



Effects of rapid livelihood transitions: Examining local co-developed change following a seaweed farming boom



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ABSTRACT

This paper examines the development and effects of a rapid livelihood transition on households, and reflects on how it fits within historic trends of livelihood change for people living in highly variable and vulnerable environments. It also discusses the implications of livelihood dynamism for local governance of natural resources. In recent decades, seaweed cultivation has expanded exponentially in coastal communities across the Asia-Pacific. A case study is presented of a remote small-island community in eastern Indonesia where over the last ten years a dramatic shift in livelihood focus has occurred. Previous dependence on diverse low-productivity livelihood activities transitioned to a predominant focus on seaweed farming. The case shows how social, economic and cultural environments co-develop as people move out of conditions of collective poverty and into more nuclear household-oriented livelihood activities. Specific attention is given to the influence on a marine resource co-management program operating on the island to illustrate how local livelihood dynamics relate to broader paradigm-driven conservation and rural development initiatives. While alternative livelihood programs seek to relieve pressure on resource stocks and provide opportunities for coastal people, this case study provides timely insights into the kinds of unintended effects, trends and impacts that are associated with rapid change in the way people make a living. This study argues that, in addition to achieving higher standards of income and well-being, livelihood improvement interventions need to adequately ensure that conditions under which new livelihood arrangements come to function can be maintained locally.

1. Introduction

As part of an increasingly urgent endeavour to achieve sustainable livelihoods along coastal areas in the Global South [1], conservation and development initiatives seek to address the multiple pressures acting on coastal environments and on the livelihoods of those who directly depend on them. The interactions between local resource users and coastal resource stocks are central to these discussions, whereby achieving sustainable resource use, empowering marginalized groups, and developing dependable means of income feature as prominent objectives [2,3]. These objectives meet both challenges and opportunities in the expanding worldviews and technological advances associated with the broader regional and global trends in growing market networks, environmental change (e.g. climate change) and globalization [4,5] that are increasingly influencing how local people make a living. The associated rates of change taking place in communities vary; often pioneering social, economic and political changes precede the kind of cultural changes that find more permanency in a society.

Understanding how these changes relate to each other can begin to explain livelihood development challenges. Such challenges are particularly pertinent in the coastal zones of the Arafura and Timor Seas (ATS) region, and the broader insular South East Asia region, where resource dependent livelihoods are highly vulnerable to marine resource degradation [6,7].

Developing alternative livelihoods has become a widely actioned strategy to cope with environmental challenges [8–11]. In their analysis of livelihood approaches in the context of Integrated Coastal Management (ICM), Sievanen et al. [12, p.298] outline how the justification of alternative livelihood strategies for small-scale fishery (SSF) communities tends to be based on several assumptions. Firstly, SSF-dependent people are poor and, given their assumed food insecurity and poverty circumstances, most likely to be exploitive of resource stocks. Secondly, people's primary occupational and livelihood activities, such as fishing, are willingly let go in preference for other more lucrative activities. Lastly, pursuing alternative livelihood activities that generate a higher income than fishing relieves the pressure on wild marine resource

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stocks and ecosystems.

This paper critically addresses these assumptions following recent literature on policy and management of SSF and coastal livelihoods [10,13,14]. Moreover, how livelihood changes evolve and gain prominence in people's lives over time – whether as a result of conscious intervention or spontaneous (economic) development – remains understudied. This study seeks to fill this gap by describing a sequence of livelihood changes that occurred with a boom in seaweed cultivation in a small-island community over a ten-year period. Resulting societal costs and spin-offs that significantly changed the island's livelihood landscape were examined. Particular attention was placed on how these changes affected the development of sustainable marine resource management practices through a community-based conservation program on the island.

Few examples exist where coastal livelihood activities in South East Asia have expanded at a rate and extent similar to seaweed cultivation over the last three decades. Fuelled by demand-driven markets in China for hydrocolloids, the global production of tropical carrageenophyte seaweed has grown exponentially. Indonesia's contribution to this production has shown similar exponential growth. Indonesia's seaweed industry predominantly involves the cultivation of seaweed from two genera, *Kappaphycus* (commonly known as cottonii) and *Euchema* (commonly known as spinosum), used to produce hydrocolloids such as carrageenan.¹ Although evidence shows that trade and cultivation of seaweed in South East Asia dates back to World War Two [15], the first significant commercial production of seaweed in Indonesia began around 1985 in Bali following successful production taking flight in the Philippines [16]. Since then, cultivation has spread to Sulawesi, which now forms the centre of seaweed production in Indonesia [17]. When in 2006 it was estimated that the Chinese market for seaweed would grow more than 10% per year [18 In: 19], the Indonesian government expressed its ambition to develop the domestic sector so as to surpass the Philippines as the main producer of carrageenophyte seaweed [20]. In 2008, only half of the estimated 770,000 ha of total suitable coastal seaweed farming area in Indonesia [21] (around 380,000 ha) was in use, indicating significant potential for expansion. By 2010, Indonesia had become a major global producer of raw carrageenophyte seaweed, claiming two-thirds of the world tonnage and value [19]. Continual expansion means seaweed cultivation is spreading to the eastern provinces of Maluku and Papua, partly due to favourable local physical conditions [20] and partly to longstanding national rural development strategies promoting smallholder economic entrepreneurship [21,22]. Current coastal livelihood development programs in Indonesia all identify seaweed farming among the top potential alternative livelihood options for communities seeking to sustainably improve their income from the sea [9,23,24].

Interestingly, the rise of seaweed farming in Indonesia developed strongly from the bottom-up along chains of local traders/collectors and farmers [19]. Growth of the industry occurred within sophisticated yet largely informal trade networks connecting producers to middlemen and collectors to exporters. Indicative of this is how value-added processing was relatively late to follow the boom. Most exports still involve raw dried seaweed, as opposed to the higher value semi-refined or refined carrageenan. In 2013, only 16 processing plants in Indonesia were capable of producing semi-refined carrageenan, although the Indonesian government continues to encourage the development of more processing plants to allow for more in-country value-adding prior to export [19]. Locally, the market sector's expansion has led to exceptionally rapid adoption of seaweed cultivation across households in many coastal communities [for examples see 12, p.300], as with the case discussed in this paper. The rapid transition of livelihoods that has occurred in these rural coastal regions provides a unique snapshot of

how people's ways of life have changed and what the broader implications have been for livelihood and environmental sustainability. With expectations for further industry growth, and associated expansion of seaweed cultivation across shallow coastal areas in Indonesia, such an enquiry is necessary and timely for coastal communities, including those in the ATS region.

2. Methods

This study was carried out as part of an ongoing transdisciplinary research collaboration beginning in 2006 between the authors and a small island-community living in Tanimbar Kei, eastern Indonesia. It is embedded within a broader co-management program oriented towards developing sustainable and viable marine resource management regimes to improve island-based livelihoods and environmental quality [25]. This particular study draws from a mixed methods qualitative approach, involving in-depth interviews carried out with seaweed farming households, traders and community leaders (n=26), and focus group discussions (FGDs) (n=6), all carried out between 2014 and 2016. Data from seaweed harvest monitoring conducted since 2012 were also analysed, involving the selection of three samples of ten seaweed farming households from the three respective hamlets in the village.² Data were collected on a monthly basis through tabled harvest monitoring sheets, by which enquiry was made into the total amount of (dry) seaweed harvested and processed that month. Although seaweed monitoring started in 2010, the study draws from four years of data collected (2012–15). Data collection was carried out by community members as part of their role in a participatory resource management program facilitated through the Indonesian Locally Managed Marine Area network (I-LMMA). The first two years of data collection were used to train, refine and improve data collection methodology consistency and accuracy. Data sets gathered since 2012 were further triangulated to ensure reliability. In addition to this ongoing seaweed production monitoring, interviews were carried out between 2014 and 2016 wherein farmers were asked to estimate their production in the years prior to 2012. These estimates were further discussed in the FGDs in each of the three hamlets, not only as a triangulation exercise, but also to enquire about broader livelihood impacts and reasons for differences in production level per year before 2012.

3. Results

3.1. Recent history of seaweed production in Tanimbar Kei

Tanimbar Kei Island is located in the Kei archipelago, a small group of islands in eastern Indonesia, in the north-eastern corner of the ATS (Fig. 1). It forms part of the district of Southeast Maluku, in Maluku province. The island of Tanimbar Kei is one of the outer islands of the archipelago, situated to the southwest of the main island of Kei Kecil, which in turn forms the administrative centre of the district. Partly due to the island's remoteness, the 120 or so households that make up the only community on the island exhibit considerable diversity and resilience in their livelihood strategies. As recently as 30 years ago, interaction with Kei Kecil was limited to as seldom as a single boat trip a week depending on seasonal conditions.³ Today, access to and from the island has increased to include regular daily motorized boat trips by local villagers and increasingly reliable telecommunication reception. The island is still not connected to common infrastructure networks, such as the electricity or water grid, so households typically generate

² The 'hamlets' referred to here are not administrative units, but rather geographically separate clusters of households that have formed around community social structures. The administrative village (*desa*) of Tanimbar Kei is the only village on the island and has no formal hamlets (*dusun*) in its structure.

³ Early sea transportation to Kei Kecil or elsewhere was largely by sail and depended on winds and sea conditions.

¹ Carrageenan's main application is in the food industry, as a thickening or gelling agent applied as an additive to a broad variety of products.

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