

## Personal Entrepreneurial Competencies among Seaweed Farmers in Sorsogon, Philippines

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Seaweed farming is a significant source of livelihood for many coastal communities in the Philippines. While it is one of the most profitable forms of aquaculture, seaweed farmers are nevertheless encouraged to participate in other business activities to provide financial security. Thus far, studies among seaweed farmers in the Philippines have primarily focused on production-related activities and market and value chains. Seaweed farmers' entrepreneurial skills have yet to be evaluated. In this study, we assess the capacity of seaweed farmers in Sorsogon, the Philippines, to undertake business ventures using the personal entrepreneurial competencies (PEC) test. We found that seaweed farmers exhibit moderate entrepreneurial competencies. There were significant differences found between the mean PEC scores across traits. "Risk-taking" and "demand for quality and efficiency" indicated a significant interaction with educational attainment. Entrepreneurial competencies among seaweed farmers may be improved by pooling tacit entrepreneurial knowledge among seaweed farmers, engaging in entrepreneurial education, and establishing and maintaining groups (cooperatives, clusters, or associations) to gain matched support from NGOs and government.

Keywords: agribusiness, education, efficiency, product quality, risk aversion

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Producing more than 1.30 million tons in 2021 and generating sales in excess of USD 213 million, seaweed production in the Philippines ranks second in terms of national export value (BFAR 2021).

Thousands of seaweed farmers across the Philippines have made seaweed cultivation a productive crop enterprise (Dumilag *et al.* 2023). Nevertheless, the role of seaweed farmers in the market and seaweed value chains is largely restricted to the sale of dried seaweed after harvest (Figure 1). While the availability of semi-refined processors is limited in some areas, most diversification of seaweed food products (mostly snack foods) in the Philippines is primarily buyer-driven, *i.e.* producers receive orders from buyers and exclusively cater to these specific demands (PEMSEA 2017; Ramirez *et al.* 2020).

There are many opportunities for value-added seaweed products to be developed by local communities (Andayog *et al.* 2020). The development of upstream value chains from harvesting to the production of different value-added products could help seaweed farmers achieve higher revenue. The process of upgrading these value chains could be facilitated by fostering entrepreneurship. This study delves into entrepreneurial competencies among

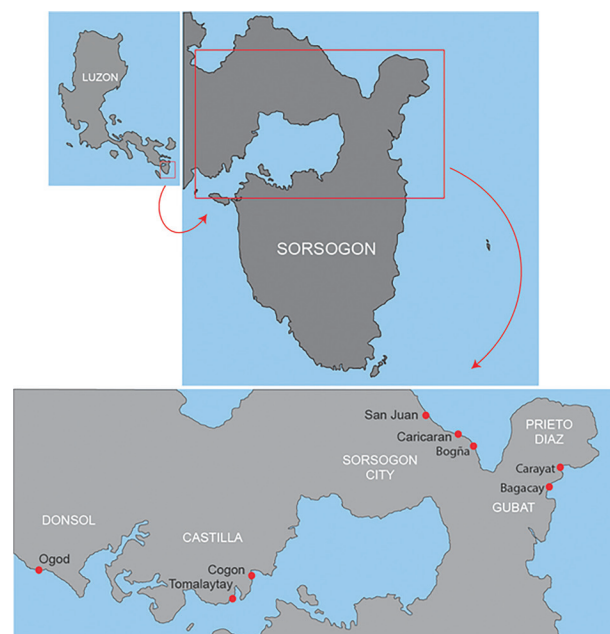
seaweed farmers. Competencies refer to the ability to perform specific tasks and are the results of entrepreneurial intention. The desire to engage in business requires a set of skills, attitudes, and behaviors that allow effective identification and pursuit of entrepreneurial opportunities (Hornaday and About 1971; McClelland 1987).

Cutting across various groups, a number of studies have confirmed the importance of evaluating entrepreneurial competency (Mitchelmore and Rowley 2010; Komarkova *et al.* 2015; Rațiu *et al.* 2023). Various scales have been developed to measure entrepreneurial intention (Liñán and Fayolle 2015), and one of the simplest and most widely used is the personal entrepreneurial competencies (PECs) test. PEC is a framework originally developed by McClelland (1987) that involves the assessment of 10 entrepreneurial characteristics: [1] opportunity seeking, [2] persistence, [3] commitment to work, [4] demand for quality and efficiency, [5] risk-taking, [6] goal-setting, [7] information-seeking, [8] systematic planning and monitoring, [9] persuasion and networking, and [10] self-confidence. There is a strong link between PECs and entrepreneurial motivation because those individuals with strong PECs are more likely to possess a higher level of willingness to start a new business (Cassol *et al.* 2022; Sampene *et al.* 2022; Tounés and Mahmoudi 2022).

The extent to which seaweed farmers are motivated to pursue business growth by upgrading their product outputs (Ponte *et al.* 2014) may be entrenched in their motives for entrepreneurship and a higher standard of living. Changing markets have led to new challenges for seaweed



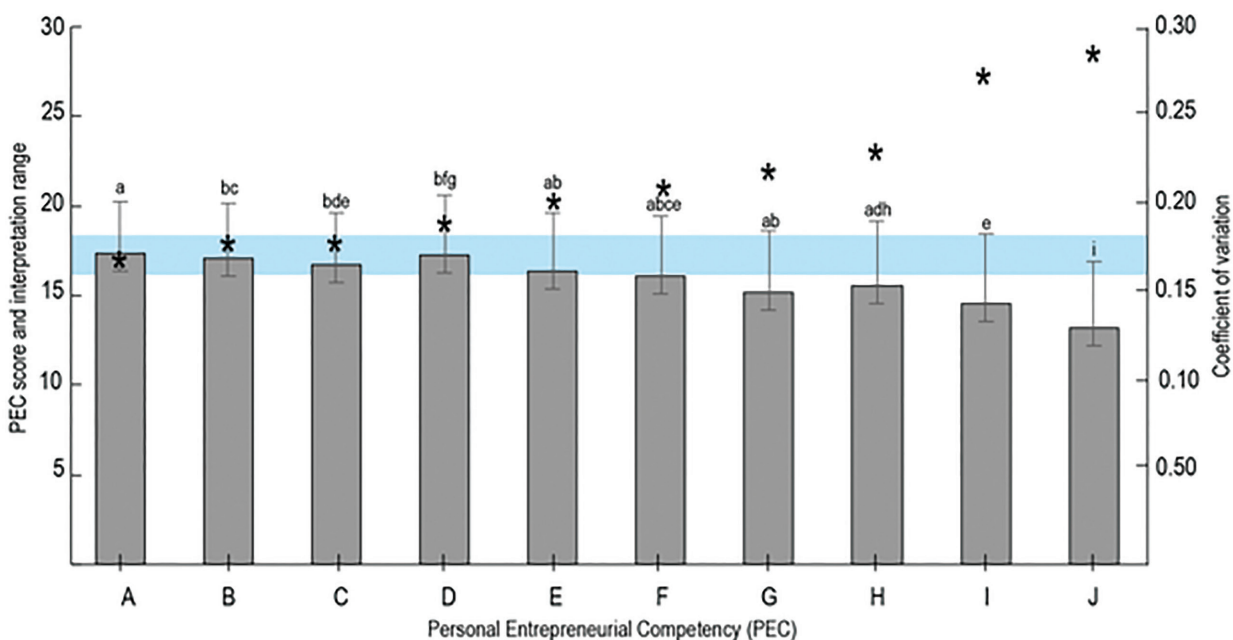
**Figure 1.** Seaweed drying in Sorsogon, Philippines. Seaweeds are either laid out on a paved road (A) or on trays (B) to sundry.



**Figure 2.** Map of the study site.

**Table 1.** Demographic variables examined in this study.

Demographic variable	Castilla		Donsol	Gubat	Prieto Diaz	Sorsogon City			All sites
	Cogon	Tomalaytay	Ogod	Bagacay	Carayat	Bogña	Caricaran	San Juan	
Total respondents	5	5	5	23	20	57	12	16	143
Sex (%)									
Male	20	0	100	65.2	40	57.9	91.7	93.8	64
Female	80	100	0	34.8	60	42.1	8.3	6.2	36
Mean age ± SD	47.0 ± 13.57	49.0 ± 10.13	49.6 ± 7.83	50.78 ± 4.80	52.1 ± 5.58	40.48 ± 3.32	45.68 ± 8.06	46.88 ± 5.06	45.90 ± 2.02
Educational attainment (%)									
Elementary	80	40	60	87	50	89.5	25	56.2	41.96
High school	20	60	40	4.3	35	3.5	50	43.8	50.35
College	0	0	0	8.7	15	7	25	0	7.69



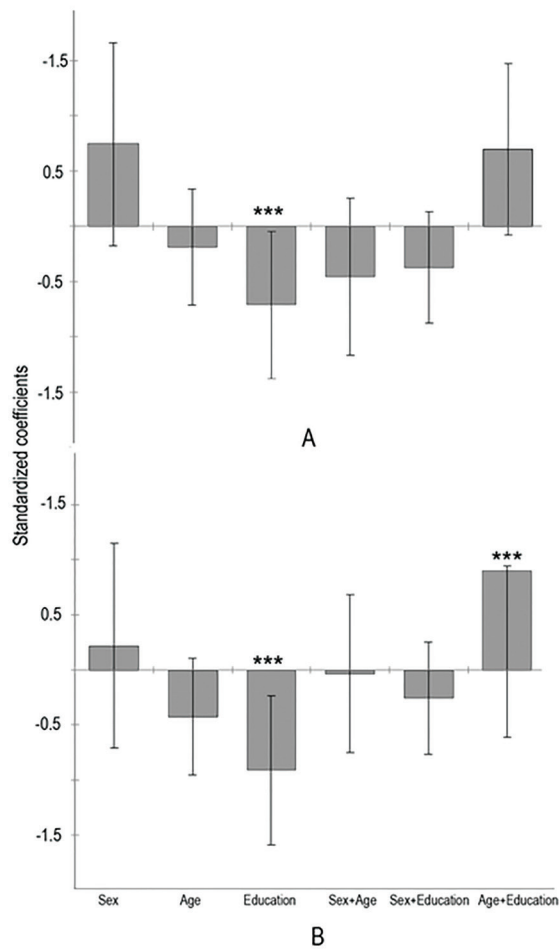
**Figure 3.** Mean personal entrepreneurial competency (PEC) scores among seaweed farmers in Sorsogon, Philippines, arranged in order of increasing coefficient of variation (values indicated as an asterisk). The letter above represents a significant difference at the 95% level of confidence. The horizontal colored bar across the means represents the threshold of moderate trait value. The PECs constitute the following 10 entrepreneurial traits: [A] commitment to the work contract; [B] goal setting; [C] information seeking; [D] self-confidence; [E] persistence; [F] opportunity seeking; [G] systematic planning and monitoring; [H] persuasion and networking; [I] demand for quality and efficiency; [J] risk-taking.

production chains in the Philippines and for the actors engaged in those chains (Suyo *et al.* 2020; Andriess and Lee 2021). To effectively adapt to these changes, seaweed farmers need to acquire new competencies and continuously engage in new learning (Nor *et al.* 2017).

Do seaweed farmers in Sorsogon, the Philippines possess entrepreneurial attitudes toward venturing into business? What factors drive these traits? Motivated to seek answers to these questions, we evaluated seaweed

farmers in Sorsogon (see Table 1 for the summary of the demographic profile) using a PEC test and analyzed the results, following the methods of Depositario *et al.* (2011) and Villena (2018). Eight sites (Figure 2) were selected to include the major seaweed farming areas in Sorsogon. We carried out a random sample from each site through a chain-referral approach. A total of 143 seaweed farmers were recruited to participate in this study. PEC scores were interpreted following McClelland (1987), including the





**Figure 4.** Results of the three-way ANOVA including interactions (Type III sums of squares), showing the standardized coefficients for the lowest PECs among seaweed farmers in the Philippines: [A] demand for quality and [B] risk-taking. A line bar indicates standard error. The triple asterisk represents significant interaction between variables on the PEC score at the 95% level of confidence.

research by McBer and Company, where a computed mean score of  $\leq 15$  was weak, 16–18 was moderate, and  $\geq 19$  was a strong indication of entrepreneurial traits. We were able to determine the ratio of the standard deviation to the mean based on the coefficient of variation (CV), where the lower CV value accounts for a more precise estimate of lesser variability. We determined any significant difference among mean PEC scores using the analysis of variance (ANOVA) and Tukey's honestly significant difference test *via* the Astatsa platform (Vasavada 2016).

Our results revealed that seaweed farmers in Sorsogon exhibited only a range of moderate traits to become potential entrepreneurs (Figure 3). Although all scores were in the mid-range, the "commitment to the work contract" ( $\bar{x} = 17.37 \pm 2.89$ ) ranked as the highest PEC score. This trait

was statistically similar with mean scores for "persistence" ( $\bar{x} = 16.37 \pm 3.23$ ), "opportunity seeking" ( $\bar{x} = 16.08 \pm 3.4$ ), and "systematic planning and monitoring" ( $\bar{x} = 15.22 \pm 3.38$ ). The "demand for quality and efficiency" and "risk-taking" were two traits that the respondents indicated the weakest ( $\bar{x} = 14.53 \pm 3.9$  and  $13.22 \pm 3.7$ , respectively). We further explored what factors impacted these two weakest traits by testing key demographic variables – gender, age, and educational attainment – based on their potential interaction effects (Figure 4). Education attainment had a significant influence on "demand for quality and efficiency" ( $p = 0.037$ ) and "risk-taking" ( $p = 0.009$ ). The interaction between age and educational attainment ( $p = 0.024$ ) significantly influenced the risk aversion behavior of most seaweed farmers. Given the proportional relationship between age and educational attainment, the cohort effects (Atingdui 2011) may explain this pattern, where age groups may influence the time invested associated with their educational attainment. Participants may lack technical skills in market and financial management, as well as little understanding of value-addition. The poor score for the two PEC levels could have been influenced by the limited knowledge and insufficient production practices.

Farmers in the Philippines generally have a low risk-taking competency (Quilloy 2015); hence, the result from this study is not surprising for seaweed farmers from Sorsogon. Entrepreneurs must be audacious (Milgrom and Roberts 1992). To overcome the fear of taking risks and participating in entrepreneurial activities, an individual needs profits or bias towards favorable risk-sharing agreements (Casson 1982). Seaweed farmers in Sorsogon may be reluctant to engage in business or at least limit their involvement, as they probably believe that the potential rewards are insufficient or unpredictable. While growing seaweeds and selling them only in a dried state does not require much capital, seaweed farming is a risk-prone enterprise confronted by both intrinsic (*i.e.* disease attack) and extrinsic factors (*e.g.* weather and market fluctuations). Factors outside their control may lead them to adhere to what they know works rather than take chances to start new businesses. For example, probably to include other factors associated with the environment for entrepreneurship, seaweed farmers in Iloilo (a province in the central Philippines) are more entrepreneurial because they are able to augment the income they derive from the cultivation and harvesting of seaweed by growing fruits or vegetables, pursuing other off-farm income, or receiving remittances from relatives (Andriess and Lee 2017). According to Kahan (2012), farmers also typically shy away from taking risks since securing family food without worrying about revenue from a business is more important to them than making long-term investments. This may also be the case for most Sorsogon seaweed farmers, whose incomes are primarily directed towards

meeting basic needs rather than generating income for business ventures.

The demand to use resources effectively and produce high-quality work was another weak point among seaweed farmers. The lack of optimism to produce quality products indicated the “*pwede na*” (this will do) or “*bahala na*” (things will turn out fine) mentality among Filipinos (Bostrom 1968; Lagmay 1977). This similar pattern, therefore, comes as no surprise to seaweed farmers in Sorsogon. Our findings may also be due, in part, to the inability of the market to pay profitable prices for the offered products. Farmers may, therefore, seek to produce as much product as possible to compensate for the low prices (Arellano and delos Reyes 2019). Aggregate output will potentially increase, but the quality of the product will be compromised. The lack of infrastructure (*e.g.* drying facility) makes it also more challenging for seaweed farmers to effectively manage resources and produce quality products (Valderrama *et al.* 2013).

There are several factors that can influence the expression of PEC skills. We hypothesized that cultural differences and their varied economic conditions might be the key explanatory variables for these differences. The results of our study seem to support that the interaction between environmental forces and the human behavior of an individual identifies the motives underlying entrepreneurial activity, *i.e.* primarily to profit (Kunkel 1965). Entrepreneurs should also seize fresh possibilities to establish new markets (Casson 1982). The combination of strong PECs and high levels of entrepreneurial motivation, including taking advantage of emerging opportunities to create new markets, are a powerful predictor of entrepreneurial success. However, it is important to note that other demographic factors (*e.g.* number of years in seaweed farming, household profiles, among others), including access to resources and markets, may also play an important role in identifying whether a new business for seaweed farmers will be successful. These elements were not covered in this present study, hence warranting further research.

In this study, education appeared to be a key variable impacting risk-taking and the demand for quality and efficiency behaviors. Along with innovation, risk-taking is a trait that is difficult to learn or change. Nevertheless, more recent findings support the increasing impact of education on the willingness to take risks and demand quality and efficient work (Dohmen *et al.* 2011; Outreville 2014; Zahra and Wright 2016). Individuals with higher levels of education may have a better grasp of the risks, are more likely to pursue higher-quality products, and may be more perceptive when it comes to efficiency. They are more careful in evaluating the potential risks and rewards of a business venture, have higher expectations

or standards, and have a better understanding of the value of quality and efficiency.

The Philippine government has implemented various programs and initiatives to support the development of the seaweed industry, but they do not appear to include support to stimulate or improve business acumen. The focus is more on the technical or operational aspects and not on entrepreneurship or agribusiness. In Sorsogon, the National Seaweed Technology Development Center – under the Bureau of Fisheries and Aquatic Resources (BFAR) – actively provides technical assistance and training to seaweed farmers on various aspects of seaweed farming, such as site selection, seedling production, and post-harvest processing. In 2017, the Global Environment Facility interventions under the Philippine Rural Development Project supported the seaweed industry in Sorsogon through the provision of boats, seaweed drying facilities, and simple food processing units. To the best of our knowledge, programs on entrepreneurship and business education among seaweed farmers in Sorsogon have been lacking.

While some individuals arguably have an innate entrepreneurial flair (Lazear Edward 2005), most entrepreneurial competencies must be learned in practice (Klein and Bullock 2006; Sánchez 2013; Mets *et al.* 2023). Entrepreneurial knowledge among seaweed farmers may have been merely acquired tacitly. Hence, having them pool together in a group exercise is an ideal opportunity and an easier way to spread the collective tacit knowledge among them (Lin 2007). Possession of key entrepreneurial traits can also be improved through training or participation in technical and/or financial management courses (Sánchez 2011; Mamun *et al.* 2019; Wu *et al.* 2019). Recognizing the need to pool resources, share risks, and foster collaboration, seaweed farmers in some areas of the Philippines created producer organizations (Bacaltos *et al.* 2013; CARE Philippines 2013; Quevedo *et al.* 2020). The formation of seaweed groups can improve entrepreneurial competencies and increase productivity (Nor *et al.* 2017). The success of these established groups can inspire seaweed farmers in Sorsogon to replicate this model. Community support structures and local political dynamics should also complement these activities to upscale the seaweed value chain (Andriess and Lee 2021).

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