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Full Length Research

Institutional model areas management of sustainable shrimp farming in the Gulf Coast of Banten, Indonesia

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Institutional is an important element in the management of ponds, not only affect the efficiency and effectiveness, but also its sustainability. This research aims to design a model of regional institutions to support the sustainability of shrimp farming ponds in the Gulf coast of Banten, Banten Province, Indonesia. The method chosen was Interpretative Structural Modeling (ISM). The method of data collection was done with surveys, laboratory tests, interviews and focus group discussion (FGD). There are five (5) elements were analyzed as the objectives of the program, the influential sectors of society, the needs of the program, the main obstacle and institutions involved in the implementation of the program. Results of the analysis showed the provision of facilities and infrastructure, superior human resources and balanced land use is a key element in the sub program objectives. While the college (L10) and research institutes (L11) is an institution that is most crucial to ensure sustainable shrimp farming. While coordination and cooperation is still low is a major constraint.

Key words: Institutional, Shrimp Farming, sustainability, ISM, key element.

INTRODUCTION

Banten Gulf coast region has a very strategic role and it is one area of potential as a producer of shrimp in Indonesia. The total area of 6457.7 of ponds reached with the results of 925.62 tonnes in 2014 (Anonymous 2015). This region has experienced its heyday (1992-1995) with a total production reached 6,000 tons / year. Along with the development of shrimp farming area, is also growing industry is no less today has established 351 new industrial and residential areas. Industrial development and new housing has an impact on shrimp farming due to increased waste that result in water pollution. By considering these conditions, so that the shrimp farming in the Gulf coast of Banten was stopped. Aquaculture is a sustainable system of aquaculture production technology that can be adapted, the ecological and economic feasibility lasts infinite (Schmittou *et al.,* 2004). Sustainable aquaculture is included in the concept of sustainable development is development that meets current needs and the ability of future generations to meet their own needs (Muhammad 2011).

To be able to manage sustainable shrimp farming area, availability of land, environmental, social, implementation of legislation, institutional and developing economies in this region Sukadi, (2009), as well as the suitability of land (Hossain and Das, 2010). While the institutions that influence the sustainability include policy makers such as local government, central government, research institutions (Widiyati, 2011).

Environmental factors to support the development be continued which are: 1, the maintenance of essential ecological processes 2, the availability of sufficient resources 3, Environment socio - cultural and economic accordingly. The most important resource is human (Soemarwoto 1994). The application of advanced technology does not always support the sustainable

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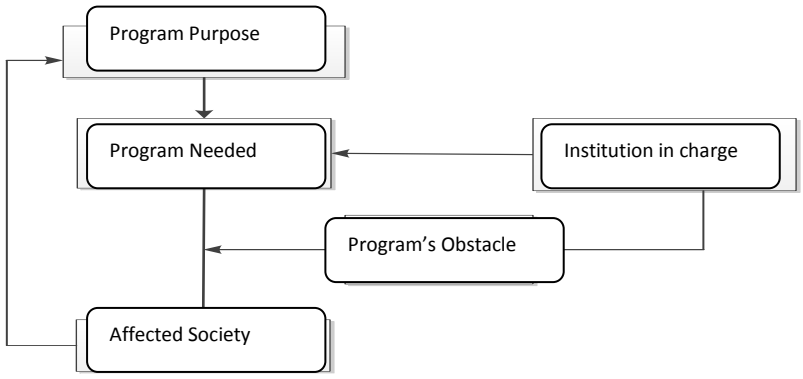

Figure 1. The relationship between the elements to achieve the goal of sustainable shrimp farming area in the Gulf coast of Banten.

aquaculture, so that the application of technology that excessive and poorly planned succession impede shrimp farming environment (Ahmad, 2006). Sustainable aquaculture is characterized by optimum production with managing water quality parameter ie physics, chemistry and biology (Bhatnagar and Devi in 2013) and the maintenance of soil quality (Caipang *et al*., 2012).

Continuous research is also carried out by the pond Sitorus (2005), sustainable development of the area of ponds in the coastal district of Serang Banten Bay by using the estimation method for the environmental capacity. Sjaifuddin (2007) examines the sustainable management of coastal areas manggunakan method systems approach while Kholil and Tangian (2012) evaluate the institutional Bunaken sustained by the ecological and economic use of ISM. Research models of institutional management of sustainable shrimp farming area in the Gulf coast of Banten is a new research model and has never been done to solve the institutional persolaan in maintaining sustainable shrimp aquaculture production. The purpose of this study is to design a model of institutional management of sustainable shrimp farming area in the Gulf coast of Banten.

RESEARCH METHODOLOGY

This study uses the ISM. To solve various problems which are interconnected with the elements used in the ISM (Attri *et al*., 2103). Data were collected through discussions (FGD) with relevant experts, practitioners' pond / managers, academics and bureaucrats and local governments. This condition is in accordance with Kholil *et al.,* (2014) stakehorlder determination can be done through interviews with experts data analysis using ISM Saxena techniques (1992). The results of discussions with experts, analysis of secondary data from the field and 9 elements developed by Saxena (1992), selected five elements used to measure the sustainable management of shrimp farming area that is 1) influential community sector; 2) The need of the program; 3) The main problems; 4) The purpose of the program; 5) Institutions involved in the implementation of the program. In general, the analysis stage as in Figure 2. The Relationship between the program elements as in Figure 1.

RESULTS AND DISCUSSION

Purposes to be obtained

Based on the expert opinions of the elements objectives to be achieved, then these elements are translated into nine sub-elements to the program objectives to be achieved in the management of sustainable shrimp farms, as in Table 1. Sub element is made to determine the sustainable production and with suitability land and the carrying capacity of land.

Table 2 shows the result of expert discussion using VAXO approach. To indicate ISM, Table 2 shows the position of sub-elements on each - each sector as in Figure 2. The Matrix Driver Power and Dependence on elements objectives to be achieved.

In figure 2 it appears that elements of the provision of production facilities and infrastructure that is easy (T1), competent human resources (T7) and land use are balanced by the relevant sector (T8) located in the sector of independent (sector IV) which means sub-element of this role enormously to the program objectives. While sub element of the application of innovative technologies for efficient and effective (T2) and community social support (T6) are in the sector linkage, which means sub elements must be studied carefully as sub elements can be decisive or even do not have a significant role , Last sustainable environment that supports the shrimp culture (T3), shrimp production is sustainable (T4) and a highly competitive commodities (T9) in sectors dependent (II) which is dependent on the provision of production facilities and infrastructure that is easy (T1), human resources competent (T7) and land use are balanced by

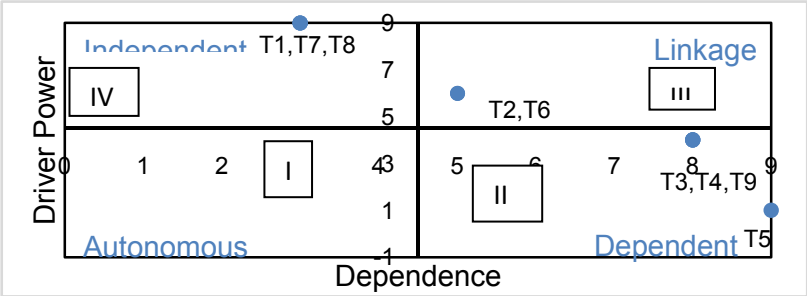

Figure 2. The Matrix Driver Power and Dependence on elements objectives to be achieved.

Table 1. The purpose of the program is to achieve sustainable shrimp farming area in Banten Coastal Bay.

Code	Sub element
T1	The easy provision of facilities and production infrastructure
T2	Application of innovative technologies which are efficient and effective
T3	environmentally sustainable for supporting shrimp farming
T4	Sustainable shrimp production
T5	Improved economy
T6	social support community
T7	Competent human resources
T8	Land use are balanced by the relevant sector
T9	The competitive commodity

Table 2. The results of the final matrix element reachability management program goals of sustainable shrimp farming area in the Gulf Coast of Banten.

No.	T1	T2	T3	T4	T5	T6	T7	T8	T9	*Driver power*
T1	1	1	1	1	1	1	1	1	1	9
T2	0	1	1	1	1	1	0	0	1	6
T3	0	0	1	1	1	0	0	0	1	4
T4	0	0	1	1	1	0	0	0	1	4
T5	0	0	0	0	1	0	0	0	0	1
T6	0	1	1	1	1	1	0	0	1	6
T7	1	1	1	1	1	1	1	1	1	9
T8	1	1	1	1	1	1	1	1	1	9
T9	0	0	1	1	1	0	0	0	1	4
Dependance	3	5	8	8	9	5	3	3	8	
Level	4	3	2	2	1	3	4	4	2	

the relevant sector (T8) located at sector IV (independent). The role of sub parliaments are becoming more apparent in the hierarchical structure (Figure 3) which shows that the sub parliaments in the level of provision of facilities and production infrastructure that is easy (T1), competent human resources (T7) and land use are balanced by the relevant sector (T8) into determinant for sub - elements which are at the upper level (at 3.2 and 1). Figure 3 gives the sense that the production facilities and infrastructure that is easy, human resources and competence usage are balanced by the relevant sector affect other sub Element in realizing

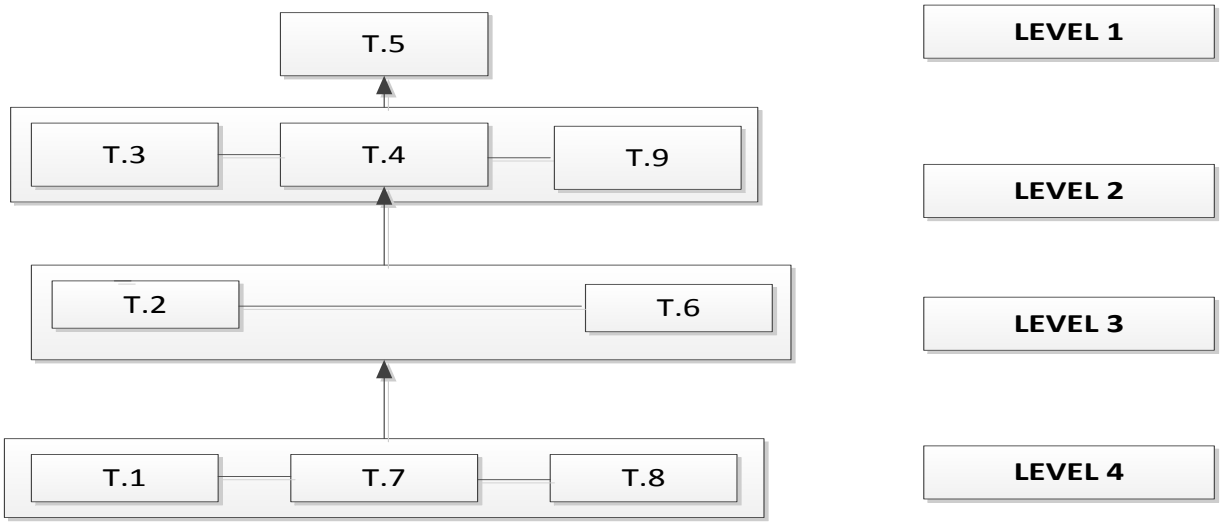

Figure 3. Interpretation of achieving program objectives.

Table 3. Institutions that play a role in the area of sustainable shrimp farming in the Gulf of Banten.

Code	Element
L1	Department of Agriculture and Fisheries of Serang
L2	Village
L3	Department of Marine Fisheries, energy and mineral resources Serang District.
L4	Financial institutions
L5	Shrimp Farmers Group
L6	The Environment Agency and Spatial Serang District
L7	Marine and Fisheries Agency of Banten Province
L8	Extension and Food Security Agency Serang District
L9	Central Government (Ministry of Maritime Affairs and Fisheries)
L10	College
L11	Research institutions

sustainable shrimp farming.

Institutions that play a role in the sustainable management of pond

Institutional influential in managing the sustainable shrimp aquaculture ponds has 11 sub-elements.

By using VAXO approach the results of such expert discussion shown in Table 4 and Figure 4. Matrix Driver Power and Dependence on elements of the agencies involved.

In Figure 4, it appears that elements of the college (L10); research institutes (L11) in the independent sector (sector IV) which means sub-element has a very big role in the program. While sub element of the Department of Agriculture and Fisheries of Serang (L1), Department of Marine and Fisheries Banten (L7); Extension and Food Security Serang District (L8) and the central government (Ministry of Maritime Affairs and Fisheries) (L9) are in the sector linkage (sector III), which means sub elements must be studied carefully because they are sub elements have a decisive or does not have a role Last significant and the Department of Marine Fisheries, energy and mineral resources Serang District (L3), financial institutions (L4), the Environment Agency and Spatial Serang District (L6), which are in sectors dependent (II) which depend on the college (L10); research institutes (L11) in sector IV (independent). The role of the sub-elements become more apparent in the hierarchical structure (Figure 3) which shows that the sub parliaments at the college level (L10), research institutes (L11) .Being determinant for sub - elements which are at the upper level (level 4, 3.2 and 1). Figure 3 gives the sense that universities and research institutions have a balanced utilization by the sector can affect other sub elements in

Table 4. Results of the final matrix element reachability institutions in managing the sustainable shrimp farming in the Gulf coast of Banten.

No.	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	Drv
L1	1	1	1	1	1	1	1	1	1	0	0	9
L2	0	1	0	0	1	0	0	0	0	0	0	2
L3	0	1	1	1	1	1	0	0	0	0	0	5
L4	0	1	1	1	1	1	0	0	0	0	0	5
L5	0	0	0	0	1	0	0	0	0	0	0	1
L6	0	1	1	1	1	1	0	0	0	0	0	5
L7	1	1	1	1	1	1	1	1	1	0	0	9
L8	1	1	1	1	1	1	1	1	1	0	0	9
L9	1	1	1	1	1	1	1	1	1	0	0	9
L10	1	1	1	1	1	1	1	1	1	1	1	11
L11	1	1	1	1	1	1	1	1	1	1	1	11
Dep	6	10	9	9	11	9	6	6	6	2	2	
Level	4	2	3	3	1	3	4	4	4	5	5	

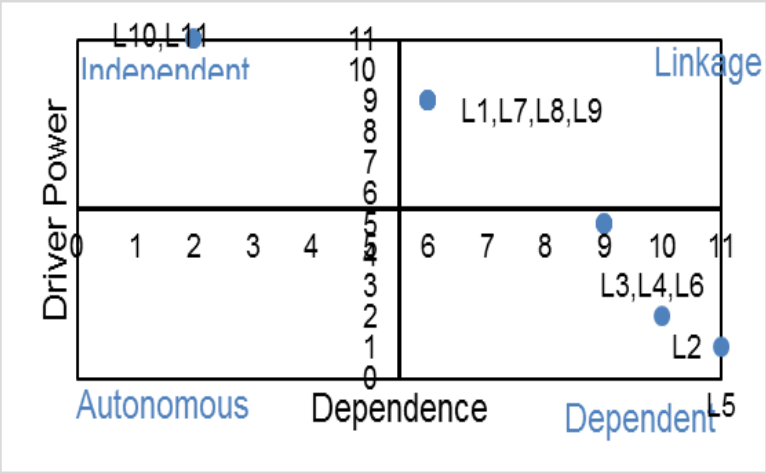

Figure 4. Matrix Driver Power and Dependence on elements of the agencies involved.

realizing sustainable shrimp farming.

Constraints in the sustainable management of pond area

This element is composed of 15 sub-elements. To achieve the goals and needs of the program turns out there are obstacles as in Table 5. Based on the analysis of interviews and questionnaires were used VAXO was known as in Table 6. The data is processed into a graph such as Figure 6. In Figure 6 can be identified that the element of enforcement of the regulations are still low (K7); cooperation between sectors is still weak (K15). Further still in quadrant IV, waterways role is not well ordered (K3); construction and layout of the pond is still traditional (K4), infrastructure support from various sectors is still low (K5) are in the independent sector (sector IV) which means sub-element has a very big role in the program. While sub element of knowledge, skills and attitudes of managers of sustainable farms still low (K6); monitoring and evaluation of aquaculture has not done regularly and continuously (K8); capital is low (K12), implementation of new technologies is ongoing by the managers still slow (K14) are in the sector linkage, which means sub elements must be studied carefully because they are sub elements have a decisive or does not have a significant role and final community awareness against the aquaculture environment and the region is low (K1), sewage of various sectors still does not meet the quality

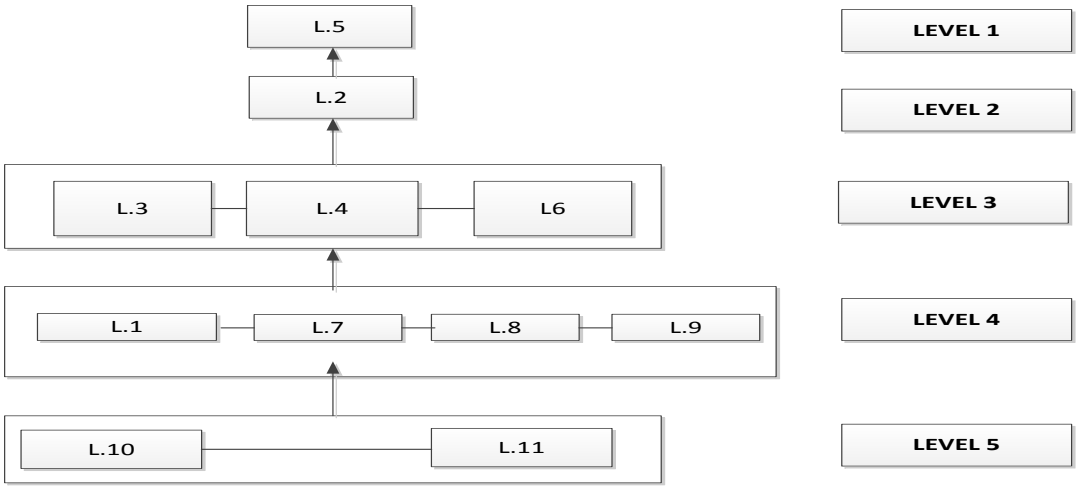

Figure 5. Schematic interpretation of institutions that play a role in the sustainable management of the pond.

Table 5. Obstacles to achieve the goals and needs of the program.

Code	Element
K1	Public awareness of the environmental sustainability of aquaculture and the region is low
K2	Problem-solving efforts are still partially drains, not well ordered construction and layout of the pond are still traditional
K3	Infrastructure support from various sectors is still low
K4	Knowledge, skills and attitudes of managers of sustainable farms still low
K5	Enforcement of regulations is still low
K6	Monitoring and evaluation of aquaculture has not done regularly and continuously
K7	Sewage from various sectors still does not meet quality standards permitted
K8	Large shrimp disease infection
K9	Environmental management is not comprehensive due to still based on administrative boundaries
K10	Low capital
K11	The development of a sustainable pond management strategies not involving stakeholders
K12	Ongoing implementation of new technologies by the managers still slow
K13	Cooperation between sectors is still weak
K14	Public awareness of the environmental sustainability of aquaculture and the region is low
K15	Problem-solving efforts are still partially drains are not well ordered construction and layout of the pond are still traditional

standards are permitted (K9), implementation of new technologies is ongoing by the managers still slow (K14). Further troubleshooting is still partial paya (K2), the development of a sustainable pond management strategy not involving stakeholders (K13). While the most powerful influence in the management constraints sustainable pond area is large shrimp disease infection (K10) in sectors dependent (II) and subject to the enforcement of the regulations are still low (K7), cooperation between sectors is still weak (K15); waterways not well ordered (K3), construction and layout of the pond is still traditional (K4), infrastructure support from various sectors is still low (K5) located at sector IV (independent). The role of the sub parliaments become more apparent in the hierarchical structure (Figure 3) which shows that the sub parliaments in the level of enforcement of regulations is still low (K7); cooperation between sectors is still weak (K15), the drains have not laid out well (K3); construction and layout of the pond is still traditional (K4); infrastructure support from various sectors is still low (K5) to be decisive for sub - elements which are at the upper level (level 5,4,3,2 and 1). Figure 3 gives the sense that the enforcement of the regulations are still low (K7), cooperation between sectors is still weak (K15); waterways not well ordered (K3), construction and layout of the pond is still traditional (K4), infrastructure support from various sectors is still low (K5) affect other sub Elmen in realizing sustainable shrimp farming.

Table 6. Results of the final matrix element reachability constraints in the management of sustainable shrimp farming area in the Gulf coast of Banten.

No.	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13	K14	K15	Drv
K1	1	1	0	0	0	0	0	0	1	1	1	0	1	0	0	6
K2	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	3
K3	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	13
K4	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	13
K5	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	13
K6	1	1	0	0	0	1	0	1	1	1	1	1	1	1	0	10
K7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
K8	1	1	0	0	0	1	0	1	1	1	1	1	1	1	0	10
K9	1	1	0	0	0	0	0	0	1	1	1	0	1	0	0	6
K10	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
K11	1	1	0	0	0	0	0	0	1	1	1	0	1	0	0	6
K12	1	1	0	0	0	1	0	1	1	1	1	1	1	1	0	10
K13	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	3
K14	1	1	0	0	0	1	0	1	1	1	1	1	1	1	0	10
K15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
Dep	12	14	5	5	5	9	2	9	12	15	12	9	14	9	2	
level	3	2	5	5	5	4	6	4	3	1	3	4	2	4	6	

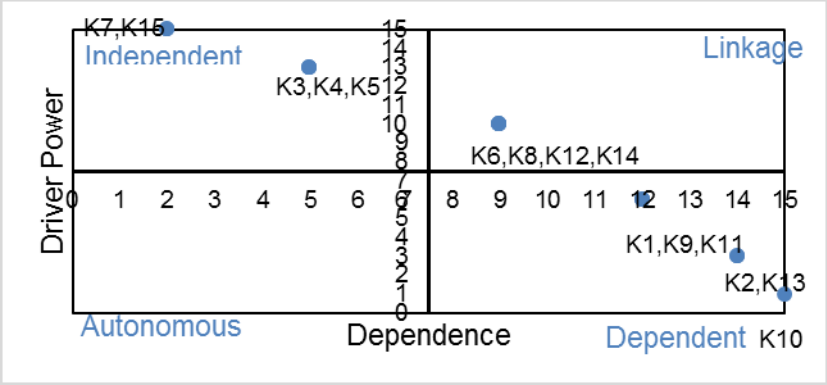

Figure 6. Matrix Driver Power and Dependence on institutions that play a role of element.

Conclusion

Facilities and infrastructure for the production of simple and competent human resources and the utilization of the balance by the relevant sector is a key element to realize the management of shrimp farming sustainable in the Gulf coast of Banten While the main obstacle is the enforcement of the regulations remains low and cooperation between sectors is weak. To realize the management of shrimp farming area in the coastal bays sustainable offerings, the institution most responsible among other institutions are universities and the research institutes.

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