RESOURCE MANAGEMENT ANALYSIS OF AQUACULTURE SUSTAINABILITY
(The Case Studies Floating Net Cages Reservoir at Cirata)

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Freshwater aquaculture resources by utilizing open access aquatic such as reservoirs widely used for floating net cages fishery. Activities floating net cages aquaculture should be managed in a structured to balance the economic value to be obtained open access aquatic with ecological values common in the future. Freshwater aquaculture is not independent of environmental conditions climate change in weather from dry season to rainy season which led to trun over Cirata reservoir. This study aims to analyze the management of fishery resources sustainable freshwater aquaculture. The technique of taking respondents conducted by purposive random sampling. The analytical tool used Rapfish models for freshwater aquaculture. Resource management of freshwater aquaculture sustainable approach analyzed the ecological, economic, technological, social and institutional arrangements of local government. Based on the results of research resources management of freshwater aquaculture in Cirata economic and social dimensions of institutional support sustainable resource use open access aquatic for aquaculture, while the dimensions of ecology, technology and regulations of local government has not supported the sustainability of resource management for the general freshwater aquaculture using floating net cages.

Keywords: climate change, managing, reservoirs, floating net cages, rapfish.

Introduction

Resource management of freshwater aquaculture in open access by utilizing Cirata is one of the local government's efforts to optimize the function derivatives from Cirata, thus providing direct benefits to the community affected the construction of Cirata reservoir. The impacts of climate change on fisheries and aquaculture are significant as aquaculture environments are very sensitive to environmental perturbation. The biophysical changes as well as the socio-economic impacts on communities are major challenges in aquaculture and fisheries sectors under climate change scenarios (Yazdi and Shakouri 2010; Cheung et al. 2009).

Global warming which also happened in Indonesia has been impacts to productivity of freshwater aquaculture in Cirata, West Java. Other climatological parameters such as rainfall, moisture, and wind speed had not regularly on every year, because of year-to-year shift is relatively hard to predict. Condition Cirata until recently has been experienced environmental degradation is very serious. The area of the reservoir was more and more narrow with increasing water depths decreases. Depth waters Cirata are either degraded where the maximum depth of only 89 m compared to the first time the reservoir is operated depth reaches 106 m (BPWC,2014). Weather caused transition of mature fish died unexpectedly. This is thought due to changes in the weather so that rain water that goes into made oxygen reservoir water reservoir is reduced and make the fish can not adapted.

Climate change will affect fisheries and aquaculture via acidification, changes in sea temperatures and circulation patterns, the frequency and severity of extreme events, and sea-level rise and associated ecological changes. Both direct and indirect impacts , include impacts on targeted populations' range and productivity, habitats and food webs as well as impacts on fishery and aquaculture costs and productivity and fishing community livelihoods and safety (Daw et al., 2009; Badjeck et al ., 2010).

Multi function Cirata Reservoir for hydro-electric generation, flood control and to provide potable water and for multipurpose (World Commission on Dams, 2000). Reservoirs are built, large communities living in the potential impoundment area can be displaced, depriving them of their traditional livelihoods, often leading to discontent and conflic with authorities and governments (Mc Cully 1995; Roy 1999).

Material and Methods

The data used in this research were collected using the survey method from both primary and secondary sources. Methods of analysis used in this research, which aims to determine the level of sustainability of fishery, is the Rapfish technique (A Rapid Apprasial Tehnique For Fisheries). The reason of choosing the Rapfish's MDS approach is its stability. The multi-dimensional approach to scaling in Rapfish gives stable results (Pitcher, 1999) compared to dual variable method.

Result

Climate change involves a complex of effects that collectively may dramatically modify the natural environment and have profound influence on the world's fisheries, most of which are likely to be judged as negative. As every fisherman knows, change is a constraint the reservoir harvesters and fisheries dependent communities have coped with change throughout history and continue to do so. For example, atmospheric and reservoir temperature variability and the resultant shifts in reservoir currents appear to have contributed to large-scale and catastrophic decreases in fisheries productivity, including crashes of reservoir Cirata. Predicted fisheries effects of climate change fall into two classes: those associated with the biological health and viability of fish stocks, and those that impinge on the safety or the social, cultural, and financial sustainability of fishermen and fishing communities.

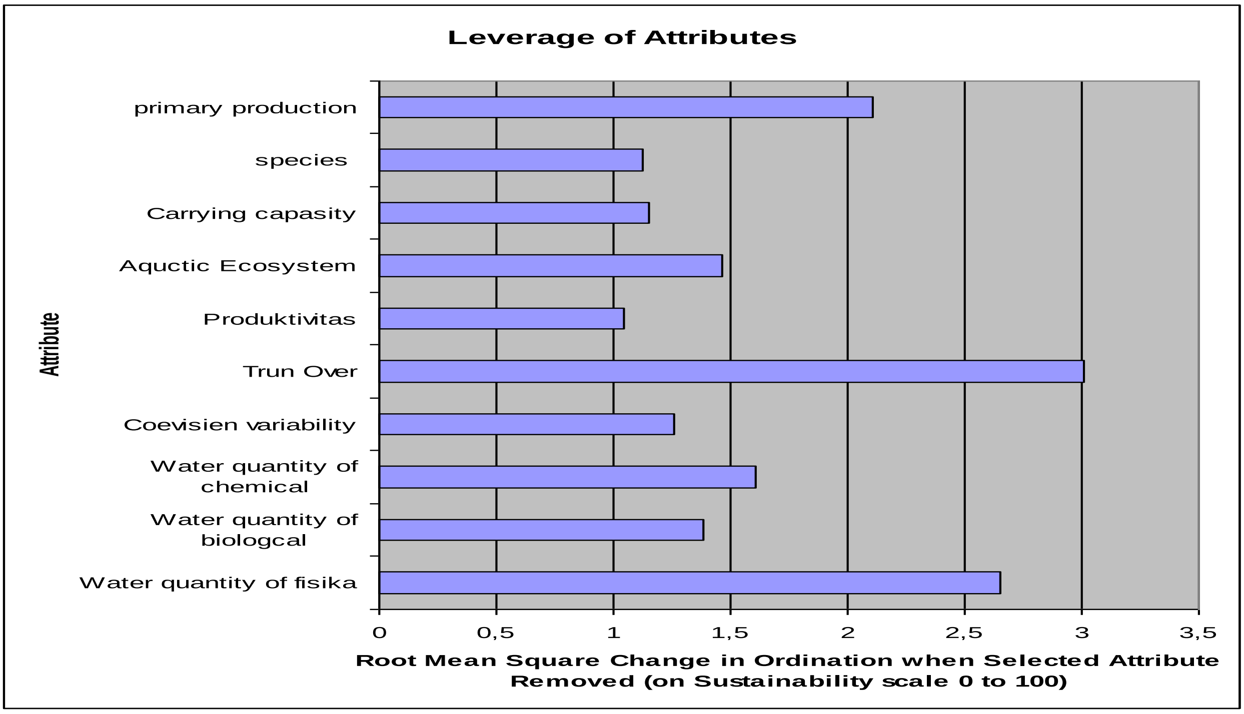

Fig 1. Ecological Sutainability

Ecological parameters indicates the condition of turn over is higher than the productivity effect of climate change means lower productivity result of turn over (Fig 1). Climate change effect on water quality either biological, chemical and physical. Water quality temperature is one of the factors that influence the absorption of nutrient metabolism and survival of fish. The optimal temperature range for growth and reproduction of reach 28-30^0 C. Water temperature at the study site ranged from 29-30^{0}C can be concluded from these data is still in the range that is optimal for fish life.

Brightness, minimum turbidity occurred in the waters east of the season but did not last long because the surface layer circulation is good enough caused the suspended silt carried into aquatic wide. Brightness can be used as an indicator of fertility waters, although the brightness can be affected by mud particles, plankton and other particles. The brightness level is monitored during maintenance ranged between 3-7 meters well enough for marine finfish aquaculture.

Oxygen, the content of dissolved oxygen in the surface waters of the inner layer varies ranging from 5.0 to 7.11 ppm. The pH values in waters having variations by location, depth and season. In the dry season pH ranged from 8.04 to 8.71% neath the surface; 7.16 to 8.10 in the rainy season from 7.51 to 7.62; transition season ranged from 7.8 to 7.91. The degree of acidity (pH) is one of the important parameters in determining the quality of the water. pH during the study ranged from 7 - 8 categorize the level of fertility waters based on pH value that is not productive (5.5 to 6.5), productive (6,5 - 7,5), very productive (7.5 to 8.5) and a suitable range for fish is 6.5 to 8.5. Thus, the pH of the water in the study area is relatively stable with the level of fertility and the productive waters suitable for fisheries.

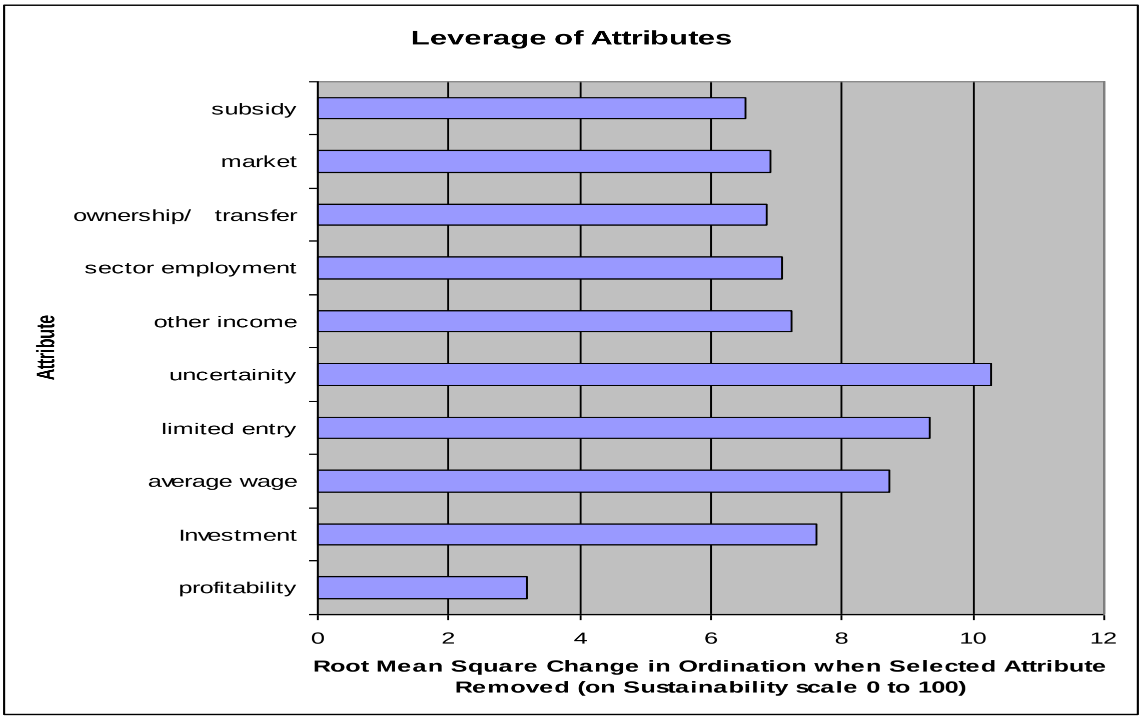

Fig 2 Economic Sustainability

Economic parameters showed the value high uncertainty due to climate change that occurred In the cultivation of floating net cages , resulting in lower profit from floating net cages activities with high investment costs, requiring government support to subsidize feeding(Fig 2).

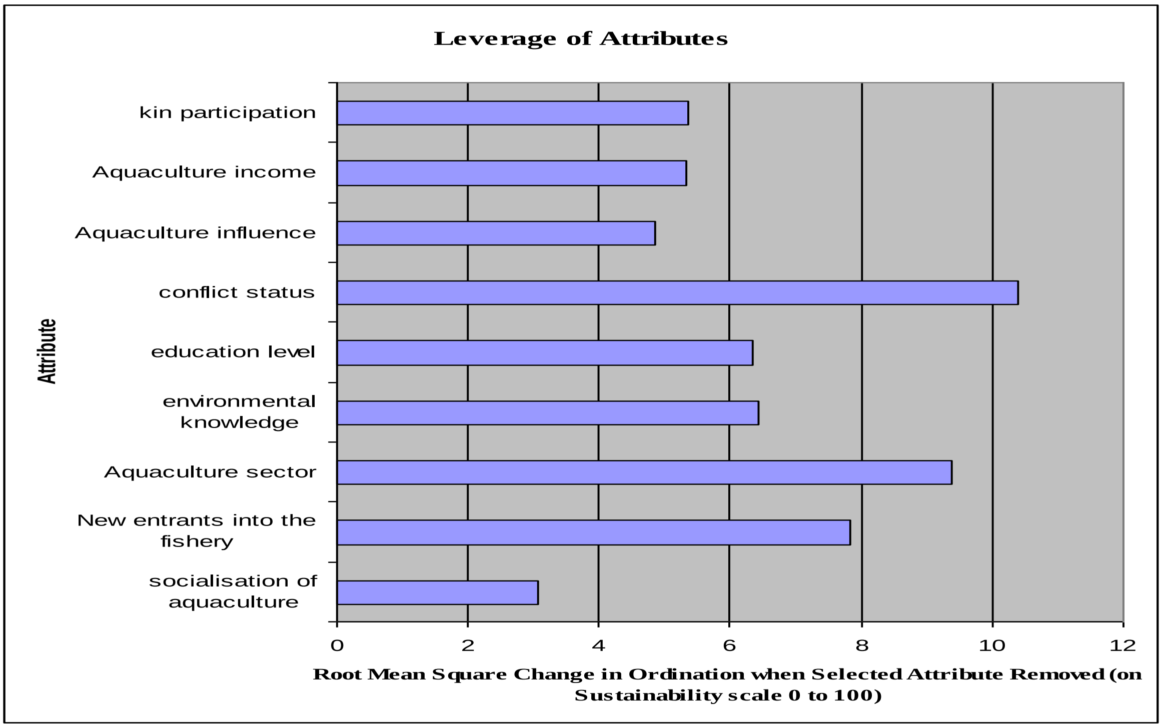

Fig 3 Social Sustainability

Social parameters ownership conflicts between local communities floating in net cages use with the outside community, so it is necessary to the making of a determination of the location of floating in net cages . Income of local people was still depend on the activity of floating in net cages floating in net cages, so that the necessary knowledge through formal and informal education about aquaculture floating in net cages and environmental knowledge about natural resources (Fig 3).

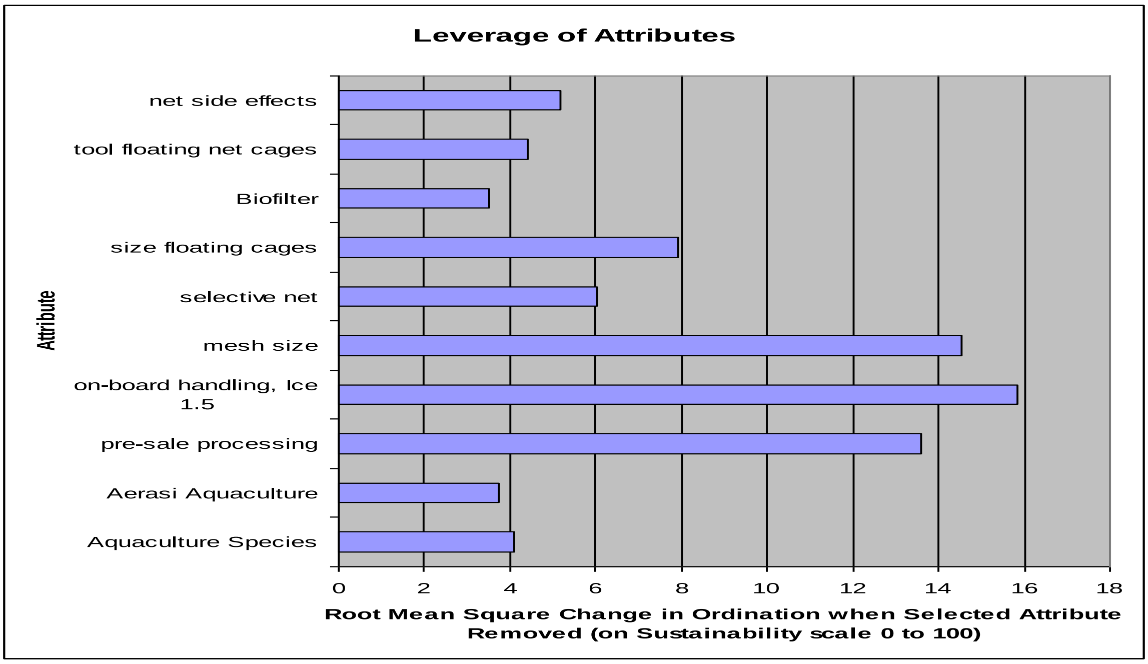

Fig 4 Technology Sustainability

Technological parameters of handling result of climate change is the main yields to maintain the freshness of the fish and value-added processing of fishery products. KJA cultivation technology by taking into account the size of the nets and equipment KJA to reducing losses due to climate change, such as the presence of aquaculture biofilters and aeration (Fig 4).

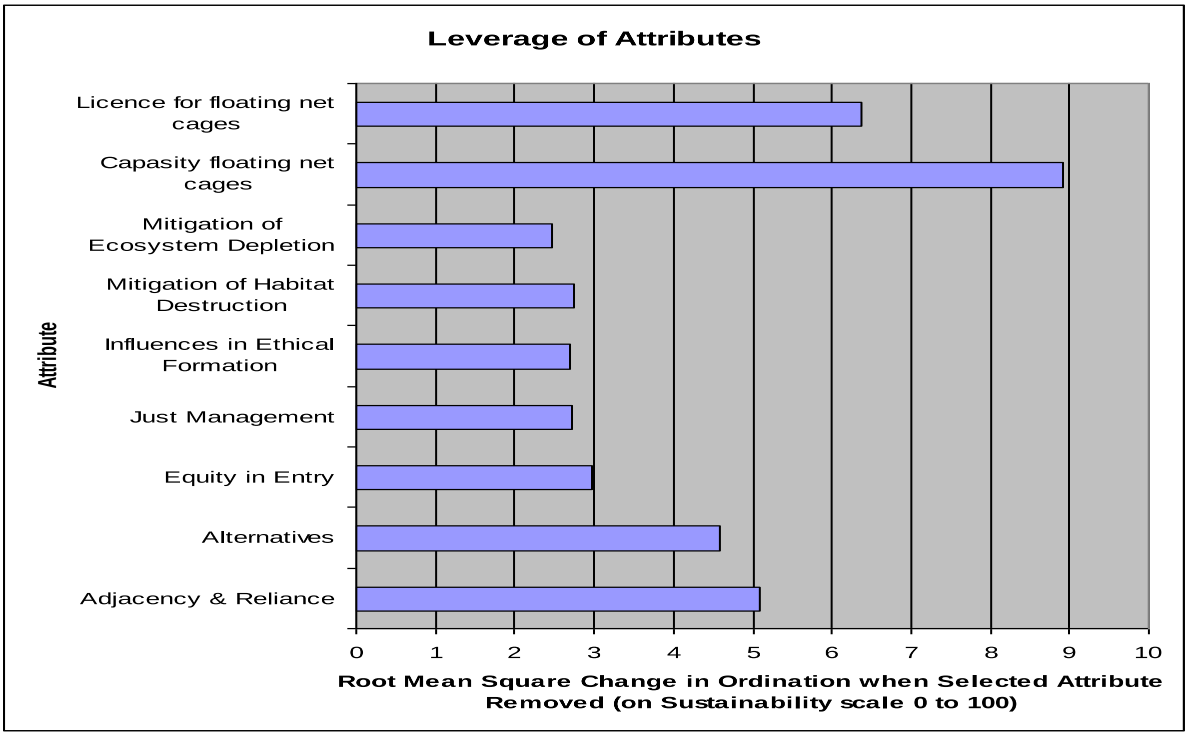

Fig 5 Regulations Sustainability

Regulations parameters are in the the local government policy in determining the capacity of KJA, KJA business license.(Fig 5). A 'fishery' includes both societal and ecological subsystems that are interdependent. In the context of climate change, 'stresses and disturbances' are the cumulative and acute drivers of change related to climate. Although this definition emphases external processes, were that resilience may be threatened by the sum of multiple stressors, both external and internal, and the cumulative effects of one or several of them over time. Most fishery sector analysts regard the harvest itself as the greatest single threat to the resilience of the fishery system (World Bank, 2004; FAO, 2007)

Cage aquaculture using plankton-feeding fish (e.g. bighead and silver carp) was introduced in the reservoir. There was no need for external inputs as the fish feed on naturally occurring plankton. As a starting point, we adopt the working definitions of the Intergovernmental Panel on Climate Change (IPCC, 2001): "Vulnerability is the extent to which climate change may damage or harm a system; it depends not only on a system's sensitivity, but also its ability to adapt to new climatic conditions"

Thus individuals and societies are vulnerable to climate risks and other factors and this vulnerability can act as a driver for adaptive resource management, of the kind already seen in many small-scale fisheries subject to climate-driven and other uncertainty (Allison & Ellis, 2001; Jul-Larson et al., 2003). Co-management approaches to fisheries can benefit local communities by giving them more control over their resources. Fisheries management can conduct climate-change risk assessments and allow for the costs of adaptation and the potential changes in economic contributions from the fishery sector under likely climate sserios in their sectoral planning. Economists, sociologists, and development special -ists tend to approach the " fisheries and aquaculture sector " as a single entity that with enlightened guidance (and funding) will respond rationally to economic forces and will change operational behaviors to maximize financial return.

Conclusions

Based on the results of research resources management of freshwater aquaculture in Cirata economic and social dimensions of institutional support sustainable resource use open access aquatic for aquaculture, while the dimensions of ecology, technology and regulations of local government has not supported the sustainability of resource management for the general freshwater aquaculture using floating net cages. This research results uncertainties around estimating future climate change impacts on fisheries are high, responding to future climate change threats is largely compatible.

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