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# Economic Vulnerabilities of Fishing-dependent Households Around Laguna Lake, Philippines

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**The study characterizes the mainly subsistence fishing communities surrounding Laguna Lake and provides empirical evidence of the economic deprivation that they are experiencing using survey data. Following a multi-dimensional approach, the paper focuses on consumption expenditures as the prime indicator of economic well-being – together with assets ownership, financial behavior, and social engagements. Regression analyses are conducted to identify the factors underlying consumption and to determine how different forms of household capital (physical, financial, and social) and fishing activities affect the capacity to generate income or livelihood. The study finds that: 1) food consumption (mainly rice) accounts for half of the household's total expenditures, is very income-inelastic, and is mainly determined by household size; 2) all consumption expenditures are income-inelastic and are therefore basic necessities, except for mobile phone load, the only luxury consumption expenditure for these low-income fishing households; (3) while derived income (sum of all expenditures and savings) is not significantly determined by any form of capital, it is significantly higher for households undertaking aquaculture; and (4) the conditional cash transfer of the government significantly contributes to household consumption as an income augmentation measure but does not significantly lower food shortage vulnerability of the household.**

Keywords: aquaculture, economic vulnerability, household consumption expenditures, income elasticity of consumption, open fishing

## INTRODUCTION

Laguna Lake – with a total surface area of 90,000 ha, which is almost half of the total area of all lakes in the Philippines of 190,000 ha – is the biggest lake in the country and the second-largest inland body of water in Southeast Asia. With a total shoreline of 220 km, Laguna Lake is bounded by Metropolitan Manila in the northwest, Rizal in the northeast, and Laguna in the southwest and southeast. Up until the present, the lake is surrounded by poor fisherfolk communities in rural as well as semi-urban cities and municipalities of the provinces of Laguna and Rizal, and even in the highly urbanized cities of Metropolitan Manila.

There are a number of issues about the condition and activities in and around the lake that may have serious socio-economic implications on the poor fishing communities. Laguna Lake water is highly polluted with domestic wastewater from households and the services sector (Palanca-Tan 2015, 2017), wastewater from livestock and poultry production (Alcantara *et al.* 2008), fertilizer residue from croplands (Baldia *et al.* 2003; Reyes *et al.* 2008), and toxic and hazardous substances from industries (Tamayo-Zafaralla *et al.* 2002). Heavy sedimentation and siltation in the lake are caused by soil

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erosion arising from inappropriate agricultural practices, quarrying, deforestation, landfill, and land conversion (Tamayo-Zafaralla *et al.* 2002). Illegal reclamation, particularly in the Taguig (Metro Manila) portion of the lake, is said to have substantially reduced the lake's surface area. There are fears that infrastructure development projects, such as the Laguna Lake Highway Project, can further disturb the lake's ecological balance. These and the proliferation of large-scale fish pen culture threaten the livelihood of the traditional fishermen who are dependent on small-scale open water fishing. Thus, civic organizations are calling for the government to come up with policies and programs, and to provide social safety nets for the economically vulnerable group of the lake's subsistence fishing households.

This paper looks into the actual living conditions and vulnerabilities of poor fishing communities surrounding Laguna Lake so as to guide public policymaking and social program design and implementation. To come up with relevant and effective programs, a thorough and clear understanding of the poverty and deprivation the fishing households are experiencing is imperative. Following a multi-dimensional approach in characterizing poverty, the paper presents three sets of indicators: 1) household consumption behavior and patterns, 2) household possession of different forms of capital, and 3) households' vulnerability to food shortage; and looks at the interaction among these variables. Levels and composition of consumption are used as indicators of household economic well-being. Physical, financial, and social capital can affect the capacity to generate income that supports consumption and build-up of assets. Different policy instruments such as the conditional cash transfer, the provision of affordable credit facilities, government support for the establishment and maintenance of fishing and credit cooperatives and organizations, and other fishing and livelihood subsidies can contribute to households' build-up of different forms of capital and alleviate economic vulnerability.

Up until the present, economic well-being is most commonly measured in terms of income. This paper goes beyond income and poverty incidence measurement and focuses on consumption instead of income. Literature emphasizing consumption-based indicators of economic well-being over income is growing [see, for instance, Cutler and Katz (1991), Poterba (1991), Slesnick (2001), Meyer and Sullivan (2003, 2011), and Heshmati *et al*. (2019)]. Meyer and Sullivan (2012) argue that consumption more closely reflects material well-being and is a better predictor of economic deprivation or material hardship than income. Consumption is also more accurately reported than income (Meyer *et al.* 2009, 2018). Underreporting of income commonly occurs due to failure to account for transitory income sources, as well as transfers or assistance from government and private organizations. Moreover, income does not fully reflect 1) the actual living standard of individuals who smooth consumption over time using savings, 2) differences in wealth accumulation, 3) ownership of durable goods such as houses and cars, and 4) access to credit (Meyer and Sullivan 2012). These conceptual limitations in the sole use of income, as a well-being indicator, necessitate a multi-dimensional approach in the characterization and analysis of economic vulnerability and deprivation of poor fishing communities surrounding Laguna Lake.

## METHODOLOGY

**Poverty Indicators: A Multi-dimensional Approach**

There is a variety of approaches in identifying and characterizing the poor. These may be categorized into single-dimensional and multi-dimensional approaches. In the Philippines, the official poverty incidence is an example of a single-dimensional approach that uses income as a measure of the resources available to the household. A household is considered poor if its income falls below a certain threshold, the amount needed to meet both basic food and non-food (clothing, personal care, fuel, light and water, housing, transportation and communication, health, and education) needs of a household (PSA 2019).

An alternative to income as an indicator of resources available to the household is consumption expenditures. Meyer and Sullivan (2012) consider consumption expenditures to be a better measure of well-being in view of the various conceptual and measurement limitations of income. People have a greater tendency to under-report income, especially among the low-income groups with various sources of small, one-time, or highly irregular and uncertain income and assistance. Consumption is smoothed through time by means of savings and borrowing and, hence, is more reflective of actual living conditions. For these reasons, this paper focuses on consumption expenditures as the primary indicator of the household's economic well-being. Household respondents in this study were asked for the weekly value of their consumption of different food items (rice, viand, and other food consumed at home; food consumed outside the house) and other commodities acquired or purchased on a daily or weekly basis (cigarettes, alcoholic beverages, transportation, and mobile phone load); the monthly value of their expenses on house rent, water, electricity, gas/kerosene for cooking, and

personal care; and their yearly expenditures on clothing and accessories, education, furniture, and appliances (other durable goods), medical expenses, and recreation. Frequency of consumption of fish, meat, and vegetables – as well as the household's experience of missing meals – were also asked to obtain a fuller picture of economic deprivation. For non-purchased food items, specifically fish, a question on how much of the fish catch is allocated for own consumption was asked.

Multi-dimensional approaches employ various indicators, explore the inter-relationships among the different dimensions of well-being, and emphasize functional capabilities and social inclusion [for example, please refer to Atkinson *et al*. (2002) and Wagle (2002)]. In line with the multi-dimensional approach, this study also looks at households' access to utilities (electricity and water) and sanitation facilities, ownership of physical assets (fishing equipment and structures, and household durable goods – furniture, appliances, and other durable goods that may be used for livelihood activities such as refrigerator, computer, and automobile), financial behavior and status (saving and borrowings), social capital (formal and informal social networks and behavioral social capital), and transfers or financial assistance from government and non-government organizations.

In line with Meyer and Sullivan's (2012) suggestion to use a definition of income that is conceptually closer to resources available for consumption, the measure or indicator used for household income is based on total expenditures, net savings, and transfers.

**Analytical Framework**

The paper examines the interplay among the various indicators discussed in the previous sub-section. Specifically, the paper examines through regression analysis: 1) the relationship between household consumption and household income for different goods, 2) the influence of different forms of household capital on income, and 3) the underlying factors that contribute to household's vulnerability to food shortage.

***Consumption expenditures and income.*** The Engel curve, named after a German statistician known for his pioneer studies on household budget surveys, indicates the relationship between household consumption expenditures and household income. Engel curves reflect how the preferences for different goods change when there is an increase in household income while the prices of the goods are held constant (Caglayan and Astar 2012). Engel curve consumption functions are widely examined for different groups of goods using non-parametric (Banks *et al*. 1997), semi-parametric (Blundell *et al*. 1998), and parametric methods (Working 1943; Hausman *et al*. 1995; Byrne *et al*. 1996).

This paper follows the form of the Engel consumption function used by Allen and Bowley (1935), and Caglayan and Astar (2012):

$$C = \alpha + \beta Y + \mu \quad (1)$$

where C is household consumption expenditures on a good, Y is household income, α and β are the estimated coefficients, and μ is the random error term. The paper adds the vector **Z** to the equation to capture other household characteristics (such as household size and assistance received by the household) that may have some influence on consumption:

$$C = \alpha + \beta Y + \gamma \mathbf{Z} + \mu \quad (2)$$

Income elasticity of consumption is calculated to identify which among the consumption goods are deemed as necessities or luxuries by the households. The income elasticity of consumption measures the responsiveness of consumption to changes in income. Mathematically, it is equal to the percent change in household consumption divided by the percent change in household income. Using derivatives, the income elasticity of consumption, $\varepsilon_Y$, is calculated using the formula:

$$\varepsilon_Y = [\partial(C)/C] / [\partial Y/Y] = [\partial C/\partial Y] / [C/Y] \quad (3)$$

where $\partial(C)/C$ is the percent change in consumption and $\partial Y/Y$ is the percent change in income. Rearranging the terms, $\varepsilon_Y$ can be expressed as the ratio of the derivative function $\partial C/\partial Y$ (the estimated coefficient of Y in the consumption equation) to the average function, C/Y. A normal good is a good with a positive income elasticity of consumption, *i.e.* consumption of the good increases when income increases. A normal good is a necessity if the positive income elasticity of consumption is less than one, while a luxury good has an income elasticity of consumption that is greater than one (Mankiw 2018).

The review of literature done by Houthakker (1957) finds that income elasticity of household food expenditures is consistently less than one, indicating that food is a necessity and supporting Engel's Law that lower-income households have a higher share of food expenditures. The same conclusion is reached by later literature reviews (Caglayan and Astar 2012).

***Total household expenditures (income) and household capital.*** Benin and Randriamamonjy (2008) claim that the well established conceptual and empirical literature on household income [*e.g.* Schultz (1961), Hassan and Babu (1991), Simler *et al*. (2004), Otsuka and Yamano (2006)] shows that the main determinants of household income include human capital $K_h$ (household size, age and gender

composition of the household, education, health), assets and endowments (physical capital $K_p$ and financial capital $K_f$), social capital $K_s$, and employment in productive activities E (in the particular context of this study, fishing activities). Thus, for this study, the household income model to be estimated is given by:

$$Y = \varphi + \delta_h K_h + \delta_p K_p + \delta_f K_f + \delta_s K_s + + \delta_e E + \mu \qquad (4)$$

where $K_i$ refers to the different forms of capital possessed by the household and $\delta_i$ are the respective coefficients. Specific variables used in the study are household head's age and educational attainment for human capital, and dummy variables for ownership of house fixtures and other physical assets such as automobile (physical capital), having a loan (financial capital), memberships in a fishing-related organization and credit cooperative (social capital), and engagements in open fishing and aquaculture. Human capital (education) and physical and financial capital may be utilized in production and income-generating activities and, hence, are expected to have a positive effect on household income. Adger (2003) argues that involvement in both formal and informal groups can likewise serve as a useful asset of the household, in so far as it enables members to benefit from interaction with others through information sharing and increased access to physical and financial capital.

***Food shortage vulnerability.*** As another measure of poverty, household vulnerability to food shortage – a binary variable which takes on the value if one of the household has experienced missing meal/s and zero if otherwise – is regressed with household income, household size, conditional cash transfer, social capital variables, and engagement in fishing activities. Households with higher income, conditional cash transfers, and informal and formal social networks are assumed to be less likely to experience hunger, while larger households are more vulnerable. Engagement in open fishing and aquaculture, which are food-producing activities, are expected to make households less vulnerable to hunger.

## Data Collection

A comprehensive household survey was conducted for this study. Survey respondents were drawn from two fishing "barangays" (localities) along the shoreline of Laguna Lake – Sampiruhan and Sampad. Sampiruhan is one of 54 barangays comprising the City of Calamba. Calamba is a 1st-class city in the province of Laguna, which is located south of Metropolitan Manila. With more than 10 industrial parks and registering the highest income in Region 4A (COA 2014), Calamba claims to be the premier industrial hub outside of Metropolitan Manila. Of the city's 206,231 gainful workers 15 yr old and over, only 2% or 4,157 are agricultural, forestry, and

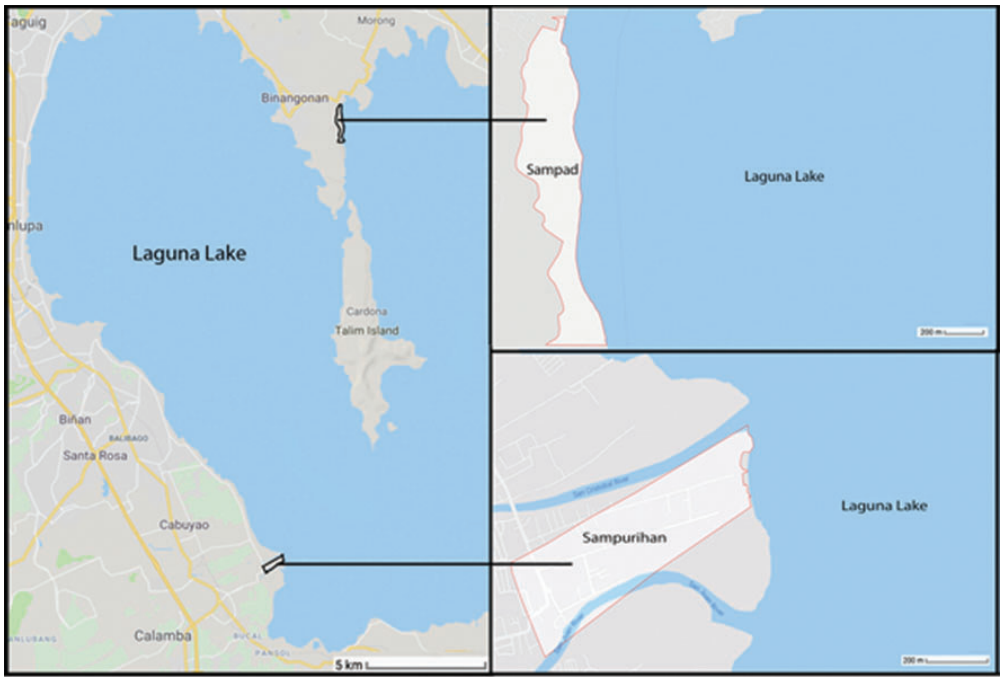


**Figure 1.** Study areas: Barangay Sampiruhan, City of Calamba, Province of Laguna; and Barangay Sampad, Municipality of Cardona, Province of Rizal.

fishery workers (PSA 2015). The few fishery workers in Calamba can be found in the 11 shoreline barangays in the city, which include Sampiruhan. As such, the barangay of Sampiruhan remains rural, with fishing as the main economic activity. Of its 81-ha land area, 60% is residential, 30% is agriculture (vegetable farms and fish ponds), and only 10% is commercial. Based on the Calamba City government website, Sampiruhan has a population of 9,927 people in 2,922 households in 2016.

On the other hand, Sampad is one of 18 barangays in Cardona, a 3rd class municipality in the province of Rizal which is located east of Metropolitan Manila. Cardona is a vertical strip of land bordering the west side of the central bay of Laguna Lake. As such, all 18 barangays of Cardona, except for three, are along the shoreline of the lake where fishing is the main means of livelihood. Of the municipality's 20,006 gainful workers 15 years old and over, 16.3% or 3,262 are skilled agricultural forestry and fishery workers (PSA 2015). The main source of the municipality's revenues is income from the municipal fish port. Sampad, one tiny lakeshore barangay in Cardona, has a population of only 2,125 in 380 households based on a 2015 report of the Department of Social Welfare and Development.

The survey was implemented through personal interviews during the months of March– September 2018. College students majoring in Economics served as survey enumerators as a service-learning activity for their Statistics class. The two barangays were chosen as study sites for the study primarily because of this student service-learning aspect of the research project. The Community Organizers Multiversity and the Rizal Chapter of the Department of Social Welfare and Development, with which the Ateneo de Manila University has a collaborative relationship, have identified candidate survey barangays in Laguna and Rizal from which the two barangays were selected based on fishing activities as well as safety considerations. In Barangay Sampad, respondents were selected using a systematic sampling procedure – from a random starting point, houses were visited using a fixed interval of five. In Barangay Sampiruhan, respondents were selected randomly by stationing student enumerators along the shore to interview fisherfolk arriving from the lake. The study generated a total of 65 respondents from Barangay Sampad and 113 respondents from Barangay Sampiruhan.

## RESULTS AND DISCUSSION

Eighty percent (80%) of the respondents in Sampiruhan and 53% in Sampad are the fisherman head of the household. Apart from the fisherman himself, enumerators were allowed to interview the spouse, parent, or adult child of the fisherman if the fisherman was not available at the time of the interview. Accordingly, similar proportions of the respondents are male – 79% for Sampiruhan and 54% for Sampad. The average age of respondents in Sampiruhan and Sampad is 52 and 45 yr, respectively. They have resided in their respective fishing communities since they were children (5–6 yr old). On average, each household has four members in both barangays.

The sample of fishing households from both Sampiruhan and Sampad is mostly engaged in open fishing (municipal fishing). Of the 113 respondents in Sampiruhan, three-fourths (83 households) are involved in open fishing while only a fifth (24 households) are fish farm operators. In the case of Sampad, 54 out of the 65 sampled fishing households (a higher proportion of 83%) engage in open fishing and about the same proportion as Sampiruhan (21.5%) undertake fish farm operations. Some respondents are engaged in both open fishing and fish farm operations.

For open fishing, the most frequently and abundantly caught fish variety in both barangays is tilapia (93% and 60% of open fishermen in Sampad and Sampiruhan, respectively). Milkfish is the second most caught fish for 4% of open fishers in Sampad, as fish pens growing milkfish abound in the Rizal area (west bay of the lake). On the other hand, milkfish is not mentioned at all by any respondent in Sampiruhan as it is relatively far from the milkfish pen area. In both barangays, gillnet and fish corral are the primary means to catch fish.

There is a difference in the kind of fish farming undertaken in Sampiruhan and Sampad. In Sampiruhan, fish farm operations mainly involve growing catfish in fishponds near the shore of the lake. A significant 82% of the farm operator respondents grow catfish, only 42% grow tilapia and much fewer (4%) grow milkfish. On the other hand, in Sampad, fish farms are all fish cages in the lake growing tilapia (86% of fish cage operators), milkfish (43%), and other fish species (64%).

### Expenditures

Data on household expenditures reflect the generally low-income status of the fishing households in both barangays. Weekly expenditures on rice (PHP 532 for Sampiruhan and PHP 553 for Sampad) and viands (PHP 893 for Sampiruhan and PHP 592 for Sampad) are close in value, especially in the case of Sampad. Food consumed outside the house is much less (PHP 410 for Sampiruhan and PHP 296 for Sampad). A question on how much of the daily fish catch is allocated for home consumption in the case of households engaged in open fishing was included in the survey instrument. On average, households engaged in open fishing in Sampiruhan consume 0.76 kg of their

daily fish catch at home, and the corresponding figure for Sampad is very close at 0.78 kg. With survey results yielding an average of 5 d/wk of fish consumption and an average price per kg of a fish catch of PHP 39 in Sampad and PHP 43 in Sampiruhan, total weekly non-purchased fish consumption is approximated to be PHP 152.49 for Sampad and PHP 164.26 for Sampiruhan. These are equivalent to about 10% and 9% of their respective total weekly food expenditures (excluding the cost of LPG or kerosene used for cooking).

With some households reporting zero expenditures on vices (alcoholic beverages and cigarettes), standard deviations exceeding the average values reflect substantial costs incurred by consuming households. Similarly, the standard deviation of mobile load expenditures exceeding the average reveals wide variations in the use of mobile phones, as this consumption item is likewise more of a habit-forming good than a general necessity. The average weekly transportation expenditures in Sampiruhan (PHP 218) was lower than in Sampad (PHP 317) due to the proximity of Sampiruhan to the town center than Sampad. The average monthly house rent is minimal as many of the fishing households are informal settlers. This is more the case in Sampad where most structures are shanty houses made of used and light materials than in Sampiruhan where there are more sturdy and permanent structures. Both Sampiruhan and Sampad are connected to the power grid. However, when it comes to water supply, only Sampiruhan is served by a water utility (Calamba Water District) while Sampad residents still rely on barangay-operated and subsidized deep well water systems (with motor pumps) and public hand-pumped deep wells. Water outlays in Sampad may be mainly purchased from water refilling stations for drinking water. Wide variations in the consumption of the less basic items (relative to food) but nevertheless necessities – personal care, clothing, education, health, appliances and furniture, and recreation – are also reflected in the survey results (please refer to Appendix Table I for the table of survey results.)

All expenditure items are annualized to calculate the share of each item in total expenditures (the annualized expenditures are in Appendix Table II). In the table of annualized expenditures, non-purchased fish consumption has been included. Non-purchased food does not appear to be substantial, accounting for only about 4–5% of total expenditures or 8–9% of all food-related expenditures. More than half of annual household expenditures are alloted to food, liquefied petroleum gas (LPG), or kerosene for cooking included (57% in Sampiruhan and 53% in Sampad). If LPG/kerosene is not included, the shares are slightly reduced to 53% (Sampiruhan) and 50% (Sampad). These shares are higher than the average 42.6% share of food expenditures in total household expenditure in the Philippines (PSA 2020), reflecting living standards in these fishing communities that are lower than that of the average Filipino household.[1] With more than half of expenditures devoted to food, there is very little left for other basic necessities such as housing, utilities (electricity and water), personal care, health, and education.

Fish is part of daily meals of nearly half of the fishing households (43% in Sampiruhan and 45% in Sampad). Substantial proportions of households also consume fish more than half of the time (44% in Sampiruhan and 31% in Sampad). The average value of fish catch consumed at home, albeit not substantial, has been deduced and incorporated in Table 2 to reflect the full share of food in total consumption of the household. Vegetables (consumed daily by 45% and 53%, and more than half of the time by 31% and 25% of respondents in Sampiruhan and Sampad, respectively) also appear to be a staple food in these rural fishing communities. where small-scale vegetable farming is done in surrounding barangays and municipalities. Despite the seeming abundance of food sources within the barangays and nearby areas, substantial proportions of respondent households – 27% in Sampiruhan and 49% in Sampad – claim they have experienced food shortage (missed meals) in the last 12 mo. The higher proportion in Sampad is expected as there are no rice and vegetable farms in the vicinity. Meat appears to be a luxury food item, with most respondents (60% in Sampiruhan and 82% in Sampad) having it on their tables just once or twice in a week.

**Utilities and Sanitation**

Electricity is available in both barangays. Most (88% in Sampiruhan and 92% in Sampad) have power connections (either private and shared). In the case of water, only Sampiruhan is served by a water utility – the Calamba Water District – and almost half (44%) of household respondents have piped water connections. Those who are not connected to the water district source their water from private or public deep wells, as these are less expensive water sources. Households operating catfish ponds have their own deep wells with motor pumps. On the other hand, there is yet no water utility servicing Sampad. At the time of the survey, the barangay office had just started its water supply project, which involves the construction of a motorized deep well system and distribution pipes to individual houses.

[1]These food expenditure shares in Sampiruhan and Sampad and the whole of the Philippines are extremely high in comparison to developed western countries such as the United States and United Kingdom, where families spend only about 10% of their income on food (POPCOM 2020).

Almost all (95%) of household respondents in Sampiruhan have a basic inexpensive water-sealed toilet and a septic tank. It may be presumed that many of those toilets have no flush, particularly those without piped water connection (as earlier mentioned, even in the less impoverished Sampiruhan, piped water supply coverage is only 44%). In Sampad, 82% of the households have toilets but presumably, all are without flush as there is no piped water in the barangay yet. Almost all of the households with toilet claim they have a septic tank. The high sanitation and sewerage coverage may not necessarily imply that sanitation and domestic wastewater management and disposal are no longer issues in these low-income fishing barangays. Like in many informal settlements in urban areas in the country, septic tanks in these fishing barangays are likely to be substandard. While the standard required by the Philippine government is that of a two-chamber tank cemented on all sides, many households in low-income and informal settlement areas make septic tanks out of large (55-gal) plastic drums (Palanca-Tan 2015, 2017). These plastic drums are buried in the ground with the bottom side cut-off so that liquid wastes from toilets flow through the ground, causing contamination of underground water and, very likely, lake water as well. As there are yet no drainage canals in these two barangays, effluents from concrete septic tanks may just be flowing directly to the lake.

Due to the presence of public wells, some households in both barangays take a bath and do their laundry at public tap or deep well areas. This is more prevalent in Sampad (37% for bathing and 52% for laundry), which is not yet served by a water utility, than in Sampiruhan (12% for bathing and 30% for laundry).

**Physical Capital**

The physical assets possessed by more than 80% of households in both Sampiruhan and Sampad are just electric fan, television, and mobile phone. The majority (more than 50%) of households in both barangays have a gas stove (mostly the one burner "super kalan"), radio, and "sala" set or seating furniture (usually plastic monoblocks). Generally, Sampiruhan households have more physical assets than Sampad households. Several Sampiruhan households have automobiles (jeepney – 8%, motorcycle – 35%, and tricycle – 31%) while only 17% of Sampad households have a motorcycle. These low-cost automobiles used as a form of public transportation provide another source of income to the households. Ownership data for other physical assets that may be used for livelihood activities are refrigerator (49% of households in Sampiruhan, 20% in Sampad,) computer (25% in Sampiruhan, 6% in Sampad), and sewing machine (9% in Sampiruhan, 11% in Sampad). Only 14% of households in Sampiruhan and none in Sampad have the luxury of an air-conditioning unit. Sampiruhan households with the relatively expensive physical assets (automobile, computer, and air-conditioning unit) reflect the presence of some low middle-income households in the barangay – those who can also afford to construct fish ponds that entail relatively more substantial financial outlay.

Boat and boat motor are the main equipment used in open fishing. Most households engaged in open fishing in Sampad (51 out of 54 or 94%) have their own boat, all of which except for one has a motor. In Sampiruhan, 70 out of 83 open fishing households (84%) have boats, 65 of which have a motor. The average costs of a boat (about PHP 19,000) and motor (about PHP 8,000) used by fishermen in Sampiruhan and Sampad are similar, indicating the similar scale of open fishing activities in these two Laguna Lake fishing communities.

In Sampiruhan, an average fish farm owner has five farms, each 584 $m^2$ big for a total fish farm area of 1,300 $m^2$. In Sampad, the average fish farm owner has only one fish cage, which is 2,800 $m^2$ in area. The contrast in the nature and scale of fish farm operations between Sampiruhan and Sampad can be noted. In Sampiruhan, aquaculture is mainly fishpond structures on land along the shoreline for growing catfish while in Sampad, it is mainly fish cages for tilapia and other fish species growing in the lake. Thus, the average farm size in Sampiruhan is much lower than that in Sampad. Average fish pond construction in Sampiruhan (PHP 41,188) is about double the fish cage/pen construction in Sampad (PHP 22,500), as a pond system set-up involves digging, a water supply source (deep well system), and a water pump system for the regular change of pond water while fish cages and pens in the lake only require bamboo frames and nets.

**Financial Capital**

The majority of households in Sampiruhan (50.4%) and Sampad (66%) had outstanding loans at the time of the survey. In Samupurihan, 87% of the loans made by households were used as capital for business while 49% were used for the household's daily needs such as food. In Sampad, about a third of households with loans used the loan money for business and another third for daily needs. There were quite a number of households (14%) in Sampad resorting to borrowing to purchase home appliances and furniture. The most common source of loans was credit cooperatives (77% of households with loans in Sampiruhan and 42% in Sampad). Relatives and friends were also common sources of loans (63% in Sampiruhan and 30% in Sampad). Only 20% of households in Sampiruhan and 16% in Sampad resort to informal loan sharks. There is also a low availment of bank loans (11% in Sampiruhan and 16% in Sampad), which is

expected of low-income households who could not meet the restrictive borrowing requirements of commercial financial institutions. In Sampiruhan, the average loan amount is PHP 21,129 with an average annual interest rate of 34.9% for an average payment period of 5.4 mo. In Sampad, the average loan amount is lower at PHP 13,138 – the interest rate is likewise lower at 26.1% but the payment period is longer at 7.3 mo. The term period of the loan appears to suit fish farm growing periods, for which substantial proportions of the loans could have been used.

Survey results also reveal that 35% of households in Sampiruhan save an average of PHP 3,621/mo. In Sampad, the proportion is higher at 51% but the average monthly savings is lower at PHP 1,923. The majority of the household in these lakeshore communities keep their savings at home (54% in Sampiruhan and 51% in Sampad). A third of the household savers in Sampiruhan keep their savings in banks while only 8% do the same in Sampad.

**Social Capital**

The preceding sections reveal the scant physical and financial capital of households in the fishing communities around Laguna Lake. Insufficient own financial capital (savings) is augmented through borrowing primarily from credit cooperatives and relatives and friends. Access to these non-commercial sources of financial capital is significantly enhanced through what is termed as social capital. On the household level, social capital can refer to social networks and skills possessed and used by a household to facilitate activities such as livelihood, consumption, and other economic undertakings (Pham 2010). Social networks can be membership in formal organizations or involvement in informal networks.

There seems to be a disparity between the two fishing barangays in terms of social capital. A much higher proportion of households in Sampiruhan (72%) are members of a fishermen's organization than in Sampad (32%). Likewise, there is also a larger proportion of households in Sampiruhan (17%) than in Sampad (8%) that are members of a credit cooperative. While a lower proportion of households in Sampad (compared to Sampiruhan) are members and have experience borrowing from the more "official" and"formal credit" cooperatives, a big proportion (39%) of Sampad households are involved in informally-organized, trust-based financial arrangement referred to as "paluwagan." In this financial scheme, closely-knit neighboring friends make regular (usually weekly) fixed deposits. Proceeds of each collection go to one member – the schedule of the members' turns in receiving the collection proceeds decided at the beginning through the random process of drawing lots. This scheme encourages saving (however small) among members, as well as enables certain members to have advance money (if they are luckily picked for the earlier disbursement schedules). Sampad households also appear to be involved more in other types of organizations – women (4% in Sampiruhan, 6% in Sampad), livelihood (1% in Sampiruhan, 3% in Sampad), and religious organizations (2% in Sampiruhan, 9% in Sampad).

Informal social networks appear to be more extensive (relative to formal social networks) in these two fishing barangays. Most of the households have several neighboring relatives (88% in Sampiruhan, 97% in Sampad), have relatives and friends who they can depend on in times of need (90% in Sampiruhan, 92% in Sampad), and know people who they trust and will be willing to help and assist financially (80% in Sampiruhan, 88% in Sampad).

To assess social skills or behavioral social capital, defined as the propensity of the individual to trust and cooperate with other individuals for mutual benefits (Carpenter *et al.* 2004; Grootaer *et al.* 2004), this study posed three opinion statements patterned after the questionnaire developed by Rosenberg (1956). Survey results indicate that, overall, respondents in both barangays slightly believe that residents in their communities are trustworthy and cooperative. On a scale of 1–5 where 1 denotes strongly disagree and 5 denotes strongly agree, the statements "Most of the residents in the barangay can be trusted," "Most of the residents in the barangay are ready to help fellow residents in case of need," and "Most of the residents in the barangay do not trust each other in money matters" score an average of 3.6, 4.1, and 3.2, respectively.

**Assistance Received by Households**

Both Sampad and Sampiruhan are program areas of the government's "Pantawid Pamilyang Pilipino Program" (4Ps). 4Ps is a conditional cash transfer program that provides income support (maximum of PHP 1,400 per household per mo) to poor households subject to compliance with certain health (visits to health centers) and education (school attendance) conditionalities (Velarde and Fernandez 2011). The majority (55%) of the households in Sampad are 4Ps beneficiaries. The proportion in Sampiruhan is lower but still substantial at 20%. Survey results also reveal that other sources of assistance (mainly in-kind) – such as medical and educational assistance from civic and religious organizations – are available in the area, but only a few are able to avail.

**Relating Consumption and Income**

The consumption-income regression model of Equation 1 is estimated using ordinary least squares (OLS)

method. Household Income is derived by combining total expenditures and savings of households. Two sets of regression runs are done for food items – Rice, Viand[2], and AllFood (sum of Rice, Viand, and Food Consumed Outside the House). In the first run, HouseholdIncome and a dummy for households receiving 4Ps (D_4Ps) are included as two separate explanatory variables. In the second run, the amount of 4Ps is combined with HouseholdIncome as a single explanatory variable (IncomeWith4Ps). In addition to the income variable, household size (HHSize) and a dummy variable for the place of residence (D_Sampiruhan, taking the value for Sampiruhan residents and zero for Sampad residents) are included as other household characteristics.

The regression results for food expenditure items are shown in Table 1. 4Ps, treated as a dummy variable, is not a significant determinant of food consumption (Rice, Viand, and AllFood) while the coefficients of Income in the two regression runs (Income without 4Ps and income with 4Ps) are very close. These results confirm that the amount of 4Ps received is treated as additional income in making consumption decisions. It is not whether or not the household receives 4Ps subsidies, but the amount of additional funds that 4Ps puts into the household budget that affects food consumption. Results for the other two explanatory variables are likewise similar for the two sets of regression runs.

Rice consumption is driven by household size and not by income, reflecting the very basic necessity nature of rice in the very low-income household diet. For Viand and AllFood, Income with 4Ps is highly significant while HHSize becomes insignificant. It appears that whatever amount of the other food items that can be bought with the household income is just distributed among all household members. Accordingly, the income elasticity of rice consumption is very small (it is essentially zero) while viand consumption has an income elasticity of 0.71–0.75, meaning a 10% increase in income increases viand consumption by 7.1–7.5%. Income elasticity of AllFood expenditures is lower as it is pulled down by the zero-income elasticity for rice. A 10% increase in income increases total expenditures on food by 5.0–5.2%.

For other consumption items, the same observation on the results of the two regression runs with the two-alternative income variable specifications can be made. Thus, only the regression results where 4Ps benefits are added to income are included in Table 2. Income with 4Ps has a significant positive effect on the following expenditure items: personal care, clothes, recreation, education, alcoholic beverages, cigarettes, and mobile load. Personal care and clothes can be considered basic necessities like food, and their income elasticities of 0.47 and 0.58, respectively, are indeed close to that of food. Recreation

**Table 1**. Food consumption as per OLS regression results.

| Explanatory variables | Rice | | Viand | | AllFood | |
|---|---|---|---|---|---|---|
| | Run 1 | Run 2 | Run 1 | Run 2 | Run 1 | Run 2 |
| Income | 0.0049 | – | 0.1350*** | – | 0.1909*** | – |
| Income with 4Ps | | 0.0048 | | 0.1350*** | | 0.1904*** |
| D_4Ps | –3256.67 | – | 14877.6 | – | 22463.1 | – |
| HHSize | 3444.7*** | 3373.6*** | 757.2 | 981.6 | 4350.6 | 4651.8 |
| D_Sampiruhan | –838.7 | 453.75 | –1356.9 | –4587.7 | 5399.7 | 275.5 |
| Constant | 14964.2** | 13371.1** | 6102.7 | 10339.9 | 18991.6 | 25967.8 |
| No. of observations | 171 | 171 | 178 | 178 | 174 | 174 |
| $R^2$ | 0.0644 | 0.0586 | 0.2542 | 0.2528 | 0.3948 | 0.3897 |
| Adjusted $R^2$ | 0.0419 | 0.0417 | 0.2370 | 0.2399 | 0.3805 | 0.3789 |
| F-stat | 2.86 | 3.47 | 14.74 | 19.63 | 27.56 | 36.18 |
| Prob > F | 0.0253 | 0.0176 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Average consumption | 29048.5 | 29048.5 | 45890.9 | 45890.9 | 94977.1 | 94977.1 |
| Average income | 246297.6 | 258711.7 | 242365.8 | 254446.7 | 246651.2 | 258851.2 |
| Income elasticity | 0.0415 | 0.0427 | 0.7130 | 0.7485 | 0.4958 | 0.5189 |

***Significant at the 1% level
**Significant at the 5% level

[2]Non-purchased fish consumption is not included in the regression analysis for Viand, as the average non-purchased fish consumption is only inferred from fish catch allocation of open-fishing households and individual household level survey data are not available for all respondent households (since not all household respondents undertake open-fishing). It may be noted, nonetheless, that non-purchased fish consumption account for only less than 10% of viand expenditures of the household.

**Table 2**. Other consumption items as per OLS regression results

| Explanatory variables | Basic necessities | | Necessities | | Addictive consumption | | Luxury |
|---|---|---|---|---|---|---|---|
| | Personal care | Clothes | Recreation | Education | Alcoholic beverages | Cigarettes | Mobile load |
| Income with 4Ps | 0.0145*** | 0.0097*** | 0.0108*** | 0.0632*** | 0.0088*** | 0.0193** | 0.0418*** |
| HHSize | 942.7* | 531.3 | 581 | –1834 | –1.3 | 1.4 | 283.8 |
| D_Sampiruhan | 3631** | 742.0 | 3591* | 25193** | 919.7 | –1855 | 2371 |
| Constant | –2431 | –826.3 | –3471 | –5940 | 14503** | 7158 | 3873 |
| No. of observations | 167 | 130 | 178 | 59 | 38 | 74 | 108 |
| $R^2$ | 0.1600 | 0.151 | 0.104 | 0.2149 | 0.232 | 0.125 | 0.385 |
| Adjusted $R^2$ | 0.1443 | 0.131 | 0.09 | 0.1720 | 0.1645 | 0.0872 | 0.3676 |
| F-stat | 10.33 | 7.48 | 6.86 | 5.02 | 3.43 | 3.33 | 21.74 |
| Prob > F | 0.0000 | 0.0001 | 0.0002 | 0.0038 | 0.0278 | 0.0245 | 0.000 |
| Average consumption | 7210.5 | 4425.5 | 3984.6 | 19324.7 | 12704.4 | 16119.3 | 7664.7 |
| Average income | 236155.9 | 263647.1 | 254446.7 | 298577.9 | 343545.4 | 219764.6 | 277708.4 |
| Income elasticity | 0.4749 | 0.5779 | 0.6897 | 0.9765 | 0.2380 | 0.2631 | 1.5145 |

***Significant at the 1% level
**Significant at the 5% level
*Significant at the 10% level

and education, which may not be considered basic for low-income households, have higher income elasticities of 0.69 and 0.98, respectively. As alcoholic beverages and cigarettes regressions only include households with non-zero consumption, their low-income elasticity (0.24 and 0.26, respectively) reflects their nature as necessities for consuming households. Interestingly, mobile load expenditures are highly elastic (income elasticity of 1.51 is greater than 1) – a 10% increase in income increases household outlay for mobile load by 15% – implying that mobile load or the use of mobile phones is a luxury good for the low-income fishing households.

Household size has a significant positive effect only on Personal Care. An additional household member increases annual expenditures on personal care products by PHP 943. All other expenditure items are not significantly dependent on the number of household members. Hence, like the non-rice food items, the low-income fishing households seem to be just distributing among all family members whatever amount of these items (except personal care) the household income could afford.

Another consumption item that is significantly determined by income is the household's electricity consumption. Table 3 reveals a very low-income elasticity of 0.14, as electricity-powered appliances of low-income fishing households are limited to the basic appliances – lights and electric fan. HHSize is not a significant determinant of electricity consumption, but households with refrigerator and airconditioning units have significantly higher electricity bills. The annual electricity bill of a household with a refrigerator is higher by PHP 5,373, while that with an airconditioning unit is higher by PHP 8,703.

**Table 3**. Electricity consumption as per OLS regression results.

| Explanatory variable | Coefficient |
|---|---|
| Income with 4Ps | 0.0075** |
| HHSize | –79.09 |
| With refrigerator | 5371* |
| No of electric fans | 1075 |
| With aircon | 8703** |
| With television set | 1698 |
| With washing machine | 2964 |
| With computer | 5056 |
| D_Sampiruhan | –280.4 |
| Constant | 2377 |
| No. of observations | 178 |
| $R^2$ | 0.2710 |
| Adjusted $R^2$ | 0.2319 |
| F-stat | 6.94 |
| Prob > F | 0.0000 |
| Average consumption | 13376.2 |
| Average income | 254446.7 |
| Income elasticity | 0.1427 |

**Significant at the 5% level
*Significant at the 10% level

Of all expenditure items, the dummy variable for Sampiruhan (D_Sampiruhan) becomes significant only for Personal Care, Recreation, and Education. Thus, it may be said that the levels of most consumption items do not differ significantly between these two fishing areas. Finally, income does not significantly affect household expenditures on health and home appliances and furnishings.

### Total Household Expenditures (Income) and Household Capital

Running a regression for household income with the available proxy variables for human capital (household head's age and educational attainment), physical capital (ownership of automobile), financial capital (loan), social capital (memberships in a fishing-related organization and credit cooperative), and fishing activities (open fishing and aquaculture) result in only one significant explanatory variable – household's engagement in aquaculture. Fish farming households have a significantly higher income. It is found that their annual income is higher by PHP 152,517 (Table 4). Involvement in aquaculture, specified in terms of the value of harvest, is also statistically significant. The coefficient indicates that for every PHP 1,000 increase in the value of harvest, household income increases by PHP 470. This reflects the significant impact of aquaculture on household income and consumption. This is not the case for open fishing income, suggesting that households involved in open fishing may be more dependent on other sources of income, presumably because of the instability and, hence, unreliability of open fishing catch.

**Table 4**. Household income as per OLS regression results.

| Explanatory variable | Variable definition and unit | Run 1 (dummy variables for open fishing and aquaculture) | Run 2 (value of sales from open fishing and aquaculture) |
|---|---|---|---|
| HH Head Age | Number of years | 2846 | 2137 |
| Household Head Education | = 0 if no formal education;<br>= 1 if elementary;<br>= 2 if high school;<br>= 3 if vocational;<br>= 4 if college | 9867 | 24680 |
| D_Open fishing | = 1 if household is engaged in open fishing;<br>= 0 if otherwise | –59302 | – |
| Value of catch | Value of daily fish catch, PHP | – | –1.11 |
| D_Aquaculture | = 1 if household is engaged in aquaculture;<br>= 0 if otherwise | 152517** | – |
| Value of harvest | Value of fish farm harvest (PHP) | – | 0.4702** |
| With 4Ps | = 1 if household is beneficiary of 4Ps;<br>= 0 if otherwise | –10167 | –46352 |
| With loan | = 1 if household has an outstanding debt;<br>= 0 if otherwise | –46547 | –9657 |
| With automobile | = 1 if household has a jeepney, motorcycle, tricycle;<br>= 0 if otherwise | 85825 | 71564 |
| Member – fishing organization | = 1 if member;<br>= 0 if otherwise | –79880 | –18049 |
| Member – credit cooperative | = 1 if member;<br>= 0 if otherwise | –28111 | –3784 |
| D_Sampiruhan | = 1 if household resides in Sampiruhan;<br>= 0 if in Sampad | 28344 | –16729 |
| Constant | | 124120 | 78660 |
| No. of observations | | 177 | 177 |
| $R^2$ | | 0.1187 | 0.1116 |
| Adjusted $R^2$ | | 0.0656 | 0.0580 |
| F-stat | | 2.24 | 2.08 |
| Prob > F | | 0.0180 | 0.0283 |

**Significant at the 5% level

**Table 5.** Food shortage vulnerability as per BL regression results.

| Explanatory variable | Variable definition and unit | Run 1 | Run 2 |
|---|---|---|---|
| Income | Total household expenditures and savings (PHP) | –1.79e–06* | –1.40e–06 |
| With 4Ps | = 1 if household is beneficiary of 4Ps;<br>= 0 if otherwise | –0.314 | –0.281 |
| HHSize | Number of household members | 0.0743 | 0.003 |
| D_Sampiruhan | = 1 if household resides in Sampiruhan;<br>= 0 if in Sampad | –0.975** | –1.246*** |
| Household Head Education | = 0 if no formal education;<br>= 1 if elementary;<br>= 2 if high school;<br>= 3 if vocational;<br>= 4 if college | –0.227 | –0.138 |
| Member – credit cooperative | = 1 if member;<br>= 0 if otherwise | 0.0318 | –0.011 |
| Member – fishing organization | = 1 if member;<br>= 0 if otherwise | –0.212 | 0.160 |
| Member – paluwagan | = 1 if member;<br>= 0 if otherwise | –0.134 | –0.255 |
| With relative in the barangay | = 1 if yes;<br>= 0 otherwise | –0.0812 | –0.113 |
| With friends to borrow from | = 1 if yes;<br>= 0 otherwise | –0.102 | 0.023 |
| D_Open fishing | = 1 if household is engaged in open fishing;<br>= 0 otherwise | – | 0.591 |
| D_Aquaculture | = 1 if household is engaged in aquaculture;<br>= 0 otherwise | – | –1.263** |
| Constant | | 0.837 | 0.589 |
| No. of observations | | 177 | 177 |
| Maximum likelihood | | –105.8 | –100.8 |

***Significant at the 1% level, ** Significant at the 5% level, * Significant at the 10% level.

It is noteworthy that none of the different forms of capital – human capital indicators (age and education), physical assets (automobiles), financial capital (loans), and social capital (membership in fishing organization and credit cooperative) – significantly contribute to income or total resources available to the households. It may be that the levels of these different forms of capital possessed by the households are just so scant to have any influence on income in general.

The factors that influence the likelihood of the households experiencing a food shortage (*i.e.* to miss meals) are analyzed using binary logit (BL) regression. The results, as shown in Table 5, reveal that household income significantly reduces vulnerability to food shortage of households (Run 1). When dummy variables for households engaged in open fishing (D_Open fishing) and aquaculture (D_Aquaculture) are included (Run 2), the coefficient for D_Aquaculture is significantly negative while household income becomes insignificant. Aquaculture engagement (that significantly raises income as per regression results in Table 4) lowers the likelihood of the household to miss meals. Households' engagement in open fishing, on the other hand, does not lower food shortage vulnerability. Finally, the coefficient for the dummy variable D_Sampiruhan is significantly negative, implying that households in Sampiruhan are less likely to experience food shortage than households in Sampad, with other things remaining the same. Agricultural activities (vegetable farms) appear to be contributing to lower food vulnerability in Sampiruhan.

## CONCLUSION

Despite some contrasts between the two fishing communities in Sampiruhan and Sampad, the living conditions of fishing households in these two barangays surrounding Laguna Lake are very similar. The households generally have low-income with almost no savings. As a result, a very high proportion of income is spent on food – mainly rice – consumption of which is mainly determined by household size and is very income inelastic.

All other consumption items are income inelastic and are, therefore, considered basic necessities except for mobile phone load, which has an income elasticity of greater than 1 – implying that this expenditure item is already a luxury for low-income fishing households.

The survey reveals very low levels of all forms of capital. Physical assets possessed by fishing households are very basic – just electric fan, television set, mobile phone, gas stove, radio, and monoblock seating furniture. There is a very small proportion of households that are saving while the majority are in debt. Nonetheless, it is good that the low-income fishing communities are largely dependent on formal credit cooperatives and relatives and friends for financial needs for business or livelihood purposes, and not on oppressive, high-interest, informal credit markets.

Regression results reveal that while household income or total household expenditures is not significantly determined by any form of household capital – physical assets, financial capital, and social capital – it is significantly higher for households undertaking aquaculture. This warrants more government support focused on aquaculture operations. Small-scale fish farm operations may be promoted with aquaculture training, increased access to low-cost credit facilities, support for fishing cooperatives and organizations, and fish farming subsidies such as free fingerlings and fishnets.

Government financial assistance through its conditional cash transfer program (4Ps) appears to contribute to household consumption as an income-augmentation measure. The amount of 4Ps received by the households lumped together with household income significantly raises the consumption of households, auguring well for the continuation and expansion of this social amelioration program of the government.

Finally, regression results indicate that food shortage vulnerability is primarily caused by very low-income levels of fishing households, and receiving financial assistance through the 4Ps program does not significantly lower the likelihood of missing meals. It may also be surmised that because fishing activities provide for household meals, the proliferation of water hyacinth in the Rizal portion of the lake that prevents fishing activities in Sampad contributes to the higher food shortage vulnerability of Sampad households and, hence, requires immediate attention. In the same light, there is a need to address the different sources of water pollution that negatively affect fishing activities in the lake - domestic wastewater from households and the services sector, wastewater from livestock and poultry production, fertilizer residue from croplands, and toxic and hazardous substances from industries.

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# APPENDICES

**Table I**. Household consumption expenditures (PHP), 2018.

| Expenditure item | Sampiruhan, n = 113 | | Sampad, n = 65 | |
|---|---|---|---|---|
| | Mean | Std. dev. | Mean | Std. dev. |
| **Weekly expenditures** | | | | |
| Rice | 532 | 369 | 553 | 443 |
| Viand and other food consumed at home | 893 | 784 | 592 | 682 |
| Food consumed outside the house | 410 | 736 | 296 | 348 |
| Alcoholic beverages | 66 | 157 | 31 | 90 |
| Cigarettes | 128 | 202 | 136 | 220 |
| Transportation | 218 | 534 | 317 | 534 |
| Mobile phone load | 78 | 135 | 113 | 438 |
| **Monthly expenditures** | | | | |
| House rent | 140 | 533 | 16 | 124 |
| LPG/kerosene for cooking | 571 | 638 | 370 | 631 |
| Electricity | 1,278 | 1,210 | 651 | 441 |
| Water | 291 | 473 | 90 | 202 |
| Personal care | 653 | 1,024 | 409 | 353 |
| **Yearly expenditures** | | | | |
| Clothing and other accessories | 3,391 | 6,387 | 2,546 | 4,131 |
| Education | 9,014 | 35,467 | 22,009 | 6,595 |
| Health/medical | 10,907 | 41,708 | 3,787 | 8,157 |
| Appliance/furniture | 1,888 | 4,823 | 2,821 | 7,229 |
| Recreation/family celebration | 5,462 | 15,929 | 1,500 | 2,456 |

**Table II**. Annualized household expenditures, 2018.

| Expenditure item | Sampiruhan, n = 113 | | Sampad, n = 65 | |
|---|---|---|---|---|
| | Mean (PHP) | Proportion (%) | Mean (PHP) | Proportion (%) |
| **Annualized weekly expenditures** | | | | |
| Rice | 27,664 | 14.2 | 28,756 | 17.4 |
| Viand and other food consumed at home | 46,436 | 23.8 | 30,784 | 18.7 |
| Non-purchased food (fish) | 8,542 | 4.4 | 7,929 | 4.8 |
| Food consumed outside the house | 21,320 | 10.9 | 15,392 | 9.3 |
| Alcoholic beverages | 3,432 | 1.8 | 1,612 | 1.0 |
| Cigarettes | 6,656 | 3.4 | 7,072 | 4.3 |
| Transportation | 11,336 | 5.8 | 16,484 | 10.0 |
| Mobile phone load | 4,056 | 2.1 | 5,876 | 3.6 |
| **Annualized monthly expenditures** | | | | |
| House rent | 1,680 | 0.9 | 192 | 0.1 |
| LPG/kerosene for cooking | 6,852 | 3.5 | 4,440 | 2.7 |
| Electricity | 15,336 | 7.9 | 7,812 | 4.7 |
| Water | 3,492 | 1.8 | 1,080 | 0.7 |
| Personal care | 7,836 | 4.0 | 4,908 | 3.0 |
| **Yearly expenditures** | | | | |
| Clothing and other accessories | 3,391 | 1.7 | 2,546 | 1.5 |
| Education | 9,014 | 4.6 | 22,009 | 13.3 |
| Health/medical | 10,907 | 5.6 | 3,787 | 2.3 |
| Appliance/furniture | 1,888 | 1.0 | 2,821 | 1.7 |
| Recreation/family celebration | 5,462 | 2.8 | 1,500 | 0.9 |
| **Total** | 195,300 | 100.0 | 165,000 | 100.0 |