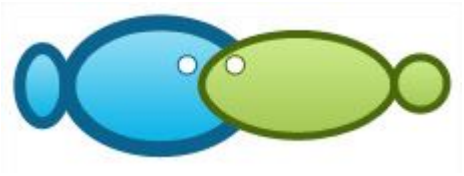

Economic and financial feasibility of abalone culture development in Hulaliu village, District of Maluku Tengah, Maluku Province

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Abstract. The aims of this research were to analyze the economic and financial feasibility, business scale, and development pattern of abalone culture in Hulaliu village, District of Maluku Tengah, Maluku Province, Indonesia. Economic feasibility was developed based on four variables considered as "constrain", *i.e.*: the availability of raw materials/natural resources, the availability of labor, market opportunities, and people's interest. Financial feasibility was based on the venture capital capability, total cost, income, profit, and investment criteria including Benefit Cost Ratio (B/C ratio), Return of Investment (ROI), and Payback Period of Capital (PPC). Analysis of business scale and development pattern was conducted based on the real condition. The result shows that abalone culture using net floating cage with investment of Rp. 25.420.000, and total cost of Rp. 22.200.000 (total investment of Rp. 47.620.000) obtained income of Rp. 45.000.000, and profit of Rp. 22.800.000. By the result, it provided the values of B/C Ratio, ROI, and PPC, respectively, 2.03, 47.8%, and 25 months. The pattern of abalone business was using what has been grown in community, however it still considered to develop the partnership system between the farmers and the government by completing the rights and the liabilities of each part.
Key Words: economic feasibility, financial feasibility, business scale, development pattern.

Introduction. Abalone is a gastropod which has high economic value and being a profitable income source to fishers in Indonesia caused by its high price and simple processing. The other benefits of this commodity are its high nutrition value and the safety of consuming it, because abalone do not consume the red tide planktons which produced PSP toxins (Effendy et al 2005; Sarita & Effendy 2005). Abalone *Haliotis squamata* has some comparative benefits compared with other species of abalone such as *H. asinina*, like: (a) higher price; (b) better in performance; (c) higher demands (Fahri 2009).

The flesh of abalone has high nutrition value with composition of protein (71.99%), lipid (3.2%), crude fiber (5.6%), ash (11.11%), and water (0.6%). While the shell has estetic and economic value which have been used as jewelry and trinkets, button made, and other kinds of handicraft (Setiawati et al 1995).

The high market demand and the increasing price of abalone lead to the overexploitation of abalone stock in nature. In general, in many countries in South East Asia, particularly Indonesia, Philippine, Thailand, and Malaysia, abalone stock in nature has been in critical level which indicated with harder to find abalone in its habitat. Beside the overexploitation, the stock of abalone becomes decreasing also caused by the degradation of abalone habitat *i.e.* coral reef ecosystem. To solve this problem, the alternative of abalone culture has to be developed (Gordon & Cook 2004; Troell et al 2006; ECDC 2008; Cloete 2009; Fermin & Encena 2009).

The global production of abalone reached 22.600 metric tones (including poaching of 3700 metric tones) worldwide in 2002. Of this, over 8600 metric tones were farmed and the total value of the production was estimated as approximately US$ 0.8 billion. Gordon & Cook (2004) reported that China is the largest producer in the world with over 300 farms and a total production of approximately 4500 metric tones. While South Africa

has become the largest abalone producer outside Asia (FAO 2004). The worldwide over-exploitation of wild abalone stocks by poaching and high market prices have been the main drivers for its cultivation (Troell et al 2006).

Abalone culture has also been developed in some provinces in Indonesia such as Bali, Nusa Tenggara Barat, Sulawesi Selatan, and Sulawesi Tenggara (Fermin & Encena 2009). Maluku has potency of abalone resource in nature, however this commodity has not been utilized optimally due to the lack of information on abalone economic value. The abalone culture development has also been conducted yet due to the lack of information about the culture technology system and the benefit of culturing abalone. In Hulaliu village, Central Maluku Regency, culture of abalone has been developed as a pilot project of specific program. It is expected to be expanded as a business to community which has aim to increase community's economic level. Before the abalone culture is developed as a business, it is important to know the feasibility of the business which will be analyzed with some factors such as economic feasibility, financial feasibility, the business scale suited to the people, and the pattern of development. Some reviews has been conducted in recent years to observe the economic feasibility of some fisheries products (particularly aquaculture products, such as oyster, scallop, tilapia, sea bass or general aquaculture), related to their production or management (Kaiser et al 2011; Di Trapani et al 2014; Nasr-Allah et al 2014; Valderrama et al 2016; Chen et al 2017). Thus, the aim of this research is to analyze the economic feasibility and financial feasibility, business scale, and development pattern of abalone culture in Hulaliu village, District of Maluku Tengah, Maluku Province, Indonesia.

Material and Method. The research was held in Hulaliu village, District of Maluku Tengah, in January 2016, and based on the culture activity which has been conducted so far. The methods used to analyze the economic and financial feasibility are explained as following.

Economic feasibility. The economic feasibility factor is determined by consideration of four variables as "constrain" *i.e.*: the availability of raw materials/natural resources, the availability of labor, market opportunities, and people's interest. The valuation of variables is based on system of "Rating Scale" which means providing score to each of variables:

- the availability of raw materials/natural resources: includes of materials, tools, and feeds. There are four scores which are described as following: score 4 (all materials are available in location), score 3 (small numbers of materials has to be brought from outside of location), score 2 (large number of materials has to be brought from outside of the location), score 1 (all materials has to be brought from outside of the location);
- the availability of labor: score 4 (large number of labor), score 3 (enough number of labor), score 2 (small number of labor), score 1 (labor unavailable);
- the market opportunities: score 4 (high availability of market opportunities), score 3 (market opportunities are available), score 2 (less availability of market opportunities), score 1 (market unavailable);
- people's interest: score 4 (very high), score 3 (high), score 2 (low), score 1 (very low).

The rank of each business that is going to be developed is highly determined by total scores and average scores. The limit scores to a business feasible to be developed are *i.e.*: maximum average score 10, and minimum average score 2.5 (COREMAP II 2009).

The economic analysis that related to business feasibility could also be determined with BCR Analysis (Benefit Cost Ratio) (Yasin 2013; Mafut 2017), and R/C Analysis (Revenue Cost Ratio) (Nuswantara et al 2016). BCR is a comparison between present value of benefit to recent value of cost, while R/C is a comparison between income and cost.

Financial feasibility. Financial feasibility is determined using several formulae according to COREMAP II (2009) as following:

1. Total Investment = Fixed Investment + Operational Investment;
2. Total Cost = Fixed Cost + Variable Cost;
3. Gross Income = Total Production x Price;
4. Net Income = Gross Income – Total Cost;
5. Criteria of Investment:
   a. Benefit Cost Ratio (BCR) = Gross Income/Total Cost (Criteria: BCR > 1, the business is feasible to be developed),
   b. Efficiency of investment utilization determined with *Return of Investment* (ROI): ROI = Net Income/Total Investment x 100% (Criteria: the higher the ROI value the more efficient the investment utilization),
   c. Length of time of investment payback determined with *Payback Period of Capital* (PPC): PPC = Total Investment/Net Income x production period (month or year) (Criteria: the lower the PPC value the better the business).

Determination of technology, business scale, and business development pattern. Technology, business scale, and business development pattern are determined by references and experiences study at other places with considering the real condition in location of business.

Result and Discussion

Economic feasibility. The valuation of variables based on system of "Rating Scale" provided results as presented in Table 1.

Table 1

The result of economic feasibility valuation of abalone culture development in Hulaiu village

No	*Variable*	*Score*
1	The availability of raw mateials	4
2	The availability of labor	3
3	Market opportunities	4
4	People's interest	3
	Total	14

Table 1 describes that abalone culture development using net floating cage in Hulaliu Village has some conveniences related to acquire brood stocks and seeds, and live feeds for feeding. Those variables are found abundantly in Hulaliu Village. The labors are available in enough number to develop abalone culture either men with married status or single men with no job. However, the available labors have no skills and knowledge in abalone culture, the technically training and learning are able to be provided. The market opportunity for abalone product is very prospective due to the high price of abalone. It is causing the high interest of people. The total value of variables is 14. The limit scores to a business feasible to be developed are *i.e.* maximum average score 10, and minimum average score 2.5. Thus it can be suggested that abalone culture in Hulaliu Village is feasible to be developed.

Financial feasibility. The financial feasibility analysis to abalone culture is based on several assumptions such as following:

- size of net floating cage: 3 x 3 x 3 m; numbers: 3 units;
- numbers of brood stock: 800 individuals;
- survival rate: 75-80%;
- weight of feed provided in 5 days: 25% of body weight;
- total production: 75 kg;
- durability of materials is for 3 times production.

Total investment needed is Rp. 25.420.000 as presented in Table 2 which consisted of some items *i.e.*: (1) net floating cage, (2) concrete tank for spawning vessel, (3)

containers for hatching process, (4) design of recirculation system, and (5) rent tools for water quality management. Total cost consists of variable and fixed cost which totalling Rp. 22.200.000. It includes seeds, feed, workers, and depreciation cost. Thus the venture capital needed is at least Rp. 47.620.000. Total income for selling 75 kg of abalone is 45.000.000 with selling price of Rp. 600.000 per kg.

The economic and financial feasibility of abalone culture development are measured by some variables such as following. Net profit that can be gained is Rp. 22.800.000. The BCR (Benefit Cost Ratio) valued 2.03 (BCR > 1) which means abalone culture is feasible to be developed. The efficiency of capital utilization is measured by ROI (Return of Investment) that valued 47.8%. The bigger the ROI, the more efficient the capital utilization. The value of PPC (Payback Period of Capital) is 25 months. The smaller the PPC, the better the business.

Table 2

The details of investment requirement, operational costs, and income reckon of abalone culture in Hulaliu

Investment					
No.	Purpose	Unit	Quantity	Unit price (Rp.)	Price
1.	Net floating cage	Packet	1	14.500.000	14.500.000
2.	Rearing media	Packet	1	2.720.000	2.720.000
3.	Hatching media	Packet	1	6.750.000	6.750.000
4.	Water circulation system designing	Packet	1	300.000	300.000
5.	Water quality measurement (rent)	Packet	1		2.800.000
		Total			25.420.000
Operational costs					
No.	Purpose	Unit	Quantity	Unit price (Rp.)	Price
1.	Seeds	Individual	800	20.000	16.000.000
2.	Feeds	Kg	80	15.000	1.200.000
3.	Worker	Person	1	500.000	4.000.000
4.	Depreciation				1.000.000
		Total			22.200.000
Income					
No.	Justification	Unit	Quantity	Unit price (Rp.)	Price
1.	Selling	Kg	75	600.000	45.000.000
		Income			45.000.000

Determination of technology, business scale, and business development pattern. The technology in abalone culture is related with the method used in rearing abalone, feeding process, and hatching process. Rearing process requires particular media from modified basket and pipe that function as shelter and attachment media. The media are placed on 3 units of net floating cage sized 3m x 3m x 3m. The broodstock of abalone is fed with seaweeds (*Ulva* sp. and *Gracillaria* sp.). The frequency of feeding is once in five days. The hygiene and freshness of seaweeds are also noticed at feeding process. It is held to avoid decomposing process of withered seaweeds that can turn into toxic for abalone. Hatching process requires facilities such as hatchery, fibre tank, concrete tank, etc.

The descriptions of those items of hatching process facilities are as following:

- net floating cage: the main rearing media is 3 units of net floating cage sized 3m x 3m x 3m (the materials used to construct are attached). Net floating cage is completed with modified basket and pipe;

- hatchery: is sized 6m x 7m. It is the place for put tanks and aquariums, and being the place the hatching process is taken place. The hatchery is semi covered designed;

- fibre tanks: the fibre tanks are constructed with size of 120 cm x 120 cm x 120 cm, amounted 4 units. They are used for egg hatching and larva rearing media;

- concrete tanks: the concrete tanks are constructed with size of 2m x 1.2m x 1m, amounted 3 units. They are used for larva rearing media;

- aquariums: two kinds of size of aquariums are constructed, which functioned as media to prepare gonad ripened broodstock. The first is sized 30cm x 20cm x 20cm and the second is sized 60cm x 40cm x 40cm (amounted 4 units);

- other facilities: besides those facilities mentioned above, other facilities needed are water tanks, electricity, air blower, and water pump.

The analysis of financial feasibility of abalone culture using net floating cage shows that the business has provided high profit by using 3 units of net floating cage, 800 seeds, and 6-8 months lenght of rearing. Net profit can be gained with this condition amounted Rp. 22.800.000 or Rp. 2.850.000.

Development pattern is better increasing the pattern that has already be in community by considering strength and weakness of the pattern. Developing and applying the new pattern to replace the one that has already been in community, shall occur new problem as a result of disorder of the intense old pattern. In applying a new system, it needs adaptation from every stake holders. Thus, the pattern developed in Hulaliu is based on the culture utilized so far. Increasing partnership pattern among farmer, entrepreneur, and government is required. It is essentially purposed to align the roles of the farmer and the entrepreneur to facilitate the same need and transparency of both parts. To apply the partnership system, it is necessary to arrange the rights and liabilities of each part involved in developing the pattern. The rights and liabilities are presented in Table 3.

Table 3

The rights and the liabilities of farmer, entrepreneur, and government in developing partnership system of abalone culture business

Institution	*The rights*	*The liabilities*
Farmer	1. Acquiring the technical coaching and traineeship; 2. Acquiring the properly selling price which determined by dealing with the entrepreneur; 3. Acquiring the insurance of product marketing; 4. Acquiring the loan for venture capital from entrepreneur.	1. Providing culture location; 2. Joining up in farmer group; 3. Maintaining the cultivation and postharvest process according to technical guideline to achieve high quality product; 4. Responsible to selling the product to entrepreneur as capital provider.
Entrepreneur	1. Acquiring the insurance from farmer related to product availability; 2. Acquiring the insurance of high quality product; 3. Acquiring the properly price based on the dealing.	1. Providing the loan of venture capital for farmers; 2. Facilitating farmer with some items of production means (such as seeds, net floating cage, feeds, etc.); 3. Monitoring the process of rearing, harvesting and postharvest processing; 4. Buying the product from farmer.
Government		1. Facilitating the cooperation between entrepreneur and farmer; 2. Formulate a regulation to cover the cooperation; 3. Monitoring the implementation of regulation; 4. Giving punishment to the part who does not obey the regulation; 5. Facilitating capital strengthening to entrepreneur; 6. Providing technical traineeship in relation to cultivation and harvest processing; 7. Monitoring and developing the process of rearing, harvesting and postharvest processing.

In Indonesia, blue economy (BE) concept is developed nowadays to change the paradigm of land-base exploitation and to gain the aim of being a maritime state. Then, aquaculture is being one of sectors that is used to achieve this purpose, which has to be augmented with policy frame of maritime and fishery, including the availability of prospective aquaculture technology, increasing the capability of human resources, socialization of BE conception, and application of BE concept in aquaculture field. The entire approaches are used to enhance economic growth and equalize balancing development through diversifications concept which leads to products diversity, for instance, the hybrid and cross breeding technology (De la Cruz & Gallardo-Escarate 2011; Setyabudi et al 2012; Sihombing 2015), and which however still conserves the environment from destruction (Radiarta et al 2015).

Conclusions. Based on analysis of some factors, it can be concluded that abalone culture using net floating cage is feasible economically and financially, with net income of Rp. 2.850.000 per month. The abalone culture using net floating cage obtained income of Rp. 45.000.000, and profit of Rp. 22.800.000. The values of B/C ratio, ROI, and PPC were 2.03, 47.8%, and 25 months, respectively. The business development pattern was using the pattern that had grown in community, and could be considered to develop the partnership system between the farmers and government by noticed the rights and the liabilities each part had to complete.

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