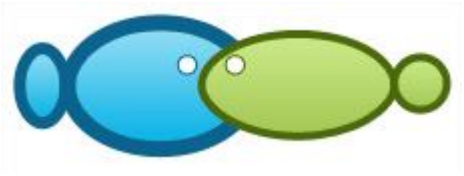

Key actors in Indonesia's sustainable mariculture enterprises: the power and influence of actors in the case of mariculture in Lampung and Bali

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Abstract. Based on the actors' consensus, the goals of sustainable mariculture can be divided into three categories: economic, social, and ecological. The actors have mapped the 19 actors involved based on their power and influence into three groups: (1) there are seven actors (MMAF, Provincial Government, Regency Government, fish farmers, hatchery farmers, middleman, and bank) who act as key players. This group of actors can be referred to as primary stakeholders; (2) eight actors (feed seller, trash fish seller, grouper farmers association, NGO, local community, input supplier, exporter, and researcher) act as subjects. This group of actors can be referred to as secondary stakeholders. Secondary stakeholders explicitly act as accelerators in achieving the goals of sustainable mariculture development. Secondary stakeholders, on the other hand, can also become obstacles to achieving goals, with the condition when these stakeholders do not have a complete understanding and information regarding the intended goals; (3) there are four actors (labor, hotel/restaurant consumers, household consumers, and cooperatives) who act as spectators. This group of actors can be referred to as tertiary stakeholders. Later we will discuss the role of each actor and its relation to objectives. As well as its role in achieving goals and its influence on other actors.
Key Words: actors, mariculture, power, relationship, sustainable.

Introduction. Aquaculture is the world's fastest expanding animal food-producing industry, accounting for 47% of the world's food fish supply in 2010. Between the early 1950s and 2010, aquaculture increased from less than one million tonnes to 60 million tonnes (amounting to USD 119 billion). Between 1980 and 2010, per capita farmed fish consumption expanded by 7.1% per year (from 1.1 kg to 8.7 kg), while the global population increased by 1.5% per year (FAO 2012). The fast rise of aquaculture is often called the "blue revolution," and the sector is now positioned to supplant capture fisheries as a global source of edible fish. Asia dominates worldwide aquaculture, accounting for 89% of total production in 2010, China accounts for the vast majority, with Indonesia coming in second, and Indonesia is the largest, particularly in Southeast Asia (FAO 2012).

In Southeast Asia, total fisheries production includes output from both aquaculture and the capture fisheries and more than tripled from 1980 to 2006. The capture fisheries remain the primary source of fish production, but a growing food source for fish comes from aquaculture. From 10% of total fisheries production in Southeast Asia in 1980, aquaculture's share increased to 17% in 2000 and 27% in 2006. By 2006, therefore, more than a quarter of the total production of food fish came from aquaculture (Hishamunda et al 2009). Indonesia is an archipelagic country in Southeast Asia with the second-longest coastline in the world, which is 108.00 km and 2/3 of its territory is territorial waters estimated to reach 6,400,000 km^2 (BIG 2018). As the world's largest maritime and archipelagic country, Indonesia offers enormous and diverse marine and

fisheries development potential. The potential for growing coastal and marine-based economic activity as a driving factor for the economy in the future is critical. The marine sector's economic activities are divided into seven categories: (1) sea transportation; (2) maritime industry; (3) fisheries; (4) marine tourism; (5) energy and mineral resources; (6) marine structures; and (7) marine services (Dahuri 2003; Kusumastanto 2003; Bappenas 2015; Wahyudin 2016). The future contribution of the fisheries industry to the growth of the marine economy will be highly strategic; thus, the output must be maximized and enhanced.

The role of the fisheries sector in the Indonesian economy has been growing. In Indonesia's economic structure, the fisheries sector is divided into capture fisheries and aquaculture (MMAF 2018). The future development of the capture fisheries sub-sector will be restricted by stock stagnation and decreased fish production volume in recent times, both at the global and national levels. The restricted potential to capture fisheries resources is both a challenge and an opportunity for national aquaculture expansion, as the potential utilization rate remains relatively low in comparison to the overall potential area of aquaculture (Zulkarnain et al 2014). From an economic and social standpoint, aquaculture is a sub-sector with the potential and strategic function of boosting the national economy, social welfare, and national food security. The aquaculture production potential in Indonesia is estimated to be 100 million tons per year, with a production value of USD 251 billion (Dahuri 2018). According to Philips et al (2015), if Indonesia's export-oriented and domestic-oriented production increase plans are executed effectively and sustainably, aquaculture development will produce 15 million employments by 2030. Within sustainable development, the aquaculture sector plays a critical role in achieving the sustainable development goals (SDGs). According to FAO (2017), aquaculture is relevant to the achievement of the SDGs, particularly in realizing national food security (goal 1), driving the economy to improve farmers welfare and job creation (goal 4), and ensuring fish supply availability through increased production of finfish. Environmental and sustainable management (target 12) and management of marine resources in a sustainable manner (goal 14) with particular targets focused on small scale fisheries in developing countries to make an important contribution to nutrition, food security, sustainable livelihoods, and poverty alleviation.

Mariculture development in Indonesia, on the other hand, cannot be separated from existing issues and challenges, particularly in terms of how this mariculture may contribute significantly to the community even while remaining sustainable. Mariculture issues and challenges include socioeconomic, regulatory, environmental, and policy issues, climate change and actor engagement (Hishamunda et al 2009; Yu & Yin 2019; Yu et al 2020). Regulation, policies (political will), and actor engagement in mariculture are exciting topics to explore in the development of mariculture in Indonesia. According to the aquaculture laws and legislation in Indonesia, mariculture can be practised with specified organizational scale constraints, specific locations, and regulated distribution. In addition, the consequences of every mariculture regulation would decide who plays what role, who benefits from the existing system, and who has control over it. One of the most significant parts of achieving sustainable development, including the growth of mariculture, is the actor's role. Actors are critical components since they decide how sustainability goals are met and the indicators that form the basis for sustainability. Bryant & Bousbaine (2014), and Zahradnik et al (2014) have all examined the importance of players in sustainable development in detail. "Actor-factor interaction" refers to the interaction between actors and sustainability indicators or variables, the outcome of sustainability will be determined by the interaction of the two.

The existence of potential economic benefits and the large number of stakeholders engaged in mariculture management can cause the issue in terms of conflicts of interest that can threaten mariculture's sustainability, so it is necessary to have a management strategy that supports mariculture's sustainability so that it remains sustainable and provides economic benefits to the community while also increasing collaboration between stakeholders. The growing popularity of actor analysis reflects an increasing recognition of how the characteristics of stakeholders-individuals, groups, and organizations influence decision-making processes (Brugha & Varvasovszky 2000). According to Kivits (2011),

actor analysis is critical to understand and assess the impact of changes in a management system; and as a way to identify and assess the interests of these key actors. This study aimed to analyze the roles, interests, and influences of the actors as material for formulating a sustainable mariculture management strategy.

Material and Method

Study design. The involvement of actors as subjects and objects of the established development system is an important factor in the success of sustainable mariculture development for promoting the national economy. Bryant & Bousbaine (2014), and Zahradnik et al (2014) go into considerable length about the importance of actors in sustainable development. A prospective approach to actor analysis is used in this research. The stages of analysis used in this study include problem identification, filling in the matrix of direct influence (MDI) table, and filling in the Actor-Objective table (Fauzi 2019). The focus group discussion (FGD) was carried out in conjunction with data collection to identify key variables in sustainable mariculture development. A total of 19 actors or stakeholders were involved in the discussion group forum. Actors or stakeholders involved include the Ministry of Marine Affairs and Fisheries (MMAF), the Provincial Marine and Fisheries Service in the target area, the district level marine and fisheries service, village governments, fish cultivators, local traders, grouper fish exporters, processing entrepreneurs, financial institutions or banks, Association of Grouper Fish Cultivators, NGOs, researchers or academics, extension workers, input providers, hatcheries, fish feed supplier, fish medicine supplier, and producers of production facilities, fishers, representatives of local community leaders. FGDs and in-depth interviews with selected actors are part of collecting data or getting an agreement on the values that will be included in the matrix of direct influence and actor-objective matrix. In addition, this process is a stage to identify the goals of sustainable mariculture development in the target area. The same perception and understanding are obtained from every actor involved in the goal of sustainable maritime development.

According to Hermans (2004), general procedures for stakeholder analysis are used to improve procedures that allow the use of actor analysis models. The resulting procedure consists of six general steps, which are as follows: 1. determining the objectives, questions, and conditions for the actor analysis, namely identifying the objectives of the actor analysis concerning the activity, identifying the main questions to be addressed, assessing the time and resources available for analysis, timing, and assessing support among actors; 2. determination of the actor-network consists of searching for information to map the characteristics of the main actor-network, thus facilitating the selection of actors who are limited but able to represent various interests in a balanced way; 3. selection of the analysis model, consisting of determining the most appropriate focus for the analysis based on the key questions; 4. data collection consists of making data collection designs and questionnaires based on the selected analysis model and the selection of key informants; 5. data structuring and analysis consist of structuring the collected data into the structure and logic of the model, where then, at the end of the process, the model is built for feedback and validation; 6. interpretation and presenting results using the theory underlying the model and reviewing issues not mentioned by the actors.

Stakeholders can be classified into the following groups based on their strengths, significant positions, and influence on an issue or problem (Ackermann & Eden 2011): 1. key players have the most clout and vested interest in the policy's development; 2. the subject is a stakeholder with a strong interest but little influence. This stakeholder is supportive but has limited power to influence the issue; 3. actor or context setter: a stakeholder with much power but low interest; 4. spectators (crowd), stakeholders with limited influence and interest in the intended outcome (objective). Its influence and relevance will shift over time. Thus, it must be properly considered.

Data analysis. To analyze the data and information obtained in this study we used a prospective analysis approach. In the process, goal setting, scenario thinking, and actors play an important role. The prospective analysis intends to rank stakeholder positions on

many strategic issues, assess convergence and divergence, and anticipate coalitions and conflicts (Markard et al 2009; Jaziri & Boussaffa 2010). In the long-term view, policymakers need to anticipate justifications for future prime movers that may affect key actors (Omran et al 2014).

The actor analysis was carried out using the MACTOR method. The MACTOR method (Matrix of Alliances and Conflicts: Tactics, Objectives, and Recommendations) is a six-step actor analysis sequence whose added value is obtained through calculations that reveal actor positions and power concerning several strategic objectives (Arcade et al 2009). MACTOR's method was developed in response to the increasing criticism of traditional extrapolation-based forecasting methods. Godet (2000) has contributed by further developing the MACTOR method methodology and procedures for use in scenario analysis. The software is freely available for download through the LIPSOR website.

The MACTOR input data are formatted following the prescribed conventions of (Rees & MacDonell 2017):

(i) descriptive qualitative data on the actor's plans, motivations, constraints, and means of action (compiled in the actor's strategy table);

(ii) the actors' positioning in relation to strategic objectives (compiled as numerical data into an actors by objectives table as to whether the actor is for (+), neutral (0) or against the objective (-) and the relative intensity or salience of the objective's importance to the actor using a scale of 0 (unimportant) to 4 (extremely important));

(iii) the influence of actors over each other (compiled numerical data as an actor-by-actor influence table measured on a scale ranging from 0 (no influence) to 4 (very high influence)).

The input data were stored as matrices, which the software later multiplies to provide the various analysis outputs. These take the shape of charts and tables that depict the actors' relationships, positions, and influences on the system's future development. The numerical data are obtained by coding responses to questions regarding an actor's preferences, relationships, and how the actor will attain his or her goals and objectives using the scales. Arcade et al (2009), Godet (1991), and Godet et al (2009) provide comprehensive examples and instructions on how to gather, code, and enter data, as well as evaluate the findings. Godet (1991) provides an example using a more recent version of the software.

The MACTOR technique is adaptable, as it may be applied to up to 20 actors and their associated objectives while being basic and straightforward (Godet et al 2009). It does, however, have several limitations. Firstly, the data gathered is often confidential, posing access, verification, and publishing challenges (Godet et al 2009). However, due to the need for anonymity, actors are more likely to freely talk about their rivals and coworkers, offering some cross-checking and additional data - if the actors act consistently as they say they will (Godet 1991; Godet et al 2009). Second, the ease with which results are generated can result in result overload, chaotic diagrams, and a never-ending task of digesting the extensive information to construct a concise overview: all of which highlight the importance of having high-quality data from the start (Bendahan et al 2004; Arcade et al 2009; Godet et al 2009). In MACTOR analysis, an actor is defined as an entity with a position in the system under study that mobilizes its resources to impact outcomes directly or indirectly through its influence on other actors. On the other hand, factors or issues are characterized as variables, concepts, subjects, difficulties, or considerations concerning the future of the system being investigated (Bendahan et al 2004). In addition to these two characteristics, discuss several variables that relate to actors and issues (factors), this study identified 19 actors (or entities) with an interest in the utilization and management of mariculture in the target area: 1. fish farmers; 2. hatchery farmers; 3. middleman/fish traders; 4. household consumer; 5. hotel and restaurant; 6. local finance institution; 7. bank; 8. Provincial Government; 9. Local Government; 10. Ministry of Marine Affairs and Fisheries; 11. researcher; 12. exporter; 13. NGO; 14. feed seller; 15. trash fish seller; 16. Grouper Association; 17. local community (community elder); 18. labor; 19. input (vitamin, chemical etc.) supplier.

Results and Discussion

Identification of mariculture development goals in the target areas. Fishery management, according to Government Regulation of the Republic of Indonesia Number 27 of 2021 concerning the implementation of the marine and fisheries sector, is all efforts, including an integrated process in information gathering, analysis, planning, consultation, decision making, allocation of fish resources, and implementation and law enforcement of laws and regulations in the field of fisheries, carried out by the Government or other authorities aimed at achieving the goals of the sector. The desired goal is to boost the national economy, which will benefit the community.

This study attempted to determine the objectives of mariculture development in the target area based on the knowledge and understanding of stakeholders, which was accomplished through a FGD approach and expert interviews. This FGD agreed on at least ten goals (Table 1) for sustainable mariculture development. These ten objectives can be classified into three categories (economic, social, and ecology). Table 1 shows five goals in the economic dimension, two goals in the social dimension, and three goals in the environmental component. This could imply that the multi-stakeholders involved in the FGD process are primarily concerned with the economic purpose of mariculture. To ensure sustainability, the economic direction of mariculture activities must be balanced with other factors such as environmental and social issues. According to prior research, the social-ecological aspect and carrying capacity (ecology) are essential indicators to measure the sustainability of mariculture (Calaprice 1976; Fröcklin et al 2012; Ren 2021); economic benefits should also be included. As a result, mariculture contributes to societal well-being (Zheng et al 2009).

Table 1

Sustainable mariculture development goals in target areas

No.	*Objectives*	*Dimension*
1	Increase farmers income	Economy
2	Increase mariculture production	Economy
3	Meet the demand for fish in the local market	Economy
4	Meeting the demand for fish in the export market	Economy
5	Improving local economy	Economy
6	Protein supply continuity	Social
7	Job creation	Social
8	Alternatives to fulfill the demand of captured fisheries	Ecology
9	Prohibitions on the use of the chemicals in mariculture	Ecology
10	Use of environmentally friendly farming materials and media	Ecology

Source: Results of FGD analysis (2020) and Expert interviews (2021).

In general, the results of in-depth interviews related to the identification of sustainable mariculture goals have placed economic goals as the main concern because, in the target area, the initiation of mariculture development is aimed at increasing farmers' income, moreover, as an alternative livelihood for coastal communities facing a declining trend from captured fisheries. Mariculture development in the target area was initially focused on a small scale. Small-scale farmers based on applicable regulations in Indonesia are fish farmers who cultivate fish to meet their daily needs. Over time, mariculture activities can not only meet household needs but can be massively commercialized to get bigger profits. Mariculture commodities that are cultivated in the target area, in general, are grouper (*Epinephelus* sp.) and barramundi (*Lates calcarifer*). Both commodities are fish with high demand in the export market. So, therefore the development of mariculture is not only to meet the needs of the local market but also to meet the needs of the export market, which has greater added value.

When viewed from the social dimension, there are two main objectives of mariculture development: maintaining supply continuity and creating jobs. Maintaining continuity of supply related to the fulfilment of food needs. Fish is the main source of

protein substitute for red meat, and animals, in general, are very important. According to Tidwell & Allan (2001), fish is a vital food source for people. It is man's most important source of high-quality protein, providing 16% of the animal protein consumed by the world's population, according to FAO (1997). It is a particularly important protein source in regions where livestock is relatively scarce - fish supplies < 10% of animal protein consumed in North America and Europe, but 17% in Africa, 26% in Asia and 22% in China (FAO 2000). The FAO estimates that about one billion people worldwide rely on fish as their primary source of animal protein (FAO 2000). Then, creating job opportunities is a manifestation of the goal of sustainable mariculture for poverty alleviation. With the growth of several mariculture facilities in the target area, it is considered that they have absorbed local labor (coastal communities) to reduce the number of unemployed in coastal villages near the mariculture facilities.

The identification results show that three objectives can be grouped into environmental dimensions, namely (1) alternatives to fulfil the demand for consumption of caught fish; (2) prohibition of the use of chemicals in mariculture; (3) use of environmentally friendly cultivation materials and media (minimizing plastic waste and water pollution). The sustainability concept in mariculture relies not only on mariculture activities that can be carried out continuously but are expected to provide low (even zero) pressure on the ecology. The alternative goal of fulfilling the consumption of caught Fish means that mariculture has a role in preventing scarcity or reducing exploitation pressures. In addition, the prohibition of the use of chemicals is a manifestation of the concept of sustainability to reduce ecological pressures and prevent chemicals that are harmful to humans. The last destination is related to marine debris. Marine debris is the latest issue to be discussed. Mariculture facilities, in general, cannot be separated from the use of plastic materials, such as nets and buoys. The potential for pollution from mariculture is very large, so it is the concern of stakeholders to include this element in the management strategy of sustainable mariculture. Contamination of habitats and organisms by marine debris is now globally ubiquitous (Thompson et al 2009), with no signs that environmental accumulations are decreasing (Thompson et al 2004; Law et al 2010). Debris contaminates a diversity of habitats, including shorelines, coral reefs, shallow bays (Endo et al 2005), estuaries, the open ocean (Knap et al 1980; Watters et al 2010) and the deep sea (Katsanevakis 2008; Coe & Rogers 2011; Rochman et al 2016).

Influence and role of actors in sustainable mariculture development. Table 2 shows the results of filling out the Matrix of Direct Influence (MDI) from the FGD and in-depth interviews. This matrix is read from left to right. Farmers, for example, have a large influence on the hatchery and middleman in this scenario (score 4) but do not influence the researcher (score 0). This is consistent with the fact that farmers have a high need to supply fish seeds from hatcheries. Similarly, the middleman acts as an intermediary in transferring fish from farmers to the final customer. The actors have a mutually beneficial partnership. The filling results in the actor-objective (MAO) matrix can be seen in Table 3. At the same time, to find out the roles and influences of actors in sustainable mariculture development can be seen in Table 4. The actor-objective matrix provides an overview of the role of each actor concerning the goals of sustainable mariculture development. The greater the value indicates that the actor has a large role or existence in the objective. While the value of 0 indicates that the actor has a good outcome or does not have a role.

The results of filling in the actor-objective matrix (Table 3) indicate that not all actors have a role or agree to the goals of sustainable maritime development that have been agreed or determined. This indicates a potential conflict between actors in achieving some of the goals that have been set. Moreover, this role is more aimed at farmers and other actors who support production activities. Table 3 also shows the number of approvals of all actors towards achieving each goal. As the main actors, farmers agree to or support all development goals of sustainable mariculture. Those with a value of 0 are more likely to have a neutral opinion from each actor towards the goal and not to show a disapproval opinion. This neutral opinion results from a weak role or the absence of a

direct relationship to the intended goal, for example, in the household consumer actor. He has a value of 0 to increase mariculture production because household consumption is not a producer that can directly increase production. The goals of job creation and increasing farmers' income are the two goals with the highest number of approvals compared to other goals. In comparison, the two lowest goals are related to supplying protein continuity and environmentally friendly materials. These two goals can be a source of potential conflict because not all actors have the same assessment of interest in these goals.

Table 2

Matrix of direct influence of sustainable mariculture development in target areas

Actors	*Farmers*	*Hatchery*	*Middleman*	*Household consumer*	*Hotel/restaurant-consumer*	*Local finance institution*	*Bank*	*Provincial Government*	*Local Government*	*Ministry of Marine Affairs and Fisheries*	*Researcher*	*Exporter*	*NGO*	*Feed seller*	*Trash fish seller*	*Grouper Association*	*Local community*	*Labor*	*Input supplier (vitamin, chemical, etc.)*
Farmers	0	4	4	4	4	2	2	2	3	3	0	3	1	3	4	2	2	3	3
Hatchery	3	0	0	0	0	2	2	3	3	4	2	0	2	1	0	3	2	3	3
Middleman	4	0	0	4	4	2	3	2	2	2	0	4	1	0	0	3	2	1	0
Household consumer	2	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	0
Hotel/restaurant consumer	3	0	4	1	0	1	1	3	4	1	0	2	0	0	0	0	0	0	0
Local finance institution	4	4	2	1	0	0	2	3	3	0	0	0	0	0	2	0	2	2	2
Bank	4	4	3	0	0	2	0	3	3	2	0	2	0	2	2	3	0	2	2
Provincial Government	4	4	4	2	3	3	3	0	3	4	1	3	3	2	2	2	2	2	2
Local Government	4	4	2	2	3	3	2	2	0	4	1	2	2	3	3	3	0	1	1
Ministry of Marine Affairs and Fisheries	4	4	4	2	3	2	1	4	4	0	4	4	3	3	3	3	3	3	3
Researcher	1	1	1	1	1	1	1	1	1	3	0	2	1	3	1	1	1	2	2
Exporter	4	2	4	1	1	0	4	4	3	4	1	0	2	0	0	0	0	1	0
NGO	3	3	3	1	1	1	1	2	2	3	3	1	0	1	1	1	1	1	1
Feed seller	4	4	0	0	0	2	4	2	2	3	1	0	1	0	3	2	0	0	2
Trash fish seller	4	3	0	0	0	2	3	3	2	4	2	0	2	3	0	3	0	0	0
Grouper Association	4	3	2	1	2	1	1	3	4	2	1	3	1	1	1	0	1	1	1
Local community	3	3	3	1	1	3	2	2	2	2	0	0	1	1	1	1	0	1	1
Labor	4	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
Input supplier (vitamin, chemical, etc.)	4	4	0	0	1	1	2	3	2	3	1	1	1	1	1	1	1	1	0

Note: Influences are graded from 0 to 4 according to the importance of the actor's possible jeopardy; 0 = no influence; 1 = operating procedures; 2 = projects; 3 = missions; 4 = existence.

Table 4 illustrates the results obtained from the Matrix of Direct and Indirect Influences (MDII). The Influence Index column (Ii) indicates the degree of direct and indirect net dependence influence based on the results of the matrix structural analysis. In contrast, the Dependence Index column (Di) indicates the degree of direct and indirect net dependence influence.

Table 3

Matrix of relationship of actors with sustainable mariculture objectives in target areas

Actors	*Objectives*										
	Increase farmer income	*Increase mariculture production*	*Meet the demand for local market*	*Meet the demand for export market*	*Improve the local economy*	*Continuity of protein supply*	*Job creation*	*Alternatives of captured fisheries*	*Prohibition chemical use*	*Environmentally friendly materials and media*	*Absolute sum*
Fish farmers	4	4	4	4	3	3	4	4	4	4	38
Hatchery farmers	3	3	2	3	3	2	4	4	2	2	28
Middleman fish traders	2	2	2	2	2	3	3	2	1	0	19
Household consumers	2	0	0	0	1	0	0	1	1	1	6
Hotel/restaurant consumers	2	2	1	1	2	0	4	1	0	0	13
Cooperatives/local financial institution	2	2	0	0	3	0	3	1	1	1	13
Bank	2	2	0	0	0	0	2	0	2	2	10
Provincial Government	3	3	3	3	3	3	3	3	3	3	30
Regency Government	3	3	3	1	1	3	3	3	3	3	26
Ministry of Marine Affairs and Fisheries	4	3	3	4	4	4	4	3	3	3	35
Researcher / academician	1	1	1	1	1	1	1	1	1	1	10
Exporter	1	1	1	4	1	1	1	0	0	0	10
NGO	1	1	1	1	1	1	1	1	1	1	10
Fish feed seller	1	1	0	0	0	0	3	2	0	0	7
Trash fish seller	2	2	1	0	0	0	2	3	0	0	10
Grouper Farmers Association	3	3	1	1	3	2	1	2	4	4	24
Local community	1	1	1	1	1	1	1	1	1	0	9
Labor	1	2	2	1	1	1	0	3	1	1	13
Input supplier (vitamin, chemical, etc.)	2	2	1	1	1	1	2	3	0	0	13
Number of agreements	40	38	27	28	31	26	42	38	28	26	
Number of disagreements	0	0	0	0	0	0	0	0	0	0	
Number of positions	40	38	27	28	31	26	42	38	28	26	

Table 4

Matrix of direct and indirect influences of sustainable mariculture at target areas

Actors	*Farmers*	*Hatchery*	*Middleman*	*Household consumer*	*Hotel/restaurant consumer*	*Local finance institution*	*Bank*	*Provincial Government*	*Local Government*	*Ministry of Marine Affairs and Fisheries*	*Researcher*	*Exporter*	*NGO*	*Feed seller*	*Trash fish seller*	*Grouper Association*	*Local community*	*Labor*	*Input Supplier (vitamin, chemical, etc.)*	*Ii*
Farmers	45	35	28	21	23	26	31	37	37	37	15	23	20	22	24	27	18	23	22	469
Hatchery	32	32	24	15	19	22	21	28	29	28	14	22	17	21	22	21	16	22	23	396
Middleman	31	24	29	21	20	18	22	28	29	23	8	22	13	15	18	17	14	18	16	357
Household consumer	7	7	7	7	7	7	7	7	7	7	4	6	6	7	7	7	6	7	7	120
Hotel/restaurant consumer	20	15	17	15	15	13	15	15	18	17	4	16	10	10	11	12	9	12	9	238
Local finance institution	26	24	16	13	15	20	20	22	24	25	8	14	14	16	16	19	13	17	15	317
Bank	33	31	21	17	20	23	25	28	30	28	13	20	19	18	20	24	15	19	19	398
Provincial Government	48	39	34	22	25	28	31	40	42	38	18	26	22	22	24	28	19	24	23	513
Local Government	41	35	27	19	21	25	27	37	37	34	17	24	20	22	24	26	19	23	22	463
Ministry of Marine Affairs and Fisheries	53	43	34	22	25	28	34	41	40	44	18	27	22	24	24	27	19	24	23	528
Researcher	25	22	16	14	14	18	21	23	23	23	13	15	17	17	17	17	14	18	17	331
Exporter	31	25	26	19	21	20	21	25	26	26	12	22	16	17	17	21	15	18	16	372
NGO	28	23	21	20	20	22	23	26	27	28	16	21	19	21	19	23	18	23	21	400
Feed seller	29	30	20	14	16	20	23	26	26	25	13	17	16	20	22	23	15	20	21	376
Trash fish seller	30	30	23	14	16	20	21	27	28	26	14	20	16	20	21	22	14	20	22	383
Grouper Association	33	27	24	20	22	24	25	29	32	30	13	22	20	19	20	22	17	21	19	417
Local community	28	23	20	18	17	24	23	26	27	24	12	19	16	18	19	22	17	21	20	377
Labor	23	21	16	16	15	18	19	21	22	22	12	14	15	15	16	17	14	19	17	313
Input supplier (vitamin, chemical, etc.)	27	27	22	18	19	22	22	25	26	26	14	19	19	20	21	21	15	21	21	384
Di	545	481	396	318	335	378	406	471	493	467	225	347	298	324	341	374	270	351	332	7152

According to Table 4, the central government, in this case, the Ministry of Maritime Affairs and Fisheries, is a more influential actor than other actors, as evidenced by a value of Ii of 528. While farmers are the most reliant on the long-term development of maritime culture, as evidenced by the greatest Di value of 545. This is consistent with field conditions, in which the sustainability of mariculture in the target area, and Indonesia in general, has been greatly influenced in recent years by the existence of policies that have not fully supported the development of mariculture, resulting in a decline in the number of fish farmers engaged in aquaculture because of limited access to export markets. This is in response to information obtained from an in-depth interview with the chairman of the Grouper Association. He stated that the regulation limiting live fish transport vessels harms the competitiveness of grouper from mariculture in Indonesia, making it economically unprofitable for farmers. It tends to result in a reduction in fish production. On the other hand, the stakeholder who has the least influence in sustainable mariculture development is the household consumer, which Ii indicates is 120. This is founded on field conditions because household consumers have additional protein options, such as other types of catch, freshwater fish, eggs, and animals. Researchers become the actors who rely the least on other actors, as shown by a Di of 225. This corresponds to researchers who are not actively involved in technical mariculture activities. Researchers only act as observers, delivering study findings or recommendations to the government or farmers. However, the decision to implement the study findings is left to the respective authorities and farmers.

The interests and power of each actor in the development of sustainable mariculture in the target area are very diverse and need to be mapped clearly. Mapping actors will help managers or policymakers how to involve these actors in achieving the agreed goals (Reed et al 2009). The map of influence and dependence between actors is illustrated in Figure 1. This map is divided into four quadrants: subject, players, actors, and spectators. The results of the grouping are analyzed and provide information for each quadrant as follows:

1. Quadrant 1: Subjects and actors with much interest but little power. This group should be given knowledge or a better understanding of the program or the long-term development goals of mariculture in order to be pleased. This group's stakeholders must be appropriately managed so that they do not constitute a barrier to mariculture development. One approach to expand understanding or obtain complete information about the aims of sustainable marine development is through government (minister or local) outreach programs and involving these actors in every implementation or policy-making process or through public hearings. Actors in Quadrant 1 include (1) a fish feed seller; (2) a grouper farmers association; (3) non-governmental organizations (NGOs); (4) local communities; (5) a researcher/academician; (6) exporters; and (7) trash fish sellers; and (8) input suppliers.
2. Quadrant 2: Players (key players), actors with a high level of importance and influence. The group of actors in quadrant 2 is actors who are usually involved in activities that require important decisions. They have a strategic role in achieving the agreed goals. It can be said that the group of actors in this quadrant are actors who are directly and technically involved in mariculture activities. Seen in this quadrant consists of actors who act as policymakers, cultivators, financial support institutions, and traders. Actors in Quadrant 2 consist of (1) Ministry of Marine Affairs and Fisheries; (2) Provincial Government; (3) Regency Government; (4) fish farmers; (5) hatchery farmers; (6) banks; and (7) middleman/fish trader.
3. Quadrant 3: Actors (context setter), actor with a low level of importance and influence. A group of actors always provide information on program developments or the achievement of goals. From the analysis results, it is known that none of the actors involved in this study act as actors (other followers) or are mapped in quadrant 3.
4. Quadrant 4: Spectators, actors with low importance and influence. However, the group of actors in this quadrant is actors who are not affected by any changes in

the system or policy of achieving goals. This group of actors is a group that is dependent on development goals or is referred to as the beneficiary group. Actors in Quadrant 4 consist of: (1) labor; (2) cooperatives/local financial institutions; (3) hotel/restaurant consumers; and (4) household consumers.

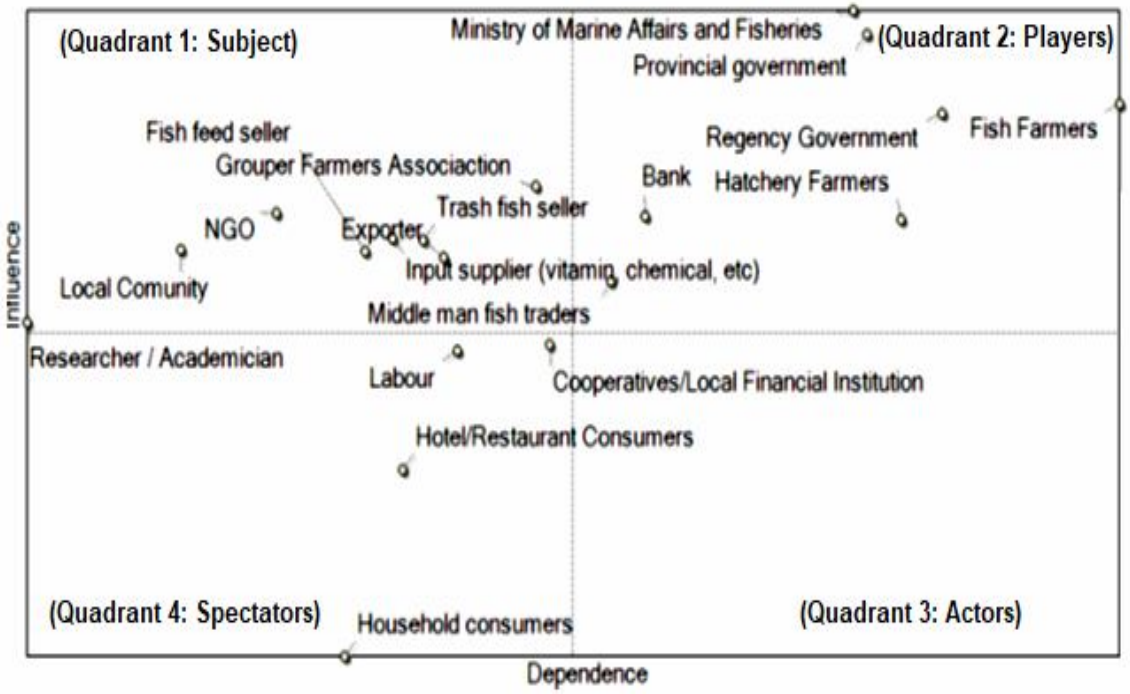

Figure 1. Influence between actors in sustainable mariculture development in target area.

Three actors have the same or influential role and have dual interests and have the potential to cause conflict, namely the Ministry of Marine Affairs and Fisheries (MMAF), Provincial Government, and Regency Government. These three actors have roles as regulators and supervisors of the process of achieving sustainable mariculture development goals in the target area. The possibility of overlapping regulations will occur from each of these actors. This is inseparable from the Regional Autonomy Law in Indonesia (Law No. 23 of 2014 concerning Regional Government) that applies in Indonesia. For example, in terms of their management, mariculture facilities located on the coast (less than 12 miles from the coastline) are the provincial government's authority.

In contrast, the management of farmers is the authority of the Regency Government. Meanwhile, MMAF, as the highest fisheries management institution in Indonesia, does not fully have the technical authority to regulate mariculture activities. So, the results of this analysis show that with the three actors in the same quadrant, it is hoped that they can synergize in determining policies and not overlap, which becomes an obstacle to achieving goals. The results of the analysis in Figure 1 show that the role of the government (MMAF, Provincial Government, and Regency Government) is as a key actor and has high power and interest in sustainable maritime development. Hierarchically, through applicable regulations, the Provincial and Regency Governments are mandated to manage resources or mariculture in their territory in a sustainable manner, which MMAF commands. In its technical implementation, mariculture management also involves directly fish farmers, hatchery farmers, financial institutions (banks), and middlemen. Fish farmers and hatchery farmers are actors who play a direct role in the success of production; the middleman plays a role in the implementation of marketing or distribution of fish from farmers to consumers; the role of the bank is to provide money or capital so that the implementation of mariculture activities can be carried out.

The group of actors in quadrant 3 (see Figure 1) has a role as actors who support the success of sustainable mariculture goals. This group of actors can potentially be an

obstacle to achieving goals if they do not have a complete understanding and information. The implementation of resource management or, in this case, mariculture can be realized if the roles of several actors are not optimal. Bryson (2003) says that natural resource management is not optimal due to the non-optimal role of actors in determining policies.

Conclusions. The analysis results have shown that the goals of sustainable mariculture, based on the consensus of the actors, can generally be divided into three dimensions, namely economic, social and ecological oriented goals. With a description of five goals in the economic dimension, two goals in the social dimension, and three goals in the ecological dimension. Overall, economic goals are the main concern of all actors. The main objective is to increase household income and improve regional economic conditions in the target area. However, the study results confirm that the balance of goals in each dimension must be carried out so that the main goal of sustainable mariculture development is still achieved.

The results of the actor's analysis of the stakeholders involved in the development of sustainable mariculture in the target area have mapped the 19 actors involved based on their power and influence into three different groups, namely (1) there are seven actors (MMAF, Provincial Government, Regency Government, fish farmers, hatchery farmers, middleman, and bank) who act as key players. This group of actors can be referred to as primary stakeholders; (2) eight actors (fish feed seller, trash fish seller, grouper farmers association, NGO, local community, input supplier, exporter, and researcher) act as subjects. This group of actors can be referred to as secondary stakeholders. Secondary stakeholders explicitly act as accelerators in achieving the goals of sustainable mariculture development. Secondary stakeholders, on the other hand, can also become obstacles to achieving goals, with the condition when these stakeholders do not have a complete understanding and information regarding the intended goals; (3) there are four actors (labor, hotel/restaurant consumers, household consumers, and cooperatives) who act as spectators. This group of actors can be referred to as tertiary stakeholders. Tertiary stakeholders are beneficiary actors or parties who receive benefits without providing any intervention to other actors. The existence of this actor explicitly has a positive influence on primary stakeholders. Even though the stakeholders experience a bad condition in a certain condition, it will not harm the tertiary stakeholder group because they have other options and may not be related to the sustainable development goals of mariculture.

This study explains that the Ministry of Marine Affairs and Fisheries, as a national policymaker, is a more influential actor than other actors. This indicates that the direction of development policy is largely determined by policymakers at the central level so that fish farmers, as the actor with the second-largest influence value, will greatly depend on every policy at the central level. So good communication and coordination are needed between these two actors. The role of other actors, such as policymakers at the provincial and district levels (at the second and third levels), serves as a key player that supports and oversees every policy from the center so that it runs well. Actors involved in technical, operational mariculture activities (fish farmers, hatchery farmers, banks, and middleman) have an important role in determining the success of achieving goals. This group is the primary stakeholder (other than those who have a role as a policymaker) and is the actor directly affected by the policy. Then, based on their role and power, secondary stakeholders or accelerator actors are groups of actors who are not directly affected by each policy. This actor acts as an agent of change and has an important role that cannot be ignored.

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