Optimising of Smart Integrated Near Shore Fish Aggregating Device for Indonesia Ocean Base on Blue Economy

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Abstract: Small island communities in developing countries depend on income in the capture fisheries sector. They use traditional equipment to catch fish. Most Indonesian people use a kind of floating building on the sea with the addition of sago palm leaves to attract fish to gather there. So that makes it easier for fishermen to find spots for gathering fish. But sometimes people often find their FADs empty, even though to go to the clump, funds are needed for the needs of the ship's engine fuel, as well as environmental conditions that sometimes turn out to be very extreme and endanger fishermen. Therefore, we made smart integrated FAD innovations where we design environmentally friendly, sustainable, and capable FADs that can be monitored from the ground to illustrate the condition of FADs if there are fish there, making it easier for fishermen to make decisions when they should go to catch fish. In this paper, the author connected FADs technology with fish trading to know about fish price base on the shore. It will help the businessman to make some decision making for their fish business and know when they must save their asset.

1 INTRODUCTION

Indonesia people have an extraordinary dependence on fish for food. Fish consumption in Indonesia, which is based mainly on small-scale subsistence and commercial fishing for fish associated with coral reefs, and large pelagic fish (including tuna), is several times higher than the global average (Bell JD,2009). Fish typically supplies 50–90% of dietary animal protein for coastal communities (Bell JD,2009) and in 10 Indonesia per capita fish consumption in these communities exceeds 70 kg yr [1]. As the human populations of Indonesia grow, governments have been encouraged to provide access to at least 35 kg of fish per person per year (Fish and food security,2008), or maintain higher traditional levels of fish consumption where they occur (Bell JD,2009), for two reasons. First, fish is rich in protein, essential fatty acids, vitamins and minerals (Ros N,2007), and is a logical cornerstone for food security given the high levels of subsistence and scarcity of arable land on many of the islands. Second, increased access to fish provides a healthy alternative to the nutritionally poor imported foods now pervading Indonesia diets (Cassels,2006). Greater consumption of fish and other traditional foods is needed to combat the high prevalence of non-communicable diseases in the region (Bell JD,2015). For many Indonesian people, the problem is that the production of fish from coral reefs will not yield the recommended 35 kg of fish per person per year or continue to supply the traditionally higher quantities of fish, as human populations grow. Several other Indonesian people will have problems distributing fish from remote reefs to urban centres.

To provide access to the recommended quantities of fish, these Indonesian people will need to allocate more of the tuna caught within their waters to local food security. Across the region, tuna will need to provide 12% of all fish required for food security by 2020, and 25% by 2035 (Bell JD,2015). Although the amount of tuna needed in 2020 and 2035 represents only 2.1% and 5.9%, respectively, of the present-day industrial catch from the combined exclusive economic zones (EEZs) of Indonesian people (Bell JD,2015), there are considerable challenges involved in distributing this tuna to the growing coastal and urban communities.

One of the most practical ‘vehicles’ for improving local access to tuna is installation of nearshore fish aggregating devices (FADs). Nearshore FADs are based on observations that tuna and other large pelagic fish are attracted to floating

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objects and often stay in their vicinity for several days. Nearshore FADs differ from the drifting FADs and large anchored FADs used by industrial tuna fleets because they are usually placed closer to shore in depths of 300–700 m.

Nearshore FADs increase the supply and consumption of fish in rural communities (Albert JA,2014) and have been progressively improved over the past 20 years to increase their working life and reduce their cost. Analyses of the cost: benefit of nearshore FADs in Indonesia Islands and show that the value of tuna and other pelagic fish caught around them exceed their costs by 3–7 times (Chapman L,2005). Other studies, comparing catch-per-unit-effort (CPUE) and fuel consumption of small-scale fishers operating with and without nearshore FADs demonstrate that: CPUE near FADs is 7 to 23 kg h greater, and average fuel consumption by fishers operating around FADs is 0.5 L lower, than when fishing is not associated with FADs. Recent research also shows that nearshore FADs provide returns on investment (internal rate of return) ranging from 80% to 180%.

There is also recognition that regular use of nearshore FADs could have two other possible benefits. First, it provides communities with the opportunity to transfer some of their fishing effort from coral reefs to oceanic fisheries resources and intervention expected to help prevent over-exploitation of coral reef fish and maintain the normal representation of important functional groups of fish (e.g. herbivores) associated with coral reefs required to assist these ecosystems to adapt to climate change. Nearshore FADs could enhance the success of coral reef management initiatives, e.g. those by the local marine managed area networks and give challenge[4], by providing practical ways for people to continue to catch pelagic fish when regulations are introduced to help coral reefs recover from overfishing and other local stressors, e.g. through designation of temporal or spatial fishing closures.

Despite the promise that nearshore FADs hold for improving access to tuna and other pelagic fish for coastal and urban communities, and for improving the management of coral reefs, extensive planning, monitoring and research are needed to reap all the potential benefits of FADs. Indeed, considerable caution is required to implement FAD programmes so that they do not fall into the same category as the many technically viable and seemingly sensible ‘solutions’ littering the region that have failed.

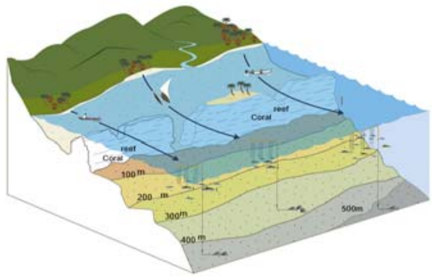

Figure 1: Concept of FADs.

This paper describes the investments, over and above the costs of construction and deployment, needed to optimise the use of nearshore FADs for improving access to tuna and other pelagic fish for the food security of rural and urban communities in Indonesia Island countries and territories.

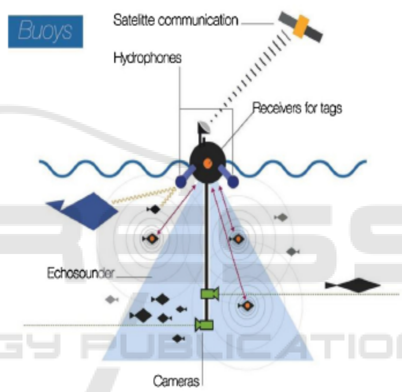

Figure 2: Concept of smart FADs.

Echo-sounder buoy technology is evolving rapidly and manufacturers, through collaboration with scientists, have already begun to solve the challenges associated with acoustic measurements on autonomous platforms, such as energy requirements and remote target classification. As Handegard et al. (2013) stated, one of the major constraints when dealing with remote devices is the lack of biological sampling for verifying taxonomic composition and validating the conversion of acoustic backscatter into biologically relevant measures such as biomass. In this regard, some buoy manufacturers have begun to integrate multiple frequencies into their echo-sounder buoys. This should allow for increased success in species discrimination capability, especially between swim-bladder (Yellowfin and Bigeye tunas) and non-swim bladder (skipjack) tunas.

The investments summarised here offer a pathway for increasing the availability of tuna and other pelagic fish for rural and urban communities in Indonesia Island countries and territories. Indeed, they represent some of the most practical ways of allowing these com-munities to obtain the relatively small share of the region's rich tuna resources they need for food security.

In addition to providing a platform for improved public health, such investments also promise to be win–win adaptations to climate change. In particular, national FAD infrastructure should help supply more fish for growing populations in the short term and provide a continued source of fish as coastal fisheries decline due to the degradation of coral reefs caused by increasing sea surface temperatures and ocean acidification. Even in Indonesian people where the abundance of tuna is projected to decrease as climate change causes an eastward shift in their distribution, nearshore FADs are likely to contribute to the needs of growing rural populations for two reasons. First, relatively large numbers of tuna are expected to remain in the EEZs of countries in the western Indonesia by 2035. Second, the percentage of average tuna catches from the EEZs of all Indonesian people required for local food security in 2035 is low (0,6%).

The outcome of the proposed suite of investments described here provides a blueprint for planning the installation of FADs as part of the national infrastructure for food security in Indonesian people. Such investments need to be given priority in national development plans because the number of nearshore FADs presently deployed in Indonesian people is estimated to be well below the numbers likely to be needed by coastal communities. Other benefits of the proposed investments will be more robust information about the quantities of tuna and other pelagic fish likely to be harvested from FADs, and the cohesive community arrangements needed to reap the full range of benefits.

Once the FADs have been deployed in rural and urban areas, it will be imperative to maintain this infrastructure. If FADs are not replaced as soon as practical following loss or damage due to storms, vandalism or fouling by coastal shipping, the momentum involved in creating opportunities to provide the additional fish needed for food security and transferring fishing effort from coral reefs to oceanic fisheries resources, will be lost.

Even though co-management of FADs is essential, national and provincial governments, or their development partners, should bear the main responsibility for the replacement of FADs lost or damaged under circumstances beyond the control of communities because small-scale fishers are unlikely to have the resources to replace FADs quickly. In much the same way that farmers are not expected to repair roads and bridges damaged by floods, build wharfs, provide shipping or construct marketplaces to sell their food (except through payment of taxes), small-scale fishers should not be expected to shoulder the cost of providing infrastructure that is so important to national food security. This is the domain of governments. However, communities should be custodians of investments made on their behalf and maintain FADs to improve the working life of these assets. Also, where FADs are lost due to negligence, vandalism or sabotage by community members, the onus should be on communities to replace them.

The prime requirements for replacing lost FADs quickly are stockpiles of spare parts in provincial areas, together with access to the vessels, staff and operating budgets needed to install new FADs. The budgets of national and provincial fisheries agencies are not presently large enough in most Indonesian people to cater for the replacement of FADs in this way. Therefore, national planning offices should alert development partners about the importance of nearshore FADs to local food security and request the resources needed to maintain the required stocks of FAD materials and specialised staff. Importantly, stockpiles of spare FADs should be replenished regularly and maintained above threshold levels.

It is also important that national governments are committed to, and have ownership of, FAD programmes. In particular, there is scope in several Indonesia Island countries for using some of the substantial licence revenues received from distant water fishing nations to help fund nearshore FAD infrastructure. In those nations where industrial fishing companies deploy large anchored FADs for use by purse-seine vessels, e.g. PNG and Solomon Islands, arrangements could also be made with such companies to assist with the installation of nearshore FADs needed for local food security.

Although the investments discussed here apply to a broad range of Indonesian people, it will be important to ensure that FAD programmes in each country or territory are developed within the national or provincial context. Differences in local governance among (and sometimes within) Indonesian people mean that attempts to apply 'one-size-fits-all' approaches are likely to add further complexity to the implementation of FAD programmes.

2 BLUE ECONOMY CONCEPTS

The Blue Economic Concept provides an opportunity to develop more economically and environmentally sound investments and businesses, utilize natural resources more efficiently and less environmentally, produces more efficient and cleaner systems, produces greater products and economic value, increase labour absorption, and provide an opportunity to benefit each contributor more fairly.

The Blue Economy will ultimately ensure that development will not only generate economic growth, but also ensuring ecological and social sustainability. In general, the Blue Economy can be understood as an economic model to encourage sustainable development with a mind-set such as the workings of ecosystems. This is not independent of the principles that exist in the Blue Economy concept, namely:

1. Natural resources efficiency.
2. Zero waste leave nothing to waste. Waste for one is a food for another waste from one process is resource of energy for the other.
3. Social inclusiveness, self-sufficiency for all, social equity more job, more opportunities for the poor.
4. Cyclic system of production, endless generation to regeneration, balancing production and consumption.
5. Open- ended innovation and adaptation, the principles of the law of the physics and continuous natural adaptation.

3 CONCLUSION

Installation of nearshore FADs is one of the few interventions that could provide access to the additional fish needed for good nutrition of Indonesia people, particularly in rural coastal areas. To ensure that nearshore FADs fulfil their potential to become an important component of national infrastructure for food security, it is imperative that investments in FAD programmes are not limited to improving the logistics of installing FADs. Investments must also extend to the participatory processes needed to identify those com-munities that are most in need of FADs, committed to sharing the benefits equitably, and prepared to engage with government agencies and their development partners in the maintenance of FADs. Smooth co-management of nearshore FADs by communities, provincial and national governments will not only help optimise the potential contributions of tuna and other pelagic fish to local food security, it will set the stage for determining whether nearshore FADs add value to management initiatives for coral reefs by transferring some fishing effort to oceanic fisheries resources.

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