

#### Key Points:

- Households report low willingness to relocate in order to improve incomes.
- Households choose their set of income-generating activities based on their location's productive opportunities and their marine user rights.
- To induce households to increase their participation in small-scale aquaculture (farming fish), policies should be targeted to specific biogeographic zones.

## Promoting Small-Scale Aquaculture in Chile: Location-based Livelihood Choices

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As Chile explores opportunities to expand small-scale aquaculture (farming fish) to improve rural livelihoods, this research provides guidance about targeting policies to match the biogeographic and

socioeconomic setting, so that opportunities will match households' interest and availability for different income-generating activities.

*Summary.* Chile has established unique marine resource user rights to reduce resource over-exploitation and expand economic opportunities in coastal areas. These rights sometimes overlap, so that one household might be involved in more than one activity, and also leave out some people who might want to participate. To help decision-makers develop policies aimed at increasing incomes through small-scale aquaculture (SSA), we collected and analyzed data to identify the factors determining households' choices of activities, as well as the factors determining income levels, in the Los Lagos region of southern Chile. We found that the influence of the local biogeographic setting on activity choices and indirectly on incomes, paired with a general unwillingness to move to places where large incomes were possible, implies the need to target different aquaculture policies in different locations within the region. We also identify locations, activities, and seasons in which there is currently not enough work available, which suggests opportunities for households to diversify their marine resource activities.

*Data collection.* We conducted 18 stakeholder interviews with 25 people to help us develop the subsequent survey of 316 households from 73 fishing villages and eight municipalities within Región de Los Lagos. We collected water data characteristics – temperature, salinity, dissolved oxygen – from 38 locations to depict the productivity of these locations for different types of marine resource-based economic activities. Analysis of the water data defined eight biogeographic zones that include open-ocean, protected coves, and estuaries.

## Biogeographic zones in Región de Los Lagos, Chile



*Framework and methodology.* Although economic theory suggests that households will relocate to take advantage of higher-paying opportunities, preliminary interviews suggested that residents tend to live and work in the same village throughout their adult lives. We asked survey questions about willingness to move. The surveys confirm that over 90% of household heads were born near their current location and over 50% of households choose the location of their marine activities based on proximity to their home.

Survey question responses to the possibility of high incomes in other locations revealed that over 70% of respondents are not willing to move for any income level.

Based on this evidence that households are not likely to move, we next analyze household choices in a sequence: what income-earning activities is a household engaged in and how much time is spent on



each activity? We find that the probability that a household head chooses a particular set of activities is a function of household characteristics, the biogeographic zone, and the household's marine user rights. Then, we estimate the determinants of household income as a function of the characteristics of the household, their main economic activity, and their location or biogeographic zone.

Photo: Salmon farm, Reloncaví estuary, Región de Los Lagos, Chile.

*Results.* We find that gender, education, household resource user rights, and the zone determine the choice of activities. Lower levels of education increase the probability of choosing low-skills activities such as algae extraction.

The zone itself contributes to the set of possible local activities and to their relative productivity, while the user rights further define the household's ability to be productive with particular activities. For example, one zone's estuary provides naturally high productivity for mussel farming, and mussel



generating activities.

Photo: Enumerator applying survey during fieldwork, November 2018.

farming requires a user right. Households located in different zones choose different sets of income-generating activities. The specific marine user right held by the household increases the probability of the household choosing that activity, as expected, but also increases the likelihood of choosing other marine resource-related activities. Although 53% of the households report focusing on one income generating activity, 43% of households report performing two or three activities. Zones with higher proportions of households performing more than one productive activity include zone 2 (Maullín), zone 7 (Hualaihué-North) and zone 8 (Hualaihué-South). Zones with more households reporting only one productive activity include zone 1 (Estaquilla and Carelmapu), zone 3 (Ancud), zone 4 (Calbuco), and zone 5 (Puerto Montt). Overall, fish quota holders tend to specialize in fishing and do not explore other income-

Additional regression results find that gender, household size, household workers, and the number of activities pursued all positively correlate with higher income levels. In addition, the type of main economic activity determines the level of income, with algae collectors generating the lowest incomes and other non-fishing households generating the highest incomes.

These results clearly indicate that the sets of productive activities chosen by households are diverse and vary across the region. Specific activities tend to be concentrated in particular biogeographic zones. Each zone's environmental conditions define the set of attractive local income-generating activities; the household's location drives their choice of activities. Many households undertake a mix of income-generating activities leading to diversification of income sources within households. In addition, mean annual household income varies across the zone or location and across the productive activities chosen. The specific type of the household's resource user rights also contributes to the household income.

We also explored the pattern of marine activities performed by household heads by month to identify months of the year in which households have available labor. We find significant variation in marine activities performed throughout the year. We calculate a "labor slackness ratio" based on the number of weeks per month the household workers devote to marine productive activities. This available labor time is highest during the winter months but exists all through the year. This means that households have some unused labor time available, and suggests opportunities for policies to target that available labor for income-generating activities.

**Conclusion.** Policies to promote small-scale aquaculture in this region should be targeted to specific places. With the level of reluctance to move to new locations, blanket policies or investments in remote locations are unlikely to improve regional well-being, because people will not take full advantage of non-local opportunities. To target the poorest residents, policies should focus on establishing productive programs in zones with high levels of poverty. Similarly, policies aimed at specific locations should recognize the role of the biogeographic setting in determining the set of potential activities and the potential level of productivity in that location. Expanding marine user rights in the region should also consider which types of rights lead to productive resource use in

specific locations. Last, policies could also be targeted to months of the year in which households have labor availability.

Further reading: “Low propensity to move and marine resources based livelihood choices for coastal communities in southern Chile: When heritage matters”, by H. Jo Albers, Carlos Chávez, Jorge Dresdner, Yanina Figueroa and Mauricio Leiva. EFD, Discussion Paper.