



Operational performance in aquaculture: A case study of the manual harvesting of cultivated mussels



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ABSTRACT

Aquaculture is one of the fastest growing food production sectors in recent decades. Such rapid development emphasizes the need to adopt more efficient production strategies while simultaneously increasing productivity and sustainability. Monitoring of production is an important strategy to achieve process efficiency. Therefore, we conducted a time and motion study using operational performance indicators to evaluate mussel harvesting on a commercial marine farm in Southern Brazil. We analyzed the operations of mussel sea withdrawal and disaggregation, which are widely used by local farmers but demanding for workers to perform. Mussel sea withdrawal and disaggregation had standard times of 133.7 and 266.7 s, respectively, for one mussel rope; operational production capacities of 0.16 and 0.08 kg s⁻¹, respectively; operational efficiencies of 100 and 31.6%, respectively; time efficiencies of 56.1 and 34.7%, respectively, rework percentages of 0 and 65%, respectively; and percentages of damaged products of 0 and 3.4%, respectively. These parameters indicate low operational performance. The approach used in this study also allowed us to identify process wastes and propose ways to eliminate or mitigate them, with the aim of adopting more efficient work methods.

1. Introduction

Aquaculture has become an important source of fish supply and one of the fastest growing food production technologies in the world (Asche, 2008; Fuentes-Santos et al., 2015). According to the latest statistics of the Food and Agriculture Organization of the United Nations (FAO, 2018), global aquaculture production reached 110.1 million tonnes in 2016 and had an average annual growth rate of 5.8% during 2000–2016 (FAO, 2018).

The rapid development of aquaculture has increased the need for production strategies aimed at sustainability (Fuentes-Santos et al., 2015). Advances in breeding, nutrition, genetics, equipment, and process automation have resulted in increased productivity and quality as well as reduced production costs (Asche et al., 2012). However, not all industries benefited from such innovations. Regulatory, biological, environmental, socioeconomic, and market factors have created marked differences in the degree of technological development among

aquaculture industries.

Commercial aquaculture is a profit-oriented activity whose profitability is a function of costs and returns (Yung, 1986). Achieving control over processes is a key element for production optimization (Asche, 2008; Asche et al., 2012). With the use of control mechanisms, it is possible to analyze the performance of a given production process and propose improvements to increase its efficiency. Although this practice is widespread in entities engaged in the production of goods and services, there is little information in the literature on the application of control methods to aquaculture, especially regarding operational performance. According to Slack et al. (2010), the adoption of initiatives focused on improving operational performance, that is, on how work is organized and conducted, can be more effective in terms of profitability than increasing productivity or sales volume.

Therefore, we carried out a time and motion (T&M) study and an operation performance analysis of the manual harvesting of mussels on a commercial marine farm in Southern Brazil.

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