Therefore, A-ONE is also considering the possibility of collaboration with ODA projects as well as commercialization.

The prospects of the current situation for the six questions asked to verify the business performance on technical and commercial aspects, are as shown in the figure below.

	Progress	Feasibility for business	Reasons
1 3 Business profitability in the large scale aquaculture business / Feasibility of low price setting	<ul style="list-style-type: none"> Conducted four feeding tests using fish-food made out of local products. 	Overall its probable but need further research	<ul style="list-style-type: none"> Confirmed "fish meal" created with local products contained enough protein. When comparing the Tilapia raised by locally made "fish-food" and South-African fish-food, the size and nutrition of both types of fish were relatively same. Need to develop its research for cheaper and better quality "fish-food".
4 Feasibility of conducting HR development	<ul style="list-style-type: none"> People who may become core members have applied to ABE Initiative. Considering collaboration with JICA projects and JICA scheme for knowledge transfer. 	Overall its probable but need further research	<ul style="list-style-type: none"> Two locals applied to the Mie-University exchange program under "ABE Initiative". Considering possible collaboration with JICA projects and JICA scheme in regards to knowledge transfer of technology/techniques to the local organization and fishermen.
2 Assessment on existing distribution and sales channel for aquaculture business	<ul style="list-style-type: none"> Conducted field research and trial sales using Thai Tilapia. Researched Maputo's existing distribution and sales channels. 	Overall its probable	<ul style="list-style-type: none"> Confirmed sufficient purchasing needs as the second fish replacing commonly bought fish (from Asia & Namibia), which is the only type that can be purchased cheaply and in large quantities in Mozambique. Confirmed adequate sales channels in the capital Maputo for planned production volume. Confirmed that BOP layer can purchase tilapia at assumed price.
5 Assessment on cooperation level from people at BOP layer	<ul style="list-style-type: none"> Involved local fish-farmers through hiring process or differentiated tasks from local common jobs. Decided sales methods and management styles. 	Overall its probable	<ul style="list-style-type: none"> Confirmed employment can be offered to the local people by the AEL fish-farm. In addition, confirmed that independent fishermen, who have their own fish pond in this program, can also provide employment. (In either case, it assumes the transfer of knowledge of aquaculture techniques, fertilizer, and feeding process) Hiring people at BOP layer is feasible since advanced technology and high education level is unnecessary for distribution, processing, logistics, and sales.
6 Business profitability of derivative projects	<ul style="list-style-type: none"> Assessed profitability of following derivative projects <ul style="list-style-type: none"> Selling fish-food for baby fish Eel aquafarming Aquaponics 	Partly probable	<ul style="list-style-type: none"> Since CEPAQ is concentrating on fostering baby fish fish, they are depending their bait procurement on external organizations. Thus, by creating bait that has more advantages including transportation costs, it is possible to conduct business. Currently we are conducting species assessment and several experiments on fully-grown eel. There is no custom to purchase soil conditioners for local agriculture farmers, thus, demand for Aquaponics is low.

Figure 11 The Prospect of commercialization at the present stage

1 - 6 Remaining issues and countermeasures for commercialization

(1) Large Scale Aquaculture

The main challenge to carry out the large scale aquaculture is the development of inexpensive fish meal using local materials. Through the Preparatory Survey, A-ONE confirmed the possibility of utilizing local materials such as cassava and moringa for fish meal; yet, further improvement is necessary in terms of price and quality.

In order to overcome the above challenge, A-ONE is planning to continue its development and research on fish meal in next three years. A-ONE would like to collaborate with the JICA's ODA projects, thus, planning to apply to "Grassroots Technical Cooperation Project" and cooperate with the Centro de Pesquisa em Aquacultura (hereinafter, "CEPAQ") and the Instituto Superior Politecnico de Gaza (hereinafter, "ISPG") to develop inexpensive but high-quality fish meal using local materials. In addition, in order to secure local materials, A-ONE is considering to hire local farmers as contract farmers.

(2) Human resources development

The lack of human resources that meets the expected skill levels is one of the challenges. Specialized skills are expected for researchers and farmers (both internal fish farmers and external fish farmers that A-ONE will buy Tilapia from). Currently, there are two candidates that aim to go to Mie University as exchange students, who also have a high potential to contribute to the future aquaculture technology development. They are currently applying for the Master's Degree and Internship Program of African Business Education Initiative for Youth (hereinafter, "ABE Initiative"). If they get selected

to study at Mie University under the ABE Initiative, after they complete their exchange program, they plan to join this project and become the core members to develop the business and educate future human resources.

On the other hand, even if they do not get selected, it has been agreed to utilize the existing cooperation between the Faculty of Bio resources in Mie University and ISPG. These universities will change the cooperation style from the “Preparatory Survey partnership” to “research exchange and student exchange partnership.”

In addition, in order to develop the local human resources for aquaculture, A-ONE is considering collaborating with the JICA schemes such as “JICA Grassroots Technical Cooperation Project” and “Japan Overseas Cooperation Volunteers” program.

(3) Derivative projects

In order to expand the business and increase positive effects on the people at BOP layer, A-ONE is considering three derived projects; selling fish meal, eel aquafarming, and aquaponics. In all these project need development and careful assessment.

Firstly, A-ONE plans to apply its current research results to production of fish meal for baby fish, and sales of fish meals to CEPAQ and local fish farmers. By using locally produced fish meal to not only fully-grown fish but also to baby fish, it can reduce its production cost and sell more fish meal. However, like the development of fish meal for fully-grown fish, further research is necessary. It aims to finish development of fish meal by 2019.

Secondly, the eel aquafarming for export is currently under consideration. If the experience of Tilapia aquafarming is useful for producing high value fish, it will be able to provide more employment opportunities as well as increase income for employees. However, during the Preparatory Survey, it could not find adequate breed for Japanese market. Thus, it hopes to continue researching and make its decision on feasibility for business deployment by 2018.

Thirdly, aquaponics is considered as one of derivative projects. Aquaponics is circular agriculture system that uses ponds and fish tanks. In this business model, it aims to provide water from aquaculture to farms nearby. Farms also includes those areas which originally used as ponds for aquafarming. By using aquaponics, it is possible to produce safer farmed goods since it can decrease usage of pesticides and chemical fertilizers. Currently, the details are yet to be decided, but ISPG stated that for “banana and tomato, ISPG would like to use aquaponics.” Therefore, A-ONE will assess using the aquaponics starting with these farmed goods in future. Having said that, application of aquaponics needs further research. By 2018, it aims to decide its decision on feasibility of business deployment of aquaponics.

(4) Schedule for business deployment

The schedule for business deployment is shown below.

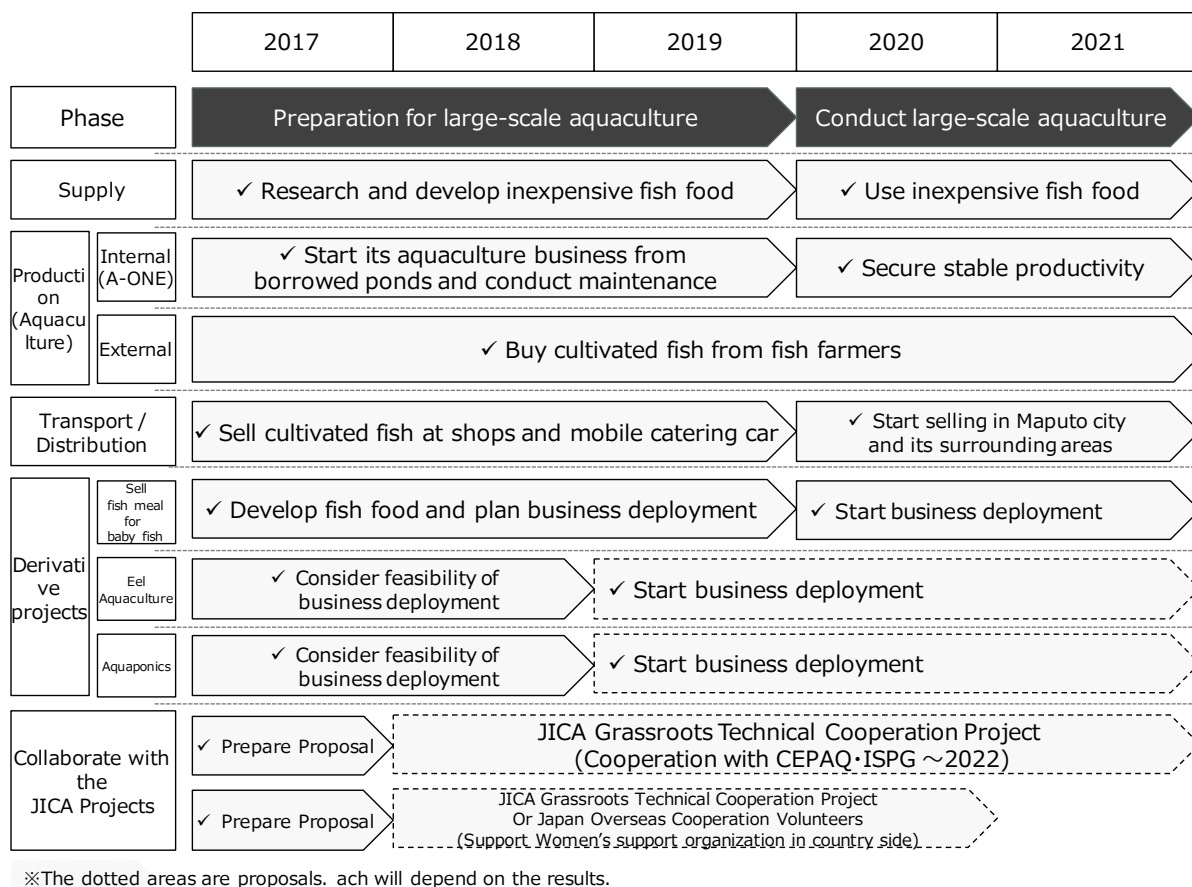


Figure 12 Schedule from 2017 to 2021

From 2017 to 2019 will be the preparation phase to start the large-scale aquaculture from 2020. Until 2019, A-ONE aims to enhance and develop the local research technology and methods on aquaculture, as well as local human resources skills. In addition, A-ONE aims to produce 260 tons of Tilapia per year by expanding its own aquaculture ponds and gradually increase the production volume from 2020 onwards. Prior to that, in 2019 A-ONE aims to prepare for large scale sales channels by setting up stores in Maputo City.

In regards to the derivative projects, for fish meals for baby fish, it aims to finish developing by 2019, and start its business from 2020. As for eel aquafarming and aquaponics, it will consider the feasibility for business deployment by 2018.

Moreover, in order to enhance its business, A-ONE is also considering the possibility to cooperate with other JICA scheme projects such as “Grassroots Technical Cooperation Project” and “Japan Overseas Cooperation Volunteers” programs.

1 - 7 Development effect

Throughout the project, A-ONE aims to work on improving nutritional deficiency, food safety, national food sufficiency levels, unemployment, and reduce the salinity level in agricultural land.

(1) Improve nutritional deficiency

It can improve nutritional deficiency of the people at BOP layer by selling Tilapia, which contains high quality animal protein, at an affordable price.

(2) Improve food safety

It can improve the safe food choices for the people at BOP layer by providing quality control including the ways in which fish are sold in the whole-sale markets.

(3) Improve food self-sufficiency rate

By producing and selling locally produced Tilapia, Mozambique will decrease dependency on imported horse mackerel.

(4) Improve unemployment situation

It can create new employment in each value chain from cultivation, processing, transportation and sales. For the A-ONE local employees, it can provide stable and decent wages, which is more than the minimum wage. It will also contribute to improving the income of local fish farmers by transcending the know-how and techniques to improve aquaculture productivity.

(5) Soften salinity in agricultural land

By using dry land that contains salinity for the aquaculture pond, A-ONE will alleviate salt damage and gradually reduce the salinity. The land will be restored to capable levels for agriculture after 10 years. In the future, it aims to be a model case and expand these methods to other regions and countries around the world.